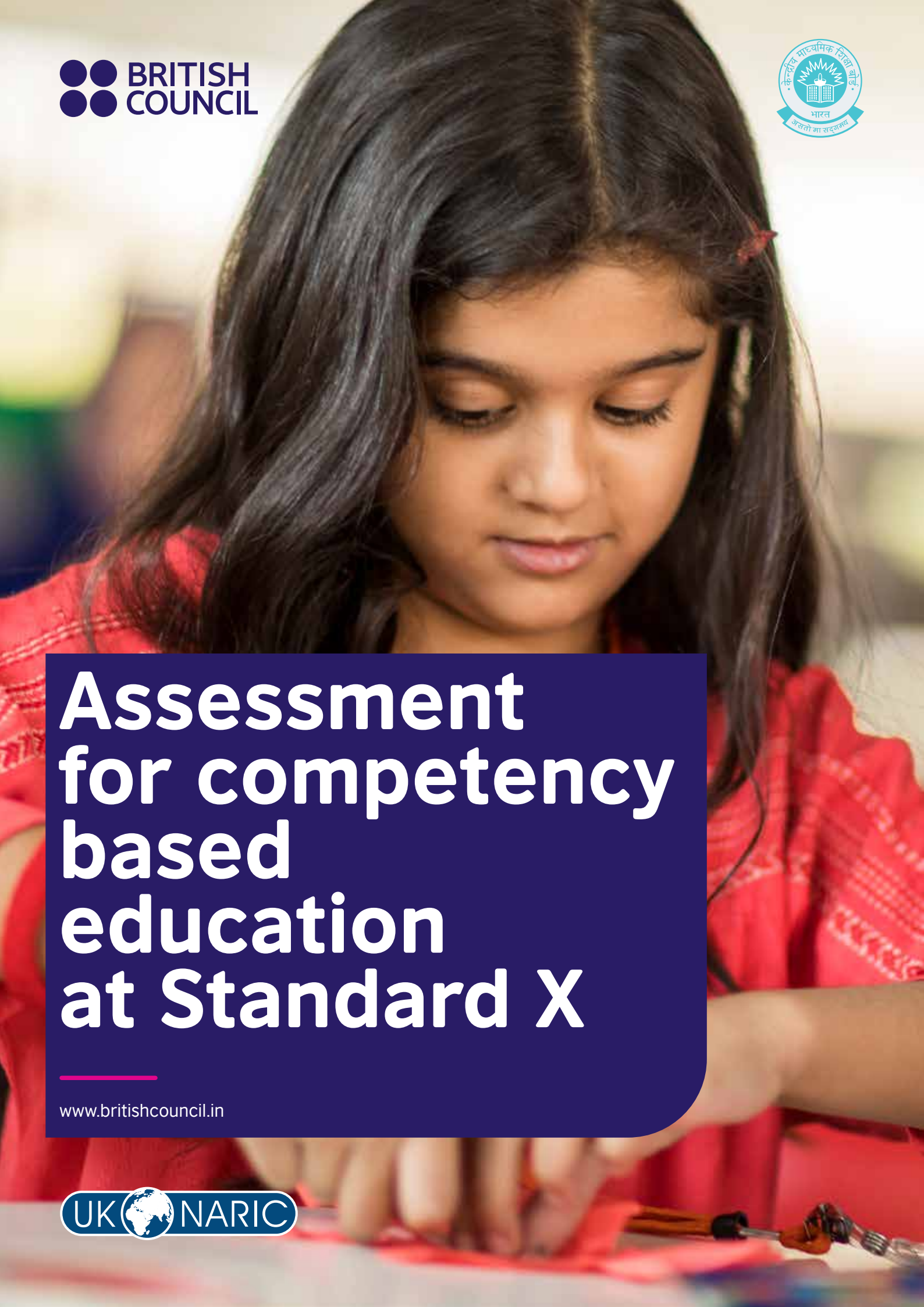

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Assessment for competency based education at Standard X

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UK NARIC

Submitted to the British Council by UK NARIC

The National Recognition Information Centre for the United Kingdom

The national agency responsible for providing information and expert opinion on qualifications and skills worldwide

November 2020

Commercial in confidence

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Foreword

We are honoured to partner with the Central Board of Secondary Education to bring you this publication. We want to acknowledge here the amazing work done by CBSE teachers who joined the global teaching community in shifting from face-to-face classrooms to virtual classrooms almost instantaneously in response to the Covid-19 pandemic closures.

I would also like to thank the UK NARIC team of UK experts who engaged with CBSE and its stakeholders to create this publication, and the British Council project team for their overall management of the project.

This publication is a part of the CBSE competency-based education project and improves understanding of the current assessment landscape at Standard X, its strengths and where moves to further integrate competency-based assessment principles can be made. High quality assessment, curriculum and pedagogy are the golden triangle of any education system and when these are made available to young people in an enabling environment it has a profound impact on learning outcomes. This project focuses on two of the three critical areas, assessment and pedagogy, and is aligned to the NCERT curriculum.

India has already set out to achieve its knowledge ambitions through the new National Education Policy 2020. This sets out the road map India has chosen for its journey to focus on high quality education and innovation, promoting conceptual and deep learning for all young people.

Education is one of the key pillars of cultural relations and an important aspect of the British Council's work in India and across the world. We hope that this project will truly transform young people's experience of assessment and learning in CBSE schools across the country and we look forward to the opportunity to work with the Ministry of Education in the future.

All the best and happy teaching!

Barbara Wickham OBE
Director India, British Council

Foreword

Central Board of Secondary Education with more than 25,000 schools in its network, in both rural and urban settings, has been committed to excellence in education. Since inception, the Board has been taking initiatives to meet the continually evolving requirements of the changing school education system.

The shift to the digital world and the recent pandemic has dramatically altered ways of teaching and learning. In the digitalised global world, the use and application of knowledge by learners has become of crucial importance. Competency Based Education (CBE) is an alternative to ensure a future ready generation proficient in relevant skills. CBSE with its focus on holistic education is facilitating this progression to CBE where learners would gain mastery of 21st century skills.

It becomes critical to reinvent the ways of teaching and learning in the classrooms. CBSE in partnership with British Council has initiated a systematic process to progressively move towards a competency-based education and assessment process. Under this project, an intervention for Science, Math and English (Reading) from classes 6 – 10 is planned which aims to strengthen system capacity; orient teachers to adopt relevant pedagogy, design and deliver competency-based assessments; and create a conducive environment that facilitates high-quality competency-based education.

CBSE is working towards a seamless transition to CBE for which policy-makers, school regulators and teachers are on-board as champions of change. It is intended that the resources and tools to implement their learning on the ground developed as a part of this programme will be made available as widely as possible through digital and physical means.

I would like to thank British Council for coming forward to partner with CBSE in this ever-important agenda.

Manoj Ahuja
Chairman, CBSE

List of acronyms

AO	Assessment objective
CBE	Competency-based education
CBL	Competency-based learning
CBSE	Central Board of Secondary Education
CEFR	The Common European Framework of Reference for Languages
GCSE	General Certificate of Secondary Education
HOTS	Higher Order Thinking Skills
IELTS	International English Language Testing System
IGCSE	International General Certificate of Secondary Education
MCQ	Multiple-choice question
NCEA	National Certificate of Educational Achievement
NCERT	National Council of Educational Research and Training
PTE	Pearson Test of English
SPM	Sijil Pelajaran *Malaysia*
SQP	Sample question paper
TOEFL	Test of English as a Foreign Language
VSA	Very short answer question

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Executive summary

Scope and context

UK NARIC has been commissioned by the British Council in India to conduct the first stage in a four-phase project, aiming to strengthen the provision for competency-based education (CBE) in the Central Board of Secondary Education (CBSE) Standard X in India. The first and current stage is to review and evaluate the CBSE Standard X examination system, focusing on Standard X provision in maths, science, English and Hindi (Reading). This final report, following on from an initial report on the site visit findings submitted in April 2020 and an interim report submitted in August 2020, reviews the existing CBSE framework. In relation to selected international assessment frameworks, it reviews and identifies scope for competency-based approaches to be integrated, considering the overall implications on the assessment system.

Methodological approach

The approach to this study combined primary research in-country with desk-based review and comparative analysis. A site visit to CBSE offices in New Delhi and to schools within the CBSE network took place in March 2020. The desk-based research then focused on collating and reviewing CBSE syllabus and assessment materials and identifying examples of international good practice. A comparative review of CBSE provision with international assessment frameworks was conducted:[1] these were selected to comprise internationally recognised qualifications taken at the same educational stage as, or with contextual relevance to, the CBSE Standard X. Definitions of competency-based education and assessment were also considered, informing UK NARIC's subsequent review of the CBSE examination system against competency-based design principles. In the case of Reading, the Common European Framework of Reference for Languages (the CEFR) provided a key reference point. This review was supported by examples of international best practice throughout. The findings from the desk-based analysis and initial stakeholder engagement were subsequently validated by drawing on further stakeholder engagement in October 2020 which involved surveys and interviews of students, principals and teachers of Standard X across the three subject areas.

1
These included IGCSE, UK GCSE, the New Zealand Certificate of Educational Achievement (NCEA) and the Malaysian SPM for maths and science. For English, the IGCSE, UK GCSE and Estonian State Examination were reviewed alongside selected English Language Tests. The Common Framework of Reference (CEFR) was also used as a reference point for English.

Key findings

Assessment of the current examination system and readiness for competency-based education and assessment

In conclusion, CBSE has taken preliminary steps to move towards a more competency-oriented format of syllabus design and assessment, although there are a number of identified areas for further development required to enable full integration of CBE practices. Below is a table summarising CBE integration, according to the design principles identified:

While the strong theoretical content base was observed to be a strength of the CBSE syllabus in preparing students for further, more advanced level study, greater engagement with employers in syllabus review and development could be of value. This acknowledges that the aim of CBSE Standard X is not only to facilitate progression but also to build employability skills. In mathematics and science, CBSE may want to consider whether allowing some use of calculators could be beneficial, noting that in

Summary of Analysis of CBSE Examination System and Current Level of Integration of Competency-Based Approaches

Key CBE Design Principles	Current Level of CBE Integration in CBSE Provision for Standard X
Curriculum Design	
1. Clearly defined aims and objectives	Partial
2. Learning outcomes focused	Limited-Partial
3. Relevant depth and breadth of content	Partial
4. Inclusion of transferable skills / general skills across academic subjects	Partial
Assessment	
1. Promoting equity and inclusivity	Partial
2. Accessibility of the assessment	Limited-Partial
3. Higher order skills-based assessment	Partial
4. Real-world relevance of the assessment	Limited-Partial
5. Synoptic and interdisciplinary assessment	Partial
6. Assessment reliability	Partial
7. Validity of assessment	Partial
Teaching and Learning	
1. Learning outcomes-focused delivery	Partial
2. Interactive teaching	Limited-Partial
3. Self-paced, individualised learning	Limited
4. Activity-based learning	Limited-Partial
5. Higher order thinking skills development	Limited
6. Appropriate formative assessment methods and feedback	Limited

the international syllabi and assessments reviewed, calculator use enables novel and extended problem-solving in real-world situations. For students taking Basic Level maths, who do not necessarily require maths for academic progression, it would be worth considering whether the assessment could have a stronger focus on practical mathematical skills and mathematical literacy required by employers. For Reading, it may be worth undertaking stakeholder engagement in order to ascertain which skills may be of most relevance to the workplace context.

The CBSE syllabus incorporates some features reflective of an outcomes-based syllabus design. The Question Typology, for example, sets out the skills intended for assessment on a general level with associated weightings. Nevertheless, there could be scope for a closer connection between the specified skills in the Question Typology and the questions included in the board exams to strengthen the assessment validity. This could be achieved by including the subject-specific skills alongside or as part of the more general skill areas of knowledge, understanding and application etc. In order to facilitate a closer link between what is taught in lessons and what is assessed by CBSE, it may be beneficial to integrate NCERT learning outcomes more concretely. This would reflect the outcomes-oriented design of similarly focused international qualifications.

A key focus and challenge of international secondary level examinations design at K-10 is to achieve a balance between an accessible assessment that allows students of all abilities to feel engaged and be able to demonstrate their skills and knowledge, while also ensuring that the most able students can be challenged. In CBSE maths and science, the fixed structure of the CBSE papers allows for clear student expectations and familiarity. Whilst the latest papers (2020) in science include more structured questions, there could nevertheless be scope for including a greater number of interrelated and scaffolded tasks in line with similarly focused international exams. Structured questions with interrelated sub-parts can enable more of a staged progression in terms of item difficulty, including lead-in sub-parts to questions to assess baseline knowledge on a topic area. These may help to increase students' confidence before subsequent more demanding questions or sub-parts which can then assess higher order thinking or novel problem-solving skills on the same topic area. In Reading, it may be beneficial to revisit the weighting of marks in open questions. This approach could provide opportunity for students to demonstrate a

wider range of competences in extended questions. This, in parallel with mark schemes which are appropriately constructed, could support the recognition of different ability levels in open answer questions.

The design and layout of CBSE Standard X papers and questions could benefit from further review to focus on clarity and conciseness to ensure that all candidates are fully aware of question requirements. In maths and science, this could involve simplifying some of the language used and the layout of questions, greater use of instructions, diagrams and images to orient the student to promote interest and engagement while enabling more of the candidate's exam time to be spent on problem-solving and showcasing their knowledge and skills. For Reading, scaffolding through rubric, layout, and/or including indicative content points for longer answer questions may increase transparency and accessibility.

Facilitating assessment reliability, CBSE employs step-wise mark schemes to support consistency in the marking process in maths and science. Nevertheless, more detailed mark schemes with greater guidance on how examiners should approach alternative answers could be of value. In languages, the use of analytic, skills-based marking approaches for marking writing tasks would reflect best practices used by international examination boards and provide increased opportunity to consistently test a range of relevant competences.

CBSE has included a number of questions aimed at higher order skills in the latest version of the Standard X exams and has incorporated some real-world scenario-based questions. However, it was found that in comparison to international examinations reviewed, a relatively smaller number of questions assess higher order thinking skills such as analysis and novel

problem-solving in real-world situations. In maths and science, CBSE assessment could benefit from a greater number of questions that assess data analysis and evaluation, experiments, situations and phenomena outside of those included in the NCERT textbooks yet still designed to draw on the student's accumulated knowledge and concepts from the course of study. At the same time, there is clear scope to assess the NCERT taught concepts by incorporating fresh contexts and wording, visual diagrams, new scenarios using datasets and experiments to focus on the candidate's understanding, while still maintaining accessibility. The use of structured free-response questions and a wider range of command words can be recommended. In Reading, higher order thinking skills could be integrated into longer response questions, such as requiring students to weigh up the advantages and disadvantages of a topic in an essay. Literature-based questions could reduce the number of recall questions in favour of questions which focus on analytical skills such as character analysis, authorial intention or the effect of creative language choices.

In languages, integration of a more communicative-oriented, skills-based assessment would be beneficial, mirroring the approach taken by systems which are based on the CEFR. This, for example, could involve the development of more items which more readily assess reading comprehension "reading for detail" competences as opposed to questions which focus on recall or direct copying from the input texts. Guidance is provided on how this can be achieved in the report.

Stakeholder feedback – surveys and interviews

Subsequent to the focus groups conducted during the initial site visit and desk-based review and analysis of documentation (syllabus and assessment materials), further stakeholder engagement was conducted using student, teacher and principal surveys and interviews.

The overall findings from the stakeholder engagement in October 2020 support the findings of the desk-based analysis and recommendations made in the interim report. Positive feedback was obtained on the overall curriculum (its broad and relevant coverage of topics in maths, science and reading) and the assessment. In addition, there was a positive view on the inclusion of continuous assessment. In terms of delivery, survey and interview responses from the schools canvassed support the view that teachers are implementing some CBE approaches; in addition to evidence that learning outcomes in planning are drawing upon NCERT. Nonetheless, as highlighted previously in the focus group discussions, the challenges of differentiation and accounting for diversity whilst implementing a student-centred approach to learning emerge as pertinent across the subjects and stakeholder groups surveyed.

Mirroring the findings of desk-based review, further practical and real-world linkages would be beneficial across subject areas both in the curriculum and the assessment. Surveys also highlighted the similarity of exam papers with NCERT textbook questions, informing the review of assessment reliability.

Key challenges

The key challenges to implementing reform are identified as follows:

- **Challenge 1:** Perceived resistance to CBE approaches from subject experts / item writers / paper setters
- **Challenge 2:** Variation in teacher mindset and perceived resistance of teachers and parents to competency-based approaches
- **Challenge 3:** Current capacity of Standard X teachers to provide outcomes-based delivery, reflecting current and past limitations in the teacher training system
- **Challenge 4:** Broad spectrum of school and student backgrounds, needs and abilities
- **Challenge 5:** Perceived variation in teachers' marking practices in the absence of standardisation for internal assessment on a system-wide scale
- **Challenge 6:** Lack of awareness and

understanding among teachers, students and CBSE staff over what is meant by CBE and CBE approaches in general

- **Challenge 7:** Scale of CBSE school network, assessment implementation and cohort size.

Overarching recommendations

A number of overall recommendations are made, relating to six themes: strengthening the validity and consistency of the syllabus design; facilitating the validity of assessment; assessment reliability and transparency; fairness and the student experience; enhancing teacher and student support; and developing pedagogy.

Overarching theme 1: Strengthening the validity and consistency of the syllabus design

- **Recommendation 1a:** In consultation with NCERT, increase engagement with employers and universities to align curriculum content and competencies with practical workplace requirements and to facilitate flexible progression pathways for holders of Standard X
- **Recommendation 1b:** Adopt subject-specific assessment objectives / question typology, detailing the range of general skills that are applicable to the subject in question
- **Recommendation 1c:** Consider whether the competency-based model of language proficiency as developed by the CEFR may have relevance and application to the English Standard X context through consultation with key stakeholders and field experts.

Overarching theme 2: Facilitating the validity of assessment

- **Recommendation 2a:** Consider appropriate tailored training for item writers, focusing on the following themes:
  - Accessibility, including formatting, layout and wording of questions in line with best practice guidelines
  - Use of authentic source material for scenario-based questions
  - Scaffolded questions, supported with clear instructions, to ensure clarity and accessibility yet also providing scope for assessment of higher order thinking skills and differentiation of student ability
  - Use and integration of visuals and diagrams to aid clarity, promote problem-solving and facilitate student engagement and motivation in the assessment.
- **Recommendation 2b:** Compile a glossary of command words as a guide for item writers, students and teachers, to clarify expectations of questions using particular action verbs in the exam papers
- **Recommendation 2c:** Engage language consultants in the item writing and paper setting process
- **Recommendation 2d:** Consider the use of tracking databases in the development of items and paper setting
- **Recommendation 2e:** Support training, monitoring and progression, establish role profiles for item writers and paper setters with clear expectations. Supplement with guidelines for item and paper development in line with the CBSE syllabus
- **Recommendation 2f:** Facilitate examiner reporting processes and consider publishing integrated examiner reports with item level qualitative analysis and recommendations.

Overarching theme 3: Assessment reliability and transparency

- **Recommendation 3a:** Consider tailored training for paper setters on mark scheme design and implementation to facilitate flexibility and consistency of the marking process
- **Recommendation 3b:** Consider reducing the number of question options or choice in maths and science in Standard X examinations
- **Recommendation 3c:** Provide additional guidelines and assessment criteria for internal assessment components, tailored to subject-specific and task requirements
- **Recommendation 3d:** Consider implementing external moderation quality assurance procedures for the internal assessment, in the event of considering an increase above the current 20% weighting.

Overarching theme 4: Fairness and the student experience

- **Recommendation 4a:** In relation to equity of assessment and with a view to promoting student engagement in the case of mathematics, explore the possibility of aligning standards between the Basic and Standard Mathematics
- **Recommendation 4b:** Reconsider the current structure of the exam papers, particularly those in maths and science, increasing scope for flexibility of question type and mark allocation throughout the papers.

Overarching theme 5: Enhancing teacher and student support

- **Recommendation 5a:** Building a databank of competency-based questions as an internal and external resource to guide item writers and paper setters
- **Recommendation 5b:** Addressing implementation of CBE on a system-wide level, provide support and guidance documentation to the following groups of stakeholders:
  - A teacher guide to facilitate understanding of changes to assessment, guidance on how best to prepare students
  - A student guide, written to set out expectations and talk the student through the main types of questions included in the exams.

Overarching theme 6: Developing pedagogy

- Approaches to competency-based teacher training could be adopted to place more emphasis on collaboration between teachers, peer reviews and observations as well as self-reflection.

Introduction

This report comprises a review of the CBSE Standard X assessment system for three subjects: science, maths and reading, and provides an assessment of the readiness for competency-based education. This report presents the findings from an initial site visit to CBSE offices in New Delhi and the desk-based review and analysis of CBSE materials and international best practices.

UK NARIC has been commissioned to conduct this review project on behalf of the British Council of India, encompassing the first stage in a series of phases under the CBSE-CBE Competency-based Education project, aimed to strengthen the capacity of the Indian education system to deliver high-quality competency-based learning and assessment for science, maths and reading at secondary school level. The key objectives of the project are to:

- "Enable better learning outcomes for students in the education system through improved assessment in Reading (English, Hindi), Science and Math.
- Set standards for test items and assessment tools through item banks to be available as samples and
- Create and train a cohort of test writers in the system to generate new high-quality test items enhancing the competency-based assessment process of schools."[1]

Through this project, the British Council aim to review existing

1
British Council, 2020. Invitation to Tender: Introduction and Background to the Project. Internal document.

2
British Council, 2020. Invitation to Tender: Introduction and Background to the Project. Internal document.

examination processes and systems for CBSE based on the recommendations:

- "Create competency-based assessment tools and test items for classes 7-12; Train selected test item writers and assessment designers;
- Train teachers on competency-based pedagogy;
- Orient school leaders to create enabling environment in school;
- Explore innovation in mentoring teachers digitally; and
- Share knowledge through conferences/seminars.[2]

In line with the project scope outlined above, this report incorporates the findings of the background research and review of the existing framework and comparative analysis with selected international assessment frameworks. It aims to identify and review the scope for competency-based approaches to be integrated and the overall implications for the assessment system. The report also aims to provide recommendations for further enhancement of the system through suggestions on further development and implementation of CBL approaches in schools and in assessment and assessment design.

National Education Policy (NEP) in India

During the course of this report, a significant policy change developed with clear relevance for CBSE and its aim to move to competency-based education. The new NEP in India launched in August 2020 aims to provide high-quality education for all learners across alllevels of education including Early Childhood Education and Care (ECEC); School Education; Higher Education; Vocational Education and Training; Professional Education; Adult Education and Lifelong Learning. More specifically, NEP aims to increase the access, affordability, equity, inclusion and accountability of education for all learners regardless of their background in all levels of education. The ultimate objective of the policy is to increase the Gross Enrolment Ratio (GRE) from 26% to 50% by 2035. Amongst other key reforms, those with immediate relevance for this project include:

- The implementation of multidisciplinary, holistic and experiential educational approaches to learning across different subjects in all levels of education;
- The encouragement of critical thinking; analytical, competency-based and enquiry-based skills of learners;
- The design and implementation of examination methods focusing on assessing students' capabilities, competencies, analytical skills and critical thinking;
- The expansion of the use of technology in teaching, learning and assessment in all levels of education;
- The provision of support towards maximising the collaborations in the curriculum across all levels of education.[3]

NEP also introduced a new structure of school education including curricular and pedagogical reforms in order to address the continuously changing developmental needs and interests of learners at different stages of their school education. The new system is guided by a

3
Ministry of Human Resource Development. (2020). National Education Policy 2020. Government of India. Available at: https://www.mhrd.gov.in/sites/upload_files/mhrd/files/nep/NEP_Final_English.pdf

5+3+3+4 design corresponding to the age ranges of 3-8, 8-11, 11-14, and 14-18 years, respectively. More specifically, the new system consists of the Foundational Stage[4], the Preparatory Stage[5], the Middle Stage[6], and the Secondary Stage.[7]

Structure of the report

Section 2 of this report provides a summary of the methodological approach, including a summary of the review of CBE definitions and approaches. Section 3 provides a brief contextual overview of the CBSE Standard X and each of the qualifications chosen for inclusion in the comparative analysis. Supplementary information on each subject's aims, learning outcomes, content and assessment can be found in the Appendices.

Sections 4, 5 and 6 include subject-level analyses for science, maths and reading respectively. Each of these sections includes a review and comparative analysis of the CBSE Standard X syllabus and assessment against international qualifications.

Section 7 comprises an overall summary of the readiness of CBSE Standard X currently for competency-based education and assessment, identifying the strengths and weaknesses of the current system and highlighting the challenges and opportunity for CBE integration moving forward. Section 8 draws together the findings of the report to provide ways forward and key recommendations.

There are nine appendices to this report, which are provided in a stand-alone document. Appendix 1 includes an overview of competency-based education. Appendix 2 reviews the four selected qualifications used for comparison with maths and science: the GCSE, IGCSE, NCEA Level 1 and the Malaysian SPM. Item level analyses of the CBSE exam questions in maths and science in relation to selected items from the four international assessments are in Appendix 3. Appendix 4 comprises the review of the CEFR framework, whilst Appendix 5 includes a summary of the stakeholder engagement findings. Appendix 6 includes a review of the qualifications which were used as a comparison for the reading. Appendix 7 includes the findings from the surveys conducted in October 2020, while Appendix 8 contains the findings from the interviews. Appendix 9 comprises a list of key documentation used to complete this study.

4
The Foundation Stage covers 3 years of pre-school education and 2 years in primary school in Grades 1-2, covering ages 3-8.

5
The Preparatory Stage includes the Grades 3-5, covering ages 8-11.

6
The Middle Stage includes Grades 6-8, covering ages 11-14.

7
The Secondary Stage covers Grades 9-12 including two stages; first stage is Grades 9 and 10 and second stage is Grades 11 and 12, covering ages 14-18

Methodology

2.1 Defining competency-based education

Definitions and key features of competency-based education were considered based on a review of relevant literature; a full overview of competency-based approaches can be found in Appendix 1.

2.1.1 Maths and science

Whilst there is no definitive international framework for CBE approaches in secondary level mathematics and science teaching and delivery and assessment design, a number of definitions have sought to define the core features of CBE at an overarching level. Perhaps the most commonly cited one is that provided by the Aurora Institute, which defines high-quality CBE in the context of K12 education as follows:

- "Students are empowered daily to make important decisions about their learning experiences, how they will create and apply knowledge, and how they will demonstrate their learning.
- Assessment is a meaningful, positive, and empowering learning experience for students that yields timely, relevant, and actionable evidence.
- Students receive timely, differentiated support based on their individual learning needs.
- Students progress based on evidence of mastery, not seat time.
- Students learn actively using different pathways and varied pacing.
- Strategies to ensure equity for all students are embedded in the culture, structure, and pedagogy of schools and education systems.
- Rigorous, common expectations for learning (knowledge, skills, and dispositions) are explicit, transparent, measurable, and transferable."[1]

Other definitions of competency-based education (please see Appendix 9 for a full list of sources) similarly emphasise the importance of a learning outcomes approach to teaching and learning, as well as a focus on attaining proficiency in particular competencies to facilitate progression. Self-paced, individualised learning is a further common theme expressed as part of CBE, and CBL approaches to delivery as is the emphasis on the authenticity of the learning experience and real-world applications of knowledge and skills. Central to all of these definitions is the goal, as specified by the Aurora Institute, to empower students, providing a meaningful and positive learning experience.

The delivery of outcomes-focused teaching and learning and the use of formative assessment methods to review student progress are highlighted components of CBE and CBL provision in schools. Reference

1 Competency Works, 2019. What is Competency-based Education - An Updated Definition. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/what-is-competency-based-education-an-updated-definition-web.pdf>.

to formalised competency-based assessment is evident, although in broader contexts rather than those specifically related to secondary education. Nevertheless, the focus on demonstrating mastery or proficiency for advancement / progression necessitates the need for summative assessment methods which can be considered to be rigorous as well as valid and reliable. Moreover, an assessment framework which offers inclusivity and equity is especially important in providing a positive learning experience in the context of secondary school education. This can also be considered characteristic of the competency-based approach to student evaluation.

2.1.2 English and Hindi

Competency-based education within the context of languages is perhaps best articulated in the Council of Europe's *Common European Framework of Reference for Languages*, (henceforth the CEFR).[2]

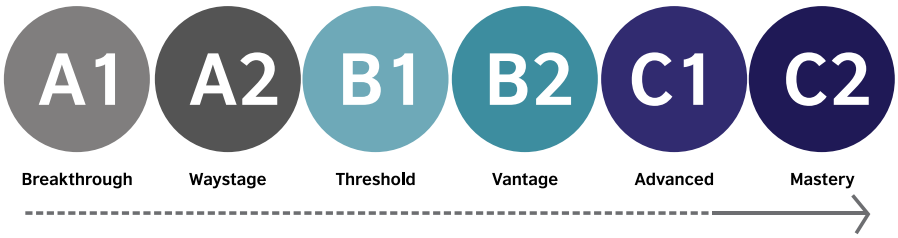
The CEFR was developed by the Council of Europe in Strasbourg throughout the 1990s as a response to the perceived need for a common framework to facilitate mutual recognition of language proficiency within Europe, but with ultimate application across multiple modern languages globally.

The key findings outlined in its publication in French and English in 2001: '*Common European Framework of Reference for Languages: Learning, Teaching, Assessment*',[3] arose from a consultative process with key industry stakeholders. The original framework is now available in forty languages, and aims to:

- Contribute to competence building in the area of linking assessments to the CEFR
- Encourage increased transparency on the part of examiner providers
- Encourage the development of both formal and informal national and international networks of institutions and experts.[4]

Proficiency levels are described on a six-point scale, from A1 at the lowest level to C2 at the highest:

Figure 1: the CEFR levels



More information about the framework and its articulation of competency-based language acquisition can be found in Appendix 4.

2
CEFR framework. Published by the Council of Europe. Available at <https://www.coe.int/en/web/common-european-framework-reference-languages/home>.

3
See further the CEFR framework. Published by the Council of Europe. Available at <https://rm.coe.int/16802fc1bf>.

4
Ibid 2001,1.

2.2 Stakeholder engagement

An in-country visit took place from March 2nd until March 6th 2020, which included meetings at CBSE offices and visits to five schools by the UK NARIC project team. The visit to the CBSE head office included focus groups with groups of teachers, principals, CBSE subject experts and meetings with the Head of CBSE and the Director of Assessment. The visits to the five schools involved interviews with principals, focus groups with students and teachers (separately where possible), and a small number of class observations.

Stakeholder surveys and further interviews of teachers, principals and students were conducted in October 2020 to validate and supplement the findings of the site visit, the findings have been integrated into relevant sections of the report as appropriate, and are included in full in Appendices 7 and 8.

Appendix 5 summarises the key questions posed to each stakeholder group.

2.2.1 Summary of the limitations

Some limitations were noted in the running of the focus groups:

- The size of some of the focus groups organised for the team can be identified as a limitation. A number of the groups comprised 15 or more, which led to challenges in managing and coordinating the responses to the questions as well as recording discussions. In some cases, the large group size impacted the depth of participation as well as potentially leading to prestige bias[5].
- A limitation in the student focus groups was evident in that some of the student focus groups also had teachers present potentially due to communication issues between parties, possibly impacting the objectivity of students' views and feedback. Some students struggled to respond in English, which may also have implications for the survey.
- In most cases, the Hindi teachers were unable to understand or respond in English. This may have implications for the teachers' survey.
- Currently, UK NARIC has not had the opportunity to interact with students from Standard X, as they were undergoing examinations during the visit period.
- Differences in provision are evident between school types, which can be further investigated in the student, teacher and principal surveys.
- The CBSE subject experts' focus group only involved experts from the academic unit involved in the SQP paper development, not the final exam development, which is managed by a separate assessment development team.

The focus groups nonetheless provided useful information on the integration of competency-based approaches, and the limitations noted were subsequently borne in mind when developing the surveys and interview questions. The surveys sent out to teachers, students and principals canvassed a large representative sample from both private and state schools, addressing similar questions to those posed to the previously conducted focus groups as well as additional questions designed to clarify issues and observations arising from the site visit.

5

A "prestige bias" results when individuals are more likely to produce answers which are viewed as corresponding to a valued cultural model.

2.3 Desk-based review

This stage involved a review of relevant CBSE materials, including the latest CBSE Standard IX and X syllabi, Sample Question Papers (SQP) for 2019-2020 as well as past examination papers from 2019 and 2018. The aim of this exercise was to review the CBSE Standard X in terms of its core components, including duration, entry requirements, content and structure, learning outcomes, assessment methods and assessed skills and associated outcomes.

2.4 Identification of relevant case studies

Case studies were identified to provide useful examples of the principles in practice, whilst acknowledging that all qualifications are designed to fit within their national context.

2.4.1 Rationale for case study selection

In the case of Science and Mathematics, the four selected case studies were drawn from the UK (the GCSE), New Zealand (the National Certificate of Educational Achievement (NCEA Level 1), Sijil Pelajaran *Malaysia* (SPM) and an International award offered by Cambridge (the IGCSE). In selecting these awards, consideration was given to ensure a sample which included qualifications which similarly offer summative, external assessments at an educational stage comparable to Standard X in India. The range was also intended to include systems which closely follow an outcomes-based approach to education and assessment as well as high performing countries in the PISA tests (New Zealand) and a mid-lower performing country (Malaysia).

It is important to acknowledge that the GCSE and IGCSE are single subject qualifications, whereas the CBSE, NCEA Level 1 and SPM are baccalaureate-style diplomas/certificates which incorporate a range of different subjects. Whilst subject-specific awards result in a grade awarded separately in each subject, baccalaureate awards are often graded at an overall level as well as on an individual subject level, acknowledging that the CBSE Standard X is awarded on an overall pass/fail basis. Nonetheless, in terms of the duration, entry level and the progression routes for advanced level study at upper secondary, the subjects that comprise these awards are broadly comparable to the GCSEs on a subject level and can be used as a point of reference to comparatively review the CBSE Standard X subjects.

In the case of Reading, case studies were drawn from Estonia (the *Riigieksamid,* State Examination Certificate), the UK (GCSE English Literature) and an international award – the Cambridge International GCSE – (English as a Second Language). Various factors influenced the selection of these case studies.

The diverse linguistic profile of India made case study selection complex for Reading. With over 20 official recognised languages,[6] and a large number of additional languages or dialects, the language profile of Indian students is not standard. Some students may be multilingual; others may use English as their home languages; others may be negotiating the learning of both Hindi and English in addition to home language(s). This linguistic complexity is not a feature of many other countries. Where

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A "prestige bias" results when individuals are more likely to produce answers which are viewed as corresponding to a valued cultural model.

student multilingualism is likely in other countries, this context often did not reflect integrated competency-based assessment, and so did not constitute valuable case studies. In other cases, where the linguistic profile might have more relevance and competency-based language assessment is undertaken - such as in Singapore where English, Chinese, Malay and Tamil are widely used - insufficient assessment materials were available for analysis.

Nevertheless, the flexibility of the CEFR as a competency-based language framework mitigates these issues to a large degree: proficiency in any language can be measured across different levels and so a student whose home language is English or Hindi is likely to reflect a higher CEFR level than one for whom English or Hindi is newly encountered in the education context. Multilingualism may lead to increased linguistic ability at a generalised level, but even so, specific competence in English or Hindi will need to be assessed independently of these other languages (although noting a student with many languages may acquire new languages more quickly). It will thus be of paramount importance for CBSE to consider, if the CEFR framework is considered to be useful, at which CEFR level(s) they wish to pitch the Standard X examinations and, indeed, whether they may wish to introduce a tiered examination or different courses to cater for the different linguistic profiles that students have.

The case studies were thus selected with the above in mind, but further factors also were considered to be important: firstly, it was felt important to include the GCSE English Literature to reflect that a considerable portion of the CBSE Standard X syllabus and examination focuses on set literary texts.

It was also useful to include qualifications where English was more concretely posited as a second language, in order to reflect the varying degrees of English language proficiency seen on the site visit at various schools. This decision was made to also reflect some of the more linguistic-based focuses of the CBSE examination, such as the error correction activities, textual comprehension questions, vocabulary synonym/antonym style questions in receptive tasks, and the extended answer tasks focusing on the accurate use of language in the written production tasks. The Estonian state English language exam was included to provide an overview of a national curriculum which has integrated the CEFR extensively into syllabus and assessment design. The Estonian case study is also of interest in terms of linguistic profile given that Estonian students may also be multilingual with Russian spoken by around a third of the population and Ukrainian also spoken in some areas.

The focus was on identifying the similarities and differences between qualification design, how the qualifications are structured to test across different linguistic and general competences, and focus on some exemplar question comparisons across different skills to draw out how different competences are tested at the item level.

There are some differences in the likely demographic of those taking the qualifications across the qualifications compared in this section which inevitably impacts on how they can be compared and on the design of the qualifications. For the GCSE English Literature examination, for example, the test-taker is very likely to be a school student, aged 14-16, and may well be a native speaker or a highly proficient speaker who has gone through the national curriculum of the UK.[7] In contrast, students taking the IGCSE in English as a Second Language, the Estonian state examination, and the international English language tests are more likely to be coming to English

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It should be noted with all case-studies that with the CEFR, the age of the candidate or student is of less significance than their proficiency level: an A1 student can be an adult or a young learner; some consideration will need to be given to text, topic and thematic appropriacy, and cognitive demand of questions in terms of 'real-world' knowledge, but the competences at the different levels of language proficiency are less fixed to specific ages. It is also worth remembering that the CEFR is descriptive, not prescriptive and is intended to be adapted to context and demographic as relevant and appropriate.

as a second or additional language – entrants for these examinations are unlikely to be native speakers. These differences are important to note in order to understand the applicability of the case studies to the Indian context: it is useful to look at literature questions from the GCSE English Literature examination, as they reflect the literature element of the CBSE Standard X examination (which the Estonian examination and the IGCSE do not). Nevertheless, it is crucial to recognise that the GCSE is pitched at a very high level in terms of proficiency, for students who are able to engage with highly complex literary texts such as Shakespeare and other literary classics primarily as native speakers. The *Riigieksamid* examination shares many aspects with the CBSE examination: it is a national school-based examination for students who will also be taking a number of other compulsory subjects, but the *Riigieksamid* does not assess literary analysis or critical reading of literature.

The purposes and associated outcomes of the qualifications also vary: the GCSE will typically lead to work or to further study at secondary level (often to the A-level). The Estonian state examination is a school leaver examination required for students to successfully graduate from upper secondary school and thus may lead to further or higher education or work. Those taking the international English language tests may cover a broader aged spectrum – they may be school-aged, but a number of test-takers may be those looking to demonstrate proficiency for a university-based context, for professional purposes or for immigration purposes, and may be adult test-takers.

The Reading section also draws on items from a range of international English language examinations such as the International English Language Testing System (IELTS), the Test of English as a Foreign Language (TOEFL) iBT, and Pearson Test of English PTE to provide a further point of comparison for competency-based language assessment, noting that although these are not school qualifications, they are strongly informed by the competency-based design of the CEFR and span a wide range of proficiency levels. Multilevel tests such as IELTs may be of interest in considering whether the Standard X examination could target more than one proficiency level through differentiated questions targeting different CEFR levels.

2.4.2 Comparative analysis

All qualifications were reviewed in terms of their core components as follows:

- Entry requirements and duration
- Aims and objectives
- Learning outcomes / assessed skills
- Content and structure
- Assessment methods
- Progression routes.

A range of publically available online materials were sourced on each of the five qualifications, including the following:

- Subject syllabi
- Exam papers from two years
- Mark schemes where available
- Teacher / examiner support materials where available.[8]

The comparative analysis focuses on comparing each qualification in terms of their core components, focusing in particular on:

- Aims
- Assessed skills
- Assessment format (including methods, volume, resources, exam structure, question types and assessed skills)
- Marking methodologies.

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Not all assessment materials are publically available, for example in the case of the Malaysian SPM, only a limited number of assessments could be sourced from 2017 and 2015 respectively.

Similarities and differences were identified between the international awards and the CBSE Standard X subjects, while examples of good practice were selected to inform the subsequent evaluation stage. Quality assurance processes were also reviewed separately to identify areas of good practice which could be applied in the context of the CBSE Standard X.[9]

2.5 Assessment of readiness for competency-based education

An assessment of the current level of integration of competency-based practices in the CBSE Standard X has been carried out, based on best practice CBE design principles identified from a review of the relevant literature of outcomes-oriented approaches in secondary education in terms of curriculum design, assessment and delivery. A list of sources is provided in Appendix 9. These principles can be summarised as follows:

Figure 2: CBE design and implementation principles

The analysis, by subject as appropriate, considers how current CBSE provision compares with each design principle, gauging the extent of CBE integration and identifying development needs, supported by international best practice examples. To this end, the analysis draws upon the key findings of the review of CBE Standard X and the comparative analysis with international secondary examinations summarised in this report.

Drawing on the findings of both the desk-based review and comparative analysis of the CBSE Standard X materials and the site visit and stakeholder engagement (Appendices 5, 7 and 8), this stage evaluates the current readiness in relation to each of the defined principles of CBE. Case studies are selected where applicable to highlight examples of international good practice. This analysis allows for identification of development needs towards full integration of CBE approaches across syllabus design, teaching and learning in schools and assessment.

2.5.1 CBE curriculum design

The following design principles are referenced in the subject-specific key findings for maths, science and English.

CBE curriculum design principle: clearly defined aims and objectives

Aims can be described as broad statements of what students are

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Publically available, online information on assessment quality assurance is particularly limited in the case of international exam boards such as CBSE, the New Zealand Qualifications Authority (NZQA) and the Malaysian Examinations Council (MEC). Review of international best practices in quality assurance relies heavily on the quality assurance systems in place for the GCSE and IGCSE, as there is more detailed publically available information on the processes and procedures used by the exam boards. The findings on the CBSE quality assurance processes are based on the account given in the interview with the Director of CBSE assessment but could not be cross-referenced in the absence of documented quality assurance handbooks.

expected to learn and are generally prescribed at a subject level, typically being applied across the whole programme of study.

CBE curriculum design principle: learning outcomes / skills-based design

A key feature of competency-based education design, learning outcomes should be measurable and clearly defined in terms of the skills students can demonstrate on completion of the course or unit of study.

CBE curriculum design principle: relevant subject content depth and breadth

Subject content and developing mastery of the prerequisite knowledge remain key components of curriculum design, the key best practice principle being that the breadth and depth of the content / topic areas should ideally facilitate the development of the prescribed overarching learning outcomes in CBE oriented approaches.

CBE curriculum design principle: inclusion of transferable and other general skills across academic subjects

Following the development of 21st-century skills frameworks, the integration of 21st-century skills or alternatively, core or transferrable skills within secondary level qualification design, has become an important feature of CBE oriented qualification design.

2.5.2 Implementation of the CBSE curriculum – teaching and learning in schools

Implementation of the CBSE curriculum is considered in the summary of Section 7 of this report. It focuses primarily on the findings of the site visit lesson observations and stakeholder engagement. It has been supplemented with the findings from the stakeholder interviews and surveys.

CBE delivery principle: learning outcomes-focused delivery

A key aspect of Aurora Institute's definition of competency-based learning and delivery focuses on the implementation of measurable and explicit learning outcomes to empower students, placing them at the centre of the learning process.

CBE delivery principle: interactive teaching

Interactive and activity-based delivery is a key feature of competency-based learning. This can involve both interaction between teacher and student, and between students.

CBE delivery principle: self-paced, individualised learning

CBE encompasses an approach to learning which takes into account individual abilities and tailors the teaching and learning experience accordingly. It similarly acknowledges the differing pace that students may work at and duration required to reach mastery in specific skills and fulfil specified learning outcomes.

CBE delivery principle: activity-based learning

Competency-based delivery advocates student-focused approaches including pair work, group work and student practice without step-by-step instruction by the teacher in the role of a facilitator. Student engagement can be facilitated by real-world application problems or tasks set by the teacher as well as linkages made explicit in teacher explanations of theoretical concepts

CBE delivery principle: higher order thinking skills development

Whilst accounting for variations in ability levels in classes, the use of stretch questions[10] and discussion work initiated by the teacher is a further feature of CBE delivery intended to engage and develop higher order thinking skills which go beyond knowledge and understanding.

CBE delivery principle: appropriate formative assessment methods and feedback

The use of formative assessment, particularly elements of peer and self-assessment, is characteristic of competency-based approaches, where students are encouraged to reflect on their own work and identify areas for improvement. As well as benefiting the student, CBE also emphasises the value to the teacher in being able to provide feedback on the effectiveness of delivery methods, informing changes / improvement in approach relevant to the individual learning style of the student.

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Stretch is a technique that helps teachers continue the learning after a student has answered a question correctly, whereby the student is expected to elaborate by responding to more challenging questions

2.5.3 Assessment principles

CBE assessment principle: promoting equity and inclusivity

Creating a fair assessment that allows the full range of skills and abilities to be properly evaluated is a key concern of competency-based assessment approaches, enabling a meaningful and positive experience which students of all abilities can engage in and learn from. The principle is of particular relevance in the context of the Indian system, where there are many groups of differing socio-economic and linguistic backgrounds, demographics and abilities taking the Standard X board exams across different regions and states.

CBE assessment principle: accessibility of the assessment

Accessibility of assessment is important in competency-based evaluation as it is central to the idea that all students should have the opportunity to access the assessment and showcase their ability in the competencies being assessed. There is also a connection between accessibility, validity and reliability of assessment in that the accessibility of the questions often has an impact on whether the final mark received is truly indicative of the student's ability in the subject.

CBSE assessment principle: higher order skills-based assessment

A focus on higher order thinking skills assessment is reflective of competency-based assessment in enabling students to advance based on mastery, therefore allowing them to demonstrate the full range of skills required to progress onto a more advanced level of study.

CBE assessment principle: real-world relevance of the assessment

A focus on assessing performance in real-world situations is also characteristic of competency-based assessment, with assessment tasks that are based on authentic data and scenarios. Authenticity is important to ensure that the context reflects how the student may use skills and knowledge in real-life. \

In summary, the move to introduce questions with real-world contexts and the use of scenarios is clearly beneficial in progressing towards a more competency-based model of assessment.

CBE assessment principle: synoptic and interdisciplinary assessment

A focus on assessing the ability to link together and integrate knowledge from different areas of the curriculum is a further feature indicative of competency-based secondary education and has been made a priority at the qualification design level. The approach to synoptic assessment can vary depending on the subject.

Synoptic assessment can be incorporated in externally set exams or alternatively in internal coursework-based assessments which provide greater scope for assessing broader skills and interdisciplinary application that may be difficult to assess under exam conditions.

In reference to best practice in conducting internal skills-based assessment, assessment criteria are employed in the internal assessment of project or portfolio work to facilitate consistency in evaluating student performance in relation to predefined skills, for example:

CBE assessment principle: assessment reliability

Reliability is an important aspect of good practice in CBE assessment design, and relates to both the paper setting and marking processes, ideally ensuring that the assessment is constructed and marked in a way that enables all candidates to achieve a score that as far as possible reflects their true ability in the subject. From an external stakeholder perspective, high reliability gives confidence that the standards achieved are maintained and retain their currency over time. Predictability, optionality and reliability in marking and standard-setting are considered. Definitions of these terms are included in Appendix 1.

CBE assessment principle: validity of assessment

Good practice in assuring the validity of assessment design relies on a close connection between the prescribed skills in the subject syllabi and the questions and marks awarded in the actual assessment.

Contexual overview of the Indian and selected international education systems

This section includes a contextual overview of the Indian and selected international secondary education systems.

3.1 Secondary education in India

In India, secondary education consists of two cycles, each two years in length: secondary (classes 9 to 10); and higher or senior secondary (classes 11 to 12), often known as "10+2" or "plus 2". Secondary schools follow the curriculum of their chosen examination board, which may either be the state education board or one of the three All India Boards, which include the CBSE).

Lower secondary education begins in class 9 (or class 8 in some cases). Hindi or the regional language is used as the medium of instruction, though English is used in many private schools and is taught as a second language in other areas.

Lower secondary schools follow the curriculum of their chosen education board. The curriculum typically covers:

- Languages: English, Hindi, regional languages
- Mathematics: algebra, arithmetic, geometry
- Science: biology, chemistry, physics (covered as integrated science)
- Social science: civics, geography, history
- Vocational studies: accounts, computers, fine arts.

Students in class 10 sit for public examinations administered by their chosen education board. The qualification awarded on completion of class 10 is generally known throughout India as the Secondary School Certificate (SSC) or the Standard 10 (Standard X).[1] Mathematics, science (integrated) and English and one other language are compulsory at Standard X.

Responsibility for the national planning and policy of the overall education system lies with the Ministry of Human Resource Development (MHRD), part of the central government. Under this ministry are two education departments: the Department of Higher Education and Department of School Education and Literacy; with the latter holding responsibility for the development of school education and implementing the National Policy of Education (1992). State governments also share the responsibility of developing school education in each state.

The development of key educational policies and programmes, including the National Curriculum Framework, is done by the National Council of Education Research and Training (NCERT). The NCERT is

1
UK NARIC. International Comparisons. India Country Profile

further responsible for the implementation of government policy on education and developing the curricula, syllabi, textbooks and additional materials for school education and advising the central and state governments and boards. For secondary and higher secondary classes, the NCERT provides subject syllabi and textbooks across a large range of subjects, from which central and state education boards can develop their syllabi and assessments. Compulsory and elective subjects are determined by the board.

Central and State Boards of Secondary/Senior Secondary Education use the national standard set by the NCERT to develop the curriculum, syllabi, and public examinations in their state or union territory. The CBSE and CISCE are central (national) boards, alongside the National Institute of Open Schooling (NIOS).[2]

CBSE

Established in 1962 under the purview of the Ministry of Human Resource Development (MHRD), the CBSE has over 21,000 public and private schools affiliated. The Board conducts final examinations, including the All India Secondary School Examination (AISSE) at Grade 10, and the All India Senior School Certificate Examination (AISSCE) at Grade 12. It also conducts other examinations annually for admission to undergraduate courses in engineering (and architecture) and medicine in numerous colleges across India. The CBSE is recognised by the Indian government and by most of the universities and colleges in India. There is also an international CBSE offered to expatriate students.

Within the CBSE secondary curriculum, at Standard X students would be expected to study:

- Two languages
- Art education
- Mathematics
- Physical education
- Science
- Social sciences
- Work education or pre-vocational education.[3]

They may also undertake additional subjects.

In order to progress to Standard XI, students are required to obtain passes (at least 33%) in all subjects. For students who do not pass two subjects, a compartment exam is offered in those subjects, students failing the compartment or three or more subjects are required to retake all subjects the following year.

3.2 England, Wales and Northern Ireland – The General Certificate of Secondary Education (GCSE)[4]

The General Certificate of Secondary Education (GCSE) was introduced in 1986 and examined for the first time in the summer of 1988, replacing the former GCE Ordinary (O) level and CSE examinations. It is normally taken by pupils around the age of 16 at the end of 11 years of schooling from

2
UK NARIC. International Comparisons. India Country Profile

3
Central Board of Secondary Education, 2015. Secondary School Curriculum 2015-2016 - Volume 1 Main Subjects.

4
UK NARIC. International Comparisons: UK Country Profile.

either maintained or independent schools.

The GCSE examinations are the principal means of assessing the National Curriculum at Key Stage 4, the two years leading up to the end of compulsory schooling. The National Curriculum was implemented for the core subjects of English, mathematics and science in September 1992 with the first examinations in 1994. The structure of the examination has been progressively adapted to accord with National Curriculum requirements, which have themselves undergone modification.

Each examining group designs its own syllabuses, but these must conform to criteria defined and monitored by Ofqual, formerly the Qualifications and Curriculum Authority (QCA). The award of a grade is intended to show that a candidate has met the level of knowledge and skill defined in the criteria.

As part of a major reform to the GCSE, for English and mathematics courses starting in England in September 2015, coursework and modular learning were discontinued with assessment limited to linear examinations at the conclusion of the two-year course. New linear GCSE programmes in other subjects were introduced for first teaching from 2016- 2019, including combined science (for first teaching in 2017). As part of the reforms, a greater focus has been placed on assessment of practical skills in science exams, higher order problem solving in mathematics and on synoptic assessment across all subjects.

The grading system has also been reformed. From 2015 onwards Grades 9 to 1 have been used in place of the previous A*-G grades, with a grade 9 considered to represent a higher level of achievement than the previous A* grade. Since 1996, tiered papers have been available in a number of subjects, and these continued to be offered in the reformed GCSE specifications in maths, science and foreign languages but not in English. A foundation tier covers Grades 5 to Grade 1 from 2015 (previously Grades C to G) Grade 9 to Grade 4 (previously grades A* to D) from 2015 onwards. Decisions about which paper to take are made towards the end of the GCSE course, and the two-grade overlap between tiers enables teachers to enter each pupil at a suitable level. A compensatory grade 3 may be awarded to candidates who fail to score sufficiently highly to achieve a 4 on the Higher Tier.

3.3 Malaysia – Sijil Pelajaran Malaysia (SPM)

Upper secondary education is two years in length (Forms IV and V) for students between 15 and 17 years of age. Entry to upper secondary schools is based upon results in the PT3 (or PMR before 2014). Generally, those with the best grades enter the academic stream, whilst others may opt for the technical or vocational streams.

The core subjects at upper secondary level for students in all three streams are Malay, history, English, Islamic studies / moral education and mathematics. All students must sit national examinations in these subjects. A wide range of subjects are offered as electives for students to choose according to their interests. On completion of Form V, students sit the Sijil Pelajaran Malaysia (SPM), also known as the Malaysian Certificate of Education. The examinations are administered by the Examination Syndicate of the Ministry of Education. Students may take the UCLES English language O level examination (English 1119, previously English 119 or 121) as part of the school syllabus.

Students take between 8 and 10 subjects. They are given a grade for each subject, but no overall grade. A pass grade in Malay language is required in order to gain the SPM certificate. From 2013, a pass grade in history is also required, and since 2016, English language has also become a compulsory pass.

3.4 New Zealand – the National Certificate of Educational Achievement (NCEA Level 1)[5]

The main national qualification for secondary school students is the National Certificate of Educational Achievement (NCEA). The NCEA is a standards-based award recognised by employers and used for selection by higher education institutions. The NCEA is listed on the New Zealand Qualifications Framework (NZQF) and is available at three levels: NCEA Level 1, NCEA Level 2 and NCEA Level 3. These correspond to the final three years of secondary schooling: Years 11, 12 and 13.

Subjects offered at school are known as "courses" and are made up of "standards" (subject components) describing what students need to know, or what they must be able to do. Schools offer two types of standard:

- Achievement standards, available in academic subjects (such as chemistry, English, history or mathematics) from the New Zealand Curriculum or Te Marautanga o Aotearoa
- Unit standards, available in vocational subjects (such as business administration, hospitality or technology).

Students typically study for six subjects at Level 1 in Year 11, reducing to five subjects at Levels 2 and 3 in Years 12 and 13. Students usually gain five to eight achievement standards per subject at each level. Each standard has a defined credit value, usually two to six credits. One credit represents ten notional learning hours. Students typically aim for 18 to 24 credits in each subject, although students in Year 13 are encouraged not to attempt more than 20 credits per subject at NCEA Level 3.

Assessment for the NCEA can be internal (or example performances, research projects or speeches) or external, through examinations administered by the NZQA or portfolio submissions. All assessment is quality assured by the NZQA.

External examinations take place at the end of each year. They are usually three hours in duration and consist of three separate papers assessing three achievement standards in one subject. Achievement standards are available in mathematics, combined science and English, which combine internal and externally assessed units. These are summarised in Appendix 2.

3.5 International – IGCSE

The International General Certificate of Secondary Education (IGCSE), a two-year secondary qualification targeting learners aged 14-16, forms an essential part of Cambridge Assessment International Education's[6] educational offer and sits alongside its other secondary qualifications such as the International AS and A Level qualifications, and the O Level qualifications.

First examined in 1988, the IGCSE is now offered across 5000 schools in 145 countries and counted 750,000 examination entries in 2017/2018.[7] The IGCSE is available in over 70 subjects, 30 of which are languages.[8] Students are typically graded on an A*-G basis though schools in selected countries may alternatively choose to follow a 9-1 grading system.[9] IGCSEs are available in maths, combined science and English and specifications are available that follow the 9-1 grading system used by the

5
UK NARIC. International Comparisons: New Zealand Country Profile.

6
Cambridge Assessment International Education was formerly Cambridge International Examinations until early 2018. Cambridge Assessment International Education is a UK-based exam board within the Cambridge Assessment Group, which is part of the University of Cambridge.

7
Cambridge Assessment International Education, Cambridge IGCSE Standards and GCSE, 2018. Available at <https://www.cambridgeinternational.org/Images/476025-cambridge-igcse-standards-and-gcse.pdf>

8
Cambridge Assessment International Education, Cambridge IGCSE Curriculum, n.d. Available at <https://www.cambridgeinternational.org/programmes-and-qualifications/cambridge-upper-secondary/cambridge-igcse/curriculum/>

9
At the time of writing, schools in Administrative Zone 3 countries could undertake the 9-1 IGCSEs in 26 subjects.

GCSE. As with the GCSEs, these comprise two-year programmes of study and culminate in a series of linear, written examinations. Further details on these programmes, including the aims, assessment objectives, content and assessment can be found in Appendix 2.

3.6 Estonia

During their first year of general upper secondary education, Estonian students choose a cluster of subjects to specialise in. Upper secondary education is for three years (grades 10-12). These cluster of subjects consist of a mix of compulsory and optional courses. For the compulsory courses, the following are studied: in art subjects, students have to study two arts courses and three music courses. In foreign languages, they need to study five courses of a foreign language at CEFR B1 proficiency level, and five courses of a foreign language at CEFR B2 level. In the subject field of language and literature, they study six courses of Estonian language, and five courses of literature. In mathematics, if studying the extensive route, they study 14 courses, and if studying the narrow route, they study eight courses. They study four subjects within natural sciences – biology (four courses); chemistry (three courses); geography (two courses); and physics (five courses). In social studies, they study civics and citizenship education (two courses); geography (one course); history (six courses) and one course in personal, social and health education. In addition, students have five courses of physical education. Beyond these compulsory courses, the remaining one-third of the curriculum can be chosen by the student from optional courses under each subject field.

Estonian secondary school students must undertake a system of state examinations called the *Riigieksamid* in order to graduate from upper secondary school. The examinations are taken by students upon completion of upper secondary school at the age of 18, by which time they will have completed 12 years of education. To graduate, students are expected to pass the following:

- Estonian language and literature or Estonian as a second language
- Foreign language (a choice between English, French, German or Russian)
- Mathematics (narrow or extensive).

In order to be awarded the Secondary School Leaving Certificate (*Gümnaasiumi lõputunnistus*) and a National Examination Certificate (*Riiegieksamitunnistus)* students must pass the state examinations and, in addition:

- Complete at least 96 courses from the school curriculum with a satisfactory mark
- Pass the school examinations (*koolieksam)* and
- Complete a research paper or practical work.

Many students elect to take two foreign language examinations. The CEFR informs the Estonian national curriculum for both home languages (Estonian, Russian) and foreign languages.[10]

10

Estonian Upper Secondary National Curriculum Page 2. Available at <https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf>

Science

A review and comparative analysis of CBSE Standard X design and assessment was conducted against four other international examinations taken at the same educational stage in different countries.

4.1 Review and comparative analysis of CBSE Standard X science

4.1.1 Aims

An introduction including reference to some of the overarching aims of the CBSE Standard IX and X is provided as follows:

Table 1: CBSE Standard X Science Aims[1]

Standard X Science
Upper primary stage demands that a number of opportunities should be provided to the students to engage them with the processes of Science like observing, recording observations, drawing, tabulation, plotting graphs, etc., whereas the secondary stage also expects abstraction and quantitative reasoning to occupy a more central place in the teaching and learning of Science. Thus, the idea of atoms and molecules being the building blocks of matter makes its appearance, as does Newton's law of gravitation. The present syllabus has been designed around seven broad themes viz. Food; Materials; The World of The Living; How Things Work; Moving Things, People and Ideas; Natural Phenomenon and Natural Resources. Special care has been taken to avoid temptation of adding too many concepts than can be comfortably learnt in the given time frame. No attempt has been made to be comprehensive. At this stage, while science is still a common subject, the disciplines of Physics, Chemistry and Biology begin to emerge. The students should be exposed to experiences based on hands on activities as well as modes of reasoning that are typical of the subject.

The table below compares the aims between the qualifications included within this study in relation to a global set of themes, many of which are indicative of competency-based approaches in science:

1 CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

Table 2: Comparative Review of Aims

Theme	CBSE	IGCSE	GCSE	NCEA Level 1	Malaysian SPM
Developing knowledge and understanding of scientific processes, principles and ideas	✓	✓	✓	✓	✓
Developing understanding of scientific enquiry methods	✓	✓	✓	✓	-
Understanding limitations of the scientific method	-	✓	-	-	-
Problem solving skills	Partial	✓	✓	-	✓
Developing practical skills	Partial	✓	✓	✓	-
Applying knowledge to everyday life	-	-	-	✓	✓
Evaluating scientific information and drawing conclusions	-	✓	✓	-	✓
Promoting enjoyment in science	-	✓	-	-	-
Becoming prepared for further studies	-	✓	-	-	-
Encouraging effective scientific communication	-	✓	-	✓	-
Concern for accuracy and precision in science	Partial	✓	-	-	✓
Promoting innovation and inventiveness	-	✓	-	-	✓
Appreciating the wider impact of science, including social, economic, technological etc.	-	✓	-	✓	✓

The CBSE Science syllabus includes a general introduction rather than separately defined, listed aims. The aim to develop knowledge and understanding of scientific processes, concepts and ideas, is shared by each of the international qualifications reviewed. Equally, developing knowledge and understanding is strongly implied as a primary focus within the introduction to the CBSE syllabus, with reference to developing students' understanding in topic areas covered previously whilst introducing new topics.

Moreover, enquiry skills development is a key theme highlighted by the international qualification aims and is similarly reflected in the CBSE Science syllabus introduction which expresses the general intention that science "should augment the spirit of enquiry, objectivity and aesthetic sensibility."[2] Alongside enquiry skills, practical skills are explicitly also mentioned directly in the IGCSE, GCSE and NCEA Level 1 aims, and indirectly in the CBSE syllabus introduction. The IGCSE goes further and intends to also develop awareness of the limitations of the scientific method. Whilst the CBSE does make reference to the need for objectivity in scientific enquiry, the IGCSE and SPM also more explicitly aim to promote concern for accuracy and precision, as well as innovation and creativity in science.

Problem-solving skills are expressed in different contexts but emerge as a key theme shared by the aims prescribed by the selected international

2
CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

qualifications in secondary level science. A focus on problem-solving within the CBSE could be inferred by the general aim that "the secondary stage expects abstraction and quantitative reasoning to occupy a more central place in the teaching and learning of Science".

Applying knowledge to everyday life is a key aim of the NCEA Level 1 syllabus as well as the Malaysian SPM, reflected by the large number of real-world application topics and real-world problems included within the content. The IGCSE, GCSE and SPM also make reference to cross-disciplinary aspects of scientific study, with the general intention of promoting the appreciation of the wider societal impacts of science, including reference to the impact of new scientific technologies in terms of social, economic and environmental concerns. A further aim, included in the IGCSE but not within the other selected international award syllabi, is the overall intention to prepare students for further study in the subject area.

4.1.2 Content and structure

The following table lists the key content of CBSE Standard IX and Standard X Science:

Table 3: CBSE Standard X Science Content[3]

CBSE Standard IX and Standard X Science	
Standard IX	Standard X
Unit 1 Matter - Its Nature and Behaviour	**Unit 1 Chemical Substances-Nature and Behaviour**
• Nature of matter	• Chemical reactions
• Particle nature, basic units	• Acids, bases and salts
• Structure of atoms	• Metals and non-metals
Unit 2 Organization in the Living World	• Carbon compounds
• Cell - Basic Unit of life	• Periodic classification of elements
• Tissues, Organs, Organ System, Organism	**Unit 2 World of Living**
• Biological Diversity	• Life processes
• Health and Diseases	• Control and co-ordination in animals and plants
Unit 3 Motion, Force and Work	• Reproduction
• Motion	• Heredity and Evolution
• Force and Newton's laws	**Unit 3 Natural Phenomena**
• Gravitation	**Unit 4 Effects of Current**
• Floatation	• Effects of Current
• Work, energy and power	• Magnetic effects of currentr
• Sound	**Unit 5 Natural Resources**
Unit 4 Our Environment	• Sources of energy
• Physical resources	• Our environment
• Bio-geo chemical cycles in nature	• Management of natural resources

3
CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

Similar to the CBSE model, secondary level qualifications included in this study (GCSE, IGCSE and SPM) require completion of a two-year integrated programme. It is important to note however that the summative assessment for the CBSE occurs in Class 9 (undertaken by the schools) and separately at the end of Class 10 (Board). These assessments cover the curriculum of Class 9 and 10 respectively and not the cumulative content of both the years as is the case in the GCSE and IGCSE. The NCEA Level 1 is based upon one year of study in Year 11 in New Zealand, although it similarly builds upon study completed earlier in Years 9 and 10. All the reviewed secondary Combined Science programmes include coverage of biology, chemistry and physics in broadly comparable proportions.

Breadth of content coverage

In terms of the broader topic areas covered at this stage in science, there are few differences between the different qualifications, particularly in core areas of biology and chemistry. The main differences relate to coverage of food technology which is a broad topic area in the CBSE Standard X exam and SPM but is not included as a stand-alone topic area in the IGCSE, GCSE and NCEA Level 1. The IGCSE and GCSE provide additional coverage of biological molecules and enzymes which are not covered as separate topic areas in the CBSE, SPM or the NCEA Level 1. Furthermore, electrochemistry and energy changes in reactions are common areas covered in some of the systems but do not feature as prominently in the CBSE Standard X or the NCEA Level 1. Notably, understanding energy changes, in particular activation energies and bonds, as well as rates of reaction, are included in all systems but are not explicitly included in the CBSE syllabus.

Further variations are evident in physics, where radioactivity is covered as a core topic in the IGCSE and GCSE as well as the SPM but is not included as a stand-alone topic in the CBSE or NCEA Level 1. The particle model (including coverage of changes of state, density of materials and specific heat capacity) is only covered as a separate topic in the GCSE whilst astrophysics, including the earth and its place in the solar system, is only covered in the NCEA Level 1.

Depth of content coverage

Whilst CBSE's broader coverage of key topic areas is comparable, there were a few differences noted in the depth of coverage in certain topic areas. In biology, for instance, genetics and inheritance include modern applications of genetic engineering in the GCSE and the SPM, whereas in the CBSE genetic engineering applications are not explicitly covered.

Differences are also evident in the depth of coverage of quantitative chemistry. The GCSE and the IGCSE, for example, cover moles, concentrations, calculations involving atomic and relative molecular mass in greater depth than the CBSE, which touches on the mole concept in Grade 9 but may not cover the range and depth of calculations required in the GCSE including calculating concentrations and molar solutions. Nonetheless, the CBSE syllabus was observed to cover optics in greater depth than the other qualifications reviewed.

4.1.3 Assessment objectives / prescribed skills for assessment

The following table includes the Question Typology for Standard X Science:

Table 4: Question Typology of the Standard X Science[4]

CBSE Standard X Maths
1. Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.
2. Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas
3. Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.
4. Analyzing and Evaluating: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.
5. Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.

Similarities are apparent in the coverage of

4 CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

The following table shows the breakdown of assessment objectives (as defined in the Typology of questions in the CBSE syllabus) and relative weightings attached to the skills areas in the qualification specifications. Some cells are merged to show where some qualification assessment objectives encompass more than one specific skill area:

Table 5: Comparative Review of Assessment Objectives

Skills	CBSE	Cambridge IGCSE[5]	GCSE[6]	NCEA Level 1[7]	Malaysian SPM[8]
Demonstrating knowledge of scientific processes, principles and ideas	✓ (22.5%)	✓ (50%)	✓ (15%)	✓	N/A*
Demonstrating understanding	✓ (25%)		✓ (25%)	✓	
Applying knowledge to solve familiar problems	✓ (21.25%)	✓ (30%)	✓ (40%)	✓	
Applying knowledge to solve unfamiliar problems					
Analysing scientific information	✓ (20%)	✓ (20%)	✓ (20%)	✓	
Evaluating scientific information				-	
Planning experiments	-			✓	
Modifying experimental procedures	-			-	
Synthesis of scientific information	✓ (11.25%)	-	-	-	

knowledge and understanding of scientific processes, principles and procedures in the CBSE and the reviewed international qualifications. In the CBSE, knowledge and understanding are, however, split into two distinct skill areas, whereas in most of the international specifications reviewed, they are combined in one objective. Similarly, the international qualification assessment objectives also include the application of knowledge, although there are some differences in the definition and scope of application. The IGCSE, for example, includes problem solving (application) under the general objective of data handling, whereas the GCSE separates application (problem solving) and analysis of data into two separate objectives (AO2 and AO3). ?

In the CBSE syllabus, analysis and evaluation are combined under Sr.4 as is also the case in the GCSE and IGCSE objectives. In the GCSE and IGCSE syllabi, however, analysis and evaluation are included under experimental skills whereas there is no explicit reference to experimental skills within the CBSE Typology. The NCEA internal unit standard assessment objectives also include reference to experimental skills of planning and analysis, albeit without explicit reference to evaluation or modifying experimental procedures.

It is noted that CBSE also includes an additional objective within analysing and evaluating, which focuses on “creating”, a skill area which is not included within the assessment objectives in the four selected

5

CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

6

Cambridge International Examinations, 2019. Syllabus for IGCSE Combined Science. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/329756-2019-2021-syllabus.pdf>

7

Pearson Edexcel, 2016. GCSE (9-1) Combined Science Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf>.

8

NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01>.

international qualification specifications in combined science.

In terms of weightings, CBSE places the largest overall weighting on knowledge recall ("remembering"), accounting for 22.5% of the marks, whilst in the GCSE, assessment of recall alone is capped at 5% and in the IGCSE it is assessed combined with understanding at 50%, with understanding carrying a greater weight. Application is also weighted higher in the IGCSE and GCSE at 30-40% relative to the CBSE, which weights it at 21.25%.

In contrast to the IGCSE and GCSE which place 20% of the weighting on planning, evaluating and modifying experimental procedures, there is no explicit reference to the assessment of practical skills in the CBSE assessment objectives / prescribed assessed skills. However, it is recognised that CBSE places 5% of the overall assessment (25% of the internal assessment) on the assessment of practical skills internally.

9 CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

10 CBSE, 2020. Science Examination Paper 2020

Table 6: Standard X Assessment Format

	SQP 2019-2020 in Science[9]	2020 Paper in Science[10]
Number and type of assessments each examination series	1 written examination (3 hours)	
Duration	Written examination: 3 hours Internal assessment: Untimed	
Type(s) of question	Section A: Are one-mark questions comprising Multiple-choice Questions (MCQ), Very Short Answer (VSA) type and assertion-reason type questions. They are to be answered in one word or in one sentence. Section B: All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50 - 60 words each Section C: All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80 – 90 words each. All questions are compulsory although in 33% of questions, a choice is provided.	Section A: Are one-mark questions comprising Multiple-choice Questions (MCQ), Very Short Answer (VSA) type and assertion-reason type questions. They are to be answered in one word or in one sentence. Section B: All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50 - 60 words each Section C: All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80 – 90 words each. All questions are compulsory although in 33% of questions, a choice is provided.
Total marks available	**Final examination: 80 marks** Section A: 20 marks Section B: 30 marks Section C: 30 marks **Internal assessment: 20 marks** Periodic assessment: 10 marks Practical: 5 marks Portfolio: 5 marks	**Final examination: 80 marks** Section A: 20 marks Section B: 30 marks Section C: 30 marks **Internal assessment: 20 marks** Periodic assessment: 10 marks Practical: 5 marks Portfolio: 5 marks
Weighting toward overall qualification	Final examination: 80% of the marks for Science Internal assessment: 20% of the marks for Science	

The table below highlights the key features of the assessment frameworks of the CBSE and the selected international qualifications reviewed:

7: Comparative Review of Assessment Format

		CBSE[11]	IGCSE[12]	GCSE[13]	NCEA Level 1[14]	SPM
Assessment Methods	Internal	✓ (20%)	-	-	✓ (Approx. 50%)	-
	External	✓ (80%)	✓ (100%)	✓ (100%)	✓ (50%)	✓ (100%)
Number and type of assessments each examination series		1 written examination paper and Internal assessment	3 written examination papers	6 written examination papers	3 written exam papers 3 internal units	2 written examination papers
Duration	Per paper	3 hours	Papers 1/3:45 minutes Papers 2/4: 1 hour 15 minutes Papers 5/6: 1 hour 15 minutes	1 hour 10 minutes per paper	1-3 hours*	Paper 1: 1 hour 15 minutes Paper 2: 2 hours 30 minutes
	Total exam time	3 hours	3 hours 15 minutes	7 hours	3-9 hours*	3 hours 14 minutes
Optional questions	✓ (33%)	-	-	-	-	✓ (5-10%)
Other resources permitted		-	Periodic table Formulae sheet	Periodic table Formulae sheet	Periodic table Formulae sheet	Periodic table Formulae sheet
Tiers		-	✓ (Core and Extended)	✓ (Higher and Foundation)	-	-
Sequencing: Exam Sections		3-4 sections (A, B C and D[15])	No sections	No sections	No sections	Paper 2: 4 sections
Question ramping		-	✓	✓	-	-
Question Types		MCQ Structured Extended Short answer	MCQ Structured Extended Short answer	MCQ Structured Extended Short answer	Structured Extended Short answer	MCQ Structured Extended Short answer
Answer sheet format		Paper / pen answer booklet separate	Paper / pen question and answers integrated	Paper / pen question and answers integrated	Paper / pen question and answers integrated	Paper / pen answer booklet separate
Total marks available		80 marks	160 marks	360 marks	90 marks	70 marks
Weighting toward overall qualification		80% (20% based on internal assessment)	Paper 1/3: 30% Paper 2/4: 50% Paper 5/6: 20%	Each paper: 16.67%	Each unit: 16.67%**	Paper 1: 40% Paper 2: 60%

*Based on the average length of time a student will take to complete, while acknowledging that the candidates are given a total of three hours per paper.

**The NCEA Level 1 awards unit credits in each subject rather than separate subject qualifications. This percentage represents broadly the proportion of credit that each unit contributes to the total number of credits typically taken in the subject.

4.1.4 Assessment methods and format

The following table details the assessment format and methods of the CBSE Standard X in Science, based on the latest exam format (SQP 2019-2020 and the 2020 paper):

The qualifications reviewed vary in terms of their assessment framework. The CBSE assessment is based upon 80% external written examination and 20% internal assessment, while the GCSE, IGCSE and SPM are assessed entirely by external written examination. This is also the case at A Level in the UK and in the Cambridge International A Level. The NCEA comprises 50% external examination and 50% internal assessment, representing the highest proportion of internal assessment in the sample of international assessment frameworks, although internal assessment is externally set (internally marked) in the case of NCEA Level 1.

4.1.4.1 Volume of assessment

Differences are apparent in the number and volume of external assessments. CBSE has the lowest volume of external assessment with a single three-hour examination paper, whilst the NCEA Level 1 Science typically involves three or four three-hour papers, although it is acknowledged that the duration can vary. The GCSE has the largest volume of summative assessment, with seven hours of total exam time. It is also important to note that whilst the GCSE and IGCSE have two separate tiers pitched at different levels of demand, the NCEA Level 1, SPM and CBSE do not have separate tiers of entry and all candidates are required to take the same paper(s).

Similarities and differences also emerge when considering the coverage and breadth of assessed topic areas in each assessment. The NCEA Level 1 assesses a narrower range of material in the three selected unit exams, which focus on three distinct topic areas, in greater depth than the other international assessments. The rest of the syllabus is assessed through practical internal assessment. This contrasts with the CBSE, IGCSE, SPM and GCSE which assess the full range of topic areas within the external examinations.

A further significant difference relates to optionality. Whilst acknowledging that NCEA candidates may select individual unit assessments (around 3 internal units), optional questions are not included in any of the international qualification examinations or NCEA internal assessments apart from Section C of the SPM Paper 2 in which candidates select one of two questions. The CBSE papers, by contrast, are found to offer a much higher level of optionality, with optional questions and parts of questions within the same question accounting for up to 33% of the marks for the paper. Where optional questions assess different topic areas and / or skills, this can lead to variations in the overall level of demand, depending on which questions the candidates select thereby affecting the reliability of assessment. More detailed comment on optionality is provided in the key findings section 4.3.

4.1.4.2 Resources

Whilst all four of the international exams permit the use of calculators, provide periodic tables and formulae sheets to assist candidates in problem solving tasks. The CBSE does not, however, permit any additional resources within the exam, placing more emphasis on candidates being able to accurately recall the relevant formulae in the examination.

11

CBSE, 2019. Science Syllabus Classes IX and X 2019-2020.

12

Cambridge International Examinations, 2019. Syllabus for IGCSE Combined Science. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/329756-2019-2021-syllabus.pdf>.

13

Pearson Edexcel, 2016. GCSE (9-1) Combined Science Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf>.

14

NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01>.

15

Varies depending on the year. The most recent SQP contains three sections: Section A, B and C.

4.1.4.3 Exam paper structure

In regard to the format and sequencing of exam papers, some immediate differences are apparent. The NCEA Level 1, IGCSE and GCSE predominantly consist of structured questions, where the majority are broken down into short, medium and extended parts assessing different skills within the same question. Question length varies throughout the papers, and questions are not sequenced according to question type or mark allocation. However, the GCSE and IGCSE papers have employed ramping whereby questions are sequenced by difficulty level, with easier items appearing earlier in the paper and more complex questions towards the end. This differs from the CBSE which has distinct sections of the exam allocated to different question types, starting with Section A (short answer), followed by Section B and Section C longer answer questions (3 and 5 marks respectively), however, these sections are not necessarily differentiated by difficulty level. The SPM Paper 2, however, is similar to the CBSE paper in that it also comprises sections of different types of questions, although the SPM sections have a more flexible structure and questions vary in terms of length and mark allocation. The CBSE exams, by contrast, have sections which are fixed in terms of mark allocation.

4.1.4.4 Answer sheet format

Whilst CBSE has separate answer sheets to the question paper, most other systems including the GCSE, IGCSE and NCEA Level 1 have integrated question and answer sheets in which students are expected to include all their answers in the space provided beneath each question. No system yet uses digital devices.

4.1.4.5 Question types and assessed skills

Overview of the CBSE SQP Paper and the 2020 Examination Paper (Set 31/5/1)

Section A

In both the SQP and the 2020 papers, Section A contains a variety of short answer and multiple-choice questions. Short answer items include stand-alone knowledge-based questions, involving definition and short explanation. Examples include the first two questions of the 2019 SQP:

Figure 3: CBSE science question examples 1

SQP 2019-2020

1. Define catenation (1)
2. How does valency of an element vary across a period? (1)

2020 Paper

1. Covalent compounds are generally poor conductors of electricity. Why? (1)
2. State the common characteristic of the following elements: Boron, Silicon, Germanium and Arsenic. (1)

Two questions in Section A of both the SQP and the 2020 paper (questions 3 and 4) are multi-part data response type questions, in which the candidate is presented with a scenario and is required to respond to a series of questions, requiring knowledge and understanding of basic principles as well as the application of knowledge to provide short explanations.

Figure 4: CBSE science question examples 2

SQP 2019-2020

3(a) State the principle behind electric generator. (1)

3(b) The output frequency of wind turbine is 50 Hz. What is meant by this statement? (1)

3(c) Why do you think Muppandal is at an advantageous position for this project? (1)

3(d) Based on the data represented in the graph below, which of the two cities A or B would be an ideal location for establishing a wind-farm and why? (1)

2020 Paper

3(a) What are solar cells?

3(b) How much voltage can be developed and how much electricity can be produced by one typical solar cell when exposed to the Sun?

3(c) The future of power generation by solar energy is bright in India. Give reason.

3(d) List two advantages of solar cells.

In the SQP paper, question 3, part a assesses knowledge and relies on recall of the basic principle behind electric generators whilst part b assesses understanding of frequency, the units and how it is measured (Sr No 2 – Understanding). Part c of question 3 involves providing a reason "why" based on the information provided, although the correct answer can be extracted/lifted from the accompanying text. Part d requires basic chart reading skills and inference to provide a supporting reason, thereby assessing Sr No 3 (Applying). Parts a, b and potentially c do not require any specific information from the extract and could be answered solely based on prior knowledge and understanding in isolation. Focused on solar cells, question 3 in the 2020 paper follows a similar format to question 3 in the SQP, with three of the four sub-parts focusing on knowledge rather than on understanding and application of concepts presented in the extract or dataset. For example, part a, which asks what solar cells are, could be answered from the candidate's own knowledge. Part b is the only part of the question that involves reading and interpreting data provided but does not involve analysis or manipulation of data.

Question 4 in the SQP appears to provide more scope for assessment of data interpretation; however, the first two parts to the question could be answered/guessed correctly without any analysis of the data provided, the answers to these questions being diabetes and insulin respectively. Part c can be answered based on knowledge, and part d involves basic chart reading skills to extract the correct answer. Question 4 in the 2020 paper is quite similar in terms of scope and format to Question 4 in the SQP. Although it is acknowledged that knowledge of the hormone is not covered in the NCERT curriculum, the first three parts to the question only require basic reading skills and extracting the correct answer from the passage, without assessing prior knowledge, understanding or application. The final part to the question (part d) involves basic chart reading skills but similarly to question 3, does not invoke higher order skills of analysis or manipulation of the data presented.

Questions 6-12 in Section A in both the SQP and the 2020 paper are discrete multiple-choice items which assess knowledge and understanding of topics from across the curriculum, while a number of questions also assess some degree of application of knowledge and techniques. For example, in the SQP, whilst question 7 can be described as a pure knowledge recall question ('a unit of electric power may also be expressed as…'), question 6 requires application of a formula in a two-step calculation (Applying Sr No 3). Similarly, in the 2020 paper, question 9 is purely

focused on knowledge while question 12 involves some degree of application of periodicity knowledge to work out the formula of a compound.

It is noted that both the SQP and the 2020 paper contained two multiple-choice questions with options. In question 8 of the 2020 paper, the first option appeared to be of higher demand than the alternative. Caution must be expressed with the setting of optional multiple-choice questions given the challenge in ensuring equal level of difficulty of the alternative questions. The setting of alternative one-mark questions could also add to the burden on candidates' decision making in the exam, potentially detracting from the assessment of scientific skills and knowledge.

Questions 13-14 in both the SQP and the 2020 paper are assertion reasoning type questions, which require the candidate to interpret information and identify the underpinning scientific reasoning. These are of a similar format in both papers. The wording of these questions nevertheless could place considerable cognitive load on candidates, potentially placing more focus on general logical reasoning and linguistic comprehension than reflecting the main purpose of the CBSE assessment which is to assess scientific knowledge and problem solving.

Section B

Section B questions in both the SQP and the 2020 paper predominantly assess knowledge and understanding of topics across the curriculum. In terms of question design and format, a number of Section B questions in the SQP are broken down into sub-parts, while the mark allocation is three marks overall for the question. For example, question 18 in the SQP and question 21 in the 2020 paper follow this format as illustrated below:

Figure 5: CBSE science example questions

SQP 2019-2020

18. (i) Create a terrestrial food chain depicting four trophic levels.

(ii) Why do we not find food chains of more than four trophic levels in nature?

2020 Paper

21. a) What provides nutrition to human sperm? State the genetic constitution of the sperm.

b) Mention the chromosomal pair present in zygote which determines the sex i) of a female child ii) a male child.

Part i of the 2019-20 question draws on knowledge of food chains and trophic levels, while part ii requires an explanation based on further understanding of food chains in nature. A small number of stand-alone questions also require a series of tasks, although these are not presented as sub-parts to the questions but rather as part of one overarching question. Examples include question 17 (SQP) and question 18 (2020 paper), which appear to include four and three separate requirements within a single question respectively:

Figure 6: CBSE science question examples

SQP 2019-2020

17. Two elements X and Y have atomic numbers 12 and 16 respectively. To which period of the modern periodic table do these two elements belong? What type of bond will be formed between them and why? Also give the chemical formula of the compound formed.

2020 Paper

18. What is meant by a trophic level in a food chain? Construct a terrestrial food chain with four trophic levels. The energy flow in a food chain is always unidirectional. Why?

Question 17 in the SQP requires the student to apply their knowledge of periodicity and bonding to provide an explanation when presented with two unknown elements, including the formulation and chemical formula of a compound. Similarly, question 18 in the 2020 exam paper is expected to explain trophic level, construct a food chain and explain why energy flows are unidirectional within the same question. Increased clarity could be gained by breaking down such questions into separate sub-parts.

The 2020 paper contains a greater number of structured questions, broken down into three sub-parts, than the SQP in which structured questions are generally stand-alone tasks or broken down into two sub-parts. One question in the 2020 paper in Section B is broken down into as many as six parts, but most have two or three. Although the mark allocation (3 marks) is given next to each question as a whole, it is not clear how these three marks are broken down for each sub-part in either the SQP or the 2020 paper.

In terms of the skills assessed, whilst the Section B questions provide scope for more detailed knowledge and understanding than Section A given the three mark allocations, there are only a few instances where students are expected to relate theoretical knowledge to situations or tasks which involve consideration or application of unseen data, factors or variables. This observation applies to both the SQP and the 2020 examination paper across the questions included in Section B.

Section C

Questions in Section C of the CBSE Standard X SQP and the 2020 paper are each worth five marks and vary in terms of format and design as well as the skills assessed across both papers. A limited number of parts to questions in Section C may require the demonstration / recall of specific formulae or manipulation of formulae to solve scientific problems. For example, the questions below:

Figure 7: CBSE science question examples

SQP 2019-2020

(i) A lens produces a magnification of -0.5. Is this a converging or diverging lens? If the focal length of the lens is 6 cm, draw a ray diagram showing the image formation in this case.

2020 Paper

30. b) Calculate the refractive index of the material of the material of a glass slab.

Notwithstanding the above example and Question 6 Section A, the use of data to carry out calculations, including calculating distances, volumes, and quantities is not assessed to any great extent in the CBSE SQP or the 2020 paper. Calculations are mainly required in relation to specific topics of electricity and optics.

Overall, the questions in Section C in both the SQP and the 2020 paper appear to place more emphasis on application and problem solving, albeit in familiar, textbook contexts, thereby assessing criterion 3. Nevertheless, there are very few questions in the SQP (2019-2020) and the 2020 paper which require direct analysis and evaluation of scientific information and the formulation of judgements / conclusions based on analysis of scientific data (Sr No 4). It has been observed that the questions that are intended to assess these skills could be answered based on knowledge in isolation and do not necessarily involve interpretation or analysis of scientific data. This is similarly observed in the 2020 examination paper, where one question presents a dataset, and only one mark is allocated to data interpretation in Section A.

It is acknowledged the 2020 paper (Set 31/5/2) includes one experimental design question (28) in Section C which assesses experimental planning skills in an extended less directed question, albeit drawing on skills developed in a familiar context. This is in contrast to the SQP paper, which does not include any experimental design / planning questions.

Summary of Similarities and Differences between the SQP and the 2020 Examination Papers in Science

The SQP and 2020 exam paper similarly assess a broad range of topic areas, broadly equal proportions of questions on biology, chemistry and physics, whilst acknowledging that the individual topics assessed vary somewhat between the SQP and the 2020 paper. The number of marks allocated to optional or alternate questions is broadly similar, with the SQP and the 2020 paper including optional / alternative multiple-choice questions as well as three- and five-mark questions in Sections B and C.

The 2020 paper includes a greater number of multi-part structured questions than the SQP and previous exam papers reviewed. These range from two-part to six-part questions and are mainly found in Sections B and C. Although they assist in breaking down the questions further, the structured questions in the 2020 paper, as with those in the SQP, do not necessarily include sub-parts which assess higher order thinking skills and the contexts are mostly familiar. Some of the sub-parts in the 2020 paper assess different sub-topics so are unrelated to other parts of the question.

Both the SQP and the 2020 papers similarly include few diagrams, with the vast majority of questions focusing on tasks which either involve the understanding in isolation, the candidate drawing a diagram or recalling factual information from memory, but potentially allow for less time and scope for problem solving in new situations.

One minor difference emerging from this review relates to set 31/5/02 of the 2020 exam series which includes one question drawing on experimental knowledge and planning, albeit in a familiar context, whilst the SQP does not include any experimental questions.

Both the SQP and the 2020 paper contain two “data response” questions in Section A, incorporating small datasets and passages (scenarios), the observations were similar across both papers. As in the SQP, question 3 in the 2020 paper is a dataset question where only one part (one mark out of four) assesses interpretation of the data, with the other three parts focusing on knowledge or extracting factual information from the passages. An emphasis on identifying factual information from the passages was observed in the 2020 paper question 4 in particular. Questions 3 and 4 do not appear to assess higher order thinking skills (application, analysis and evaluation) as intended in either paper.

As observed in both the SQP and the 2020 paper, a number of questions, which could at face value assess application and problem solving, are in fact observed to be similar in wording to those appearing in NCERT textbook, in some cases calculation questions include the same numerical values as appearing in textbook questions and solutions. For example, question 13 “A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is (i) pushed into the coil, (ii) withdrawn from inside the coil, (iii) held stationary inside the coil?” from the NCERT textbook chapter on magnets is very similar if not identical to the CBSE 2020 question 23. The inclusion of such questions potentially limits the examination’s effectiveness at assessing problem solving, as prior exposure to questions through textbooks means that candidates could rely solely, or at least to a large extent, on their memory ability rather than engaging actual thinking skills in the examination. In this context, there could be scope to introduce novel aspects into such a question by changing the introduction to the question, using diagrams or tables, presenting experimental data, switching the configuration of the magnets and observations, thereby engaging thinking and application skills of understanding of the candidate so they rely less on regurgitation of the solutions from the previously encountered problem in the textbook.

Mark schemes follow the same format for both the SQP and the 2020 papers. Slight differences are apparent; for example, the 2020 mark scheme has two columns differentiating between marks per sub-parts and total marks per question. Overall, there are more questions awarding half marks in the 2020 paper compared to the SQP, indicating possibly that the questions in the 2020 paper require longer responses and a greater number of steps are required / points to be made compared to the SQP. As in the SQP mark scheme, it is not entirely clear in places how the marks are supposed to be subdivided according to the level of response given in the answer in the 2020 paper mark schemes.

Comparative analysis with international qualifications

Short answer questions are included across all the reviewed international examinations and typically fall into two categories, the first assessing knowledge recall only and the second also assessing understanding. Both types are used across the CBSE, IGCSE, GCSE and SPM assessment, the NCEA Level 1 exams include few short answer questions in comparison to the other selected assessments. The proportion of marks allocated to short recall questions (one to two marks) is comparable across the sample of qualifications. Examples of short answer questions are provided below:

Figure 8: CBSE and GCSE Example Short Answer Questions

CBSE

1. Define catenation (1)

2. How does valency of an element vary across a period? (1)

CBSE SQP 2019-2020

1. Name two industries based on forest produce.

CBSE Standard X 2019

GCSE

(b) Some liquid is left in a warm room. After a few days no liquid can be seen. Give the name of the process that has occurred. (1)

(ii) State what is meant by the term electrolyte.(2)

(i) Under each box write the name of the state of matter shown. (2)

Pearson Edexcel GCSE Sample Assessment Materials

Similarities are evident between the CBSE short-medium answer questions and those targeting understanding in the GCSE, IGCSE and SPM. Typically, these questions begin with “describe” or “explain” or ask the candidate “why” and involve not only recall of knowledge, but the ability to structure this knowledge and demonstrate understanding of the concepts, processes or principles being assessed in a logical and coherent response.

Multiple-choice questions are similarly used in the CBSE, IGCSE, SPM and GCSE, to assess knowledge, understanding and application. The IGCSE and SPM were found to place the highest weighting on multiple-choice at 30%-40% of the overall assessment, while the CBSE and the GCSE allocate a lower overall weighting. The NCEA Level 1 assessments do not use multiple-choice questions. While the skills assessed vary, the majority of multiple-choice questions are focused on knowledge and understanding, with some focusing on assessing application and problem solving.

The CBSE and all four sets of the international examinations reviewed similarly include structured questions, whereby a series of sub-parts assess different knowledge and skills. Whilst questions in CBSE SQP Sections A, B and C can consist of two or three parts, the CBSE assessment generally includes fewer structured questions that the international counterparts examined as part of this study. The CBSE papers, however, include a higher proportion of stand-alone questions which do not include sub-parts but may sometimes include multiple embedded tasks. The 2020 CBSE paper nevertheless contains a greater number of structured questions than previous exams; however, the sub-parts are not always interrelated and do not tend to show progression in terms of difficulty level as is generally the case across the GCSE, IGCSE and NCEA Level 1 papers.

Furthermore, the type and range of skills assessed in structured questions vary. The IGCSE and GCSE both include data-response type structured questions in which the candidate is presented with a dataset and asked a series of questions of varying mark allocations. Some parts require interpretation and analysis of the data. Between 10-15% of the marks are allocated overall to data response type questions in the GCSE, IGCSE, NCEA Level 1 and SPM, whereas it is observed that the CBSE papers generally allocate a smaller proportion of marks to these questions across the papers reviewed. Examples of data response questions from the GCSE and CBSE are shown below:

Figure 8: CBSE and GCSE Example Short Answer Questions

4(a)	Refer to Table B showing the blood report of the levels of glucose of patients X and Y. Infer the disease which can be diagnosed from the given data.	1
4(b)	Identify the hormone whose level in the blood is responsible for the above disease.	1
4(c)	Which one of the following diets would you recommended to the affected patient? i) High sugar and low fat diet. ii) Low sugar and high protein diet. iii) High Fat and low fiber diet. iv) Low sugar and high fiber diet.	1
4(d)	Refer to the Table A and suggest the value of the mean blood glucose level beyond which doctor's advice is necessary: i) 180 mg/dL ii) 115 mg/dL iii) 50 mg/dL iv) 80 mg/dL	1

Question 4, CBSE SQP 2019-2020

(b) Figure 14 shows the level of progesterone for a female during five different stages of the menstrual cycle.

days in the menstrual cycle	progesterone level (nmol/l)
1–9	1.85
10–14	1.48
15–17	14.28
18–23	35.27
24–28	17.11

Figure 14

(i) Describe the changes in progesterone levels during the 28-day cycle.

(2)

.....

.....

.....

.....

(ii) Explain why progesterone levels changed following day 14.

(2)

Question 2, Pearson Edexcel GCSE Sample Paper 2 Biology

The example taken from the GCSE sample question paper given above requires the candidate to describe changes in hormone levels, by referencing and interpreting the data provided in the table. While the CBSE question above assesses knowledge and understanding of blood glucose and the hormone involved in its regulation, the answers to 4a and 4b could potentially be recalled from memory given the context of blood – glucose levels, without any real analysis of the table in Table B. Likewise, general knowledge of diabetes would allow the candidate to answer part 4c, whilst only part 4d requires the ability to interpret the data presented in Table A, but this is only worth one mark (equal to the other parts of the question assessing knowledge).

Scenario-based questions, in which a situation is presented and the candidate is expected to apply their knowledge and understanding to explain processes, phenomena and observations, are typically included across the IGCSE, GCSE, NCEA Level 1 and SPM examinations. The CBSE similarly includes a number of such questions, although generally a smaller proportion than those found in the IGCSE, GCSE and NCEA Level 1. Numerous examples of unfamiliar scenarios being used to assess conceptual understanding and application can be found across the international exam papers reviewed. The following question from the 2019 NCEA Level 1 unit test on aspects of mechanics presents the new everyday scenario of different sized footprints in the sand to assess the candidate's understanding of the relationship between force, pressure and mass:

Figure 10: NCEA Level 1 Example Real World Scenario Question


An adult and a child's feet sink into soft sand. The footprints are the same depth. The child's footprints cover a smaller area than the adult's.

(a) Pressure is defined as the force exerted divided by the surface contact area.

Using this pressure definition, explain how it applies to the adult standing in the sand.

Question 2 NCEA Level 1 Demonstrate Understanding of Aspects of Mechanics 2019 Paper

An additional type of scenario-based question included in the CBSE sample paper (2019) involves reading a passage and answering questions, based on the topic covered in the passage (Question 3). This type of question does not feature in the GCSE, IGCSE, NCEA Level 1 or SPM yet can be used to assess comprehension and application of knowledge in real-world scenarios. However, the effectiveness and validity of such questions are dependent on how the questions are worded in relation to the case study / textual scenario being presented in the question.

A notable difference relates to calculation questions and questions which assess the use of mathematics in science. The GCSE, IGCSE, NCEA and SPM include a similar, relatively consistent proportion of questions which involve single and multi-step calculations, whilst the number of calculation questions in the CBSE Standard X varies (up to 15% variability in the proportion of questions) by paper and by set. Furthermore, calculation questions in the CBSE almost invariably are set on problems in physics, whereas in other assessments (particularly IGCSE, GCSE and NCEA Level 1) they are more evenly spread between biology, chemistry and physics. This may be reflective of differences in syllabus content, particularly in chemistry where the international counterparts include more emphasis than CBSE on calculating volumes, quantities and measurements of materials in chemistry. Biological calculation questions vary, although the GCSE papers were observed to contain the greatest proportion across the papers reviewed, while biologically focused calculation problems are not found in the CBSE papers reviewed.

Figure 11: GCSE Example Calculation Questions in Biology

GCSE

6. The ratio of waist-to-hip measurements can be used to determine the risk of a person developing cardiovascular disease.

(a) Calculate the waist-to-hip ratio for a person with a waist measurement of 830 mm and a hip measurement of 0.99 m. (2)

Give your answer to two decimal places.

Pearson Edexcel GCSE Biology Sample Paper 1 Question 6

(i) Calculate the rate of water loss from the plant in mm 3 /s if the volume of water lost was 12 mm 3 in 10 minutes. (3)

Pearson GCSE Biology Sample Paper 2 Question 3

A key difference was also observed in the assessment of practical skills, which emerged as a key area of emphasis in the GCSE and IGCSE (accounting for up to 20% of the marks) but significantly less so in the CBSE board exams, although it is acknowledged that these are assessed internally in Standard X and in the NCEA Level 1. It is acknowledged that a number of CBSE questions include reference to experiments / demonstrations that appear in the NCERT textbooks. The CBSE questions, however, are found invariably to assess the understanding of concepts and observations

covered in these experiments, rather than assessing the practical skills of analysis and evaluation of experimental procedures and data which are explicitly assessed throughout the GCSE papers and separately in Paper 5 of the IGCSE. Examples of experimental questions which highlight some of these differences are shown below:

Figure 12: CBSE Experimental Question Examples

CBSE

What is hydrotropism? Design an experiment to demonstrate this phenomenon.

In the experiment ‘‘To prepare a temporary mount of a leaf peel to show stomata’’, glycerine and safranin are used. When and why are these two liquids used? Explain.

CBSE 2019 31-5-3 Question 25

Whilst questions in the IGCSE and GCSE may similarly ask candidates to plan / devise an experiment, contextual changes / novel elements are often introduced to more effectively assess the candidate's ability to apply existing experimental knowledge in a newly introduced, unfamiliar scenario. For example, the question below asks the candidate to plan a new experiment to develop magnesium sulphate crystals from an acid, with supporting equations for the processes involved based on prior knowledge of how to prepare copper sulphate crystals. Other experimental questions found in the IGCSE and GCSE, but not in the CBSE papers, may ask the candidate to explain how an experiment could be improved or modified to investigate a new variable, often drawing on experimental data.

Figure 13: Example IGCSE and GCSE Experimental Questions

Experimental planning question

Salts of metals can be made by reacting one of the metal's compounds with the appropriate acid.

Plan an experiment to prepare pure, dry crystals of magnesium sulfate, MgSO4, by reacting a suitable magnesium compound with a suitable acid. You may use equations if you wish.

GCSE Sample Paper 4 Chemistry Question

Experimental Method Questions

(iv) The scientist counted the number of bubbles produced by the Cabomba plant. Another scientist stated that this was not the best method of measuring the volume of gas produced.

Explain how you could improve the method to measure the volume of gas released more accurately.

Sample GCSE Biology Paper 2 Question 3

d) **Describe how the experiment could be modified to** obtain a more accurate value for the time it takes the train to travel around the track.

Question 6, IGCSE Paper 6 2018

(e) A student wanted to find out if the rate of this reaction depends on the concentration of the reducing agent in solution B.

Suggest how the student should modify the experiment that you have carried out to investigate this.

CBSE 2019 31-5-3 Question 25

Extended questions are stand-alone questions that involve a more comprehensive response. These are given the highest weighting in the GCSE papers (10-15%), whilst the NCEA also includes a proportion of extended tasks where the candidate is expected to provide a lengthier explanation, analysis or discussion. The CBSE also includes five-mark questions, some of which may involve a more extended response, although there is less explicit reference to being able to “analyse” or “evaluate”, “discuss”, “compare” or “contrast” in the CBSE questions, indicating more of an emphasis on detailed knowledge and understanding rather than on higher order thinking skills. This is borne out in a comparative review of mark schemes, where the GCSE awards marks for analytical skills using level-

based descriptors as well as for knowledge (points), whilst the CBSE mark schemes awards marks for knowledge only. Examples of GCSE extended questions (worth a maximum of six marks) are shown below:

Figure 14: GCSE extended questions

*(c) Explain how the changes in the trends for smoking may affect the occurrence of cardiovascular disease. (6)

*(b) The order of reactivity of chlorine, bromine and iodine can be determined by carrying out displacement reactions. Explain how displacement reactions can be used to show the reactivity of these three elements. (6)

GCSE Sample Assessment Materials 2017

Furthermore, it was also noted that the majority of the CBSE stand-alone questions that appear as extended tasks involve different tasks within the same question, whereas in the GCSE and NCEA Level 1 examples, the questions only specify one task / command word.

Overall, the CBSE includes a range of questions similarly found in international assessments. However, while the IGCSE, GCSE and NCEA Level 1 questions are more equally distributed between the different types, the majority of the questions used in the CBSE assessment encompass short and medium answer questions of between three and five marks, mostly assessing knowledge and understanding. The IGCSE, GCSE and NCEA include a significantly higher proportion of scenario-based, data response and calculation type questions than the CBSE across chemistry, biology as well as physics. Whilst the CBSE includes calculation and an experimental "planning" type questions, these questions are sometimes optional in the CBSE papers (where the alternative is a knowledge-based question) whereas in the international exam papers reviewed, all questions (including calculations) are compulsory ensuring that all candidates are assessed on the same skills.

4.1.5 Marking

4.1.5.1 CBSE marking approaches

Mark schemes for science are points-based and award marks for each correct point relevant to the question being asked. Half marks are also awarded for some points in a number of questions. In the majority of cases, 1 mark or 0.5 mark is aligned to a specific point, for example below:

Figure 15: Extract from the CBSE SQP Mark Scheme

4(a)	Diabetes	1 mark
4(b)	Insulin	1 mark
4(c)	iv) low sugar high fibre diet	1 mark
4(d)	i) 180mg/dL	1 mark
5	ii) pupils take time to adjust **OR** iii) refraction	1 mark

There nevertheless appears to be some inconsistencies in how the marks are linked to correct responses throughout the mark scheme. For instance, in the selected section below it is not clear how marks should be allocated:

Figure 16: Extract from the CBSE SQP Mark Scheme

27	(i) Oxygenated : B/D/F [B= left ventricle/D=aorta/F=left auricle/pulmonary vein] Deoxygenated: A/C/E [A= right ventricle/C= pulmonary artery/E=right auricle/vena cava] *(any two)*	0.5 + 0.5 + 0.5 +0.5 mark

A number of questions in the Standard X paper involve creating a diagram / chart including numerous interacting components. However, the CBSE mark scheme does not demonstrate how the marks break down by component and how, on a consistent basis, partial marks can be awarded for some correct components but an incorrect whole. For example, in question 18, 1+1+1 marks are indicated in the margin with no clear indication how these are assigned to specific components of the flow diagram. The mark scheme may benefit from further examiner guidance on how to award marks for partially correct diagrams, and alternative methods candidates may use to present the information in their response.

Limited direction is given in the CBSE mark scheme in the award of marks for alternative approaches / answers in cases where an alternative response

could be provided by the candidate. For example, in question 18, additional points could be included by the candidate, although only six acceptable points are listed with no apparent allowances indicated for an alternative / additional response.

4.1.5.2 Comparative review of marking approaches

The following table summarises the similarities and differences in marking methodologies employed by the five qualifications reviewed:

Table 8: Comparative Review of Marking Methodologies for Written Examinations

Qualification		Points based	Half marks awarded	Assessment criteria used	Credit given for alternative methods[16]	Breakdown of marks given in the mark scheme	
						Per sub-question	Per Step
CBSE		✓	✓	-	NE	✓	✓
IGCSE	MCQ	✓	-	-	-	N/E	N/E
	Structured questions	✓	-	-	-	✓	✓
GCSE		Mostly	-	Partial	✓	✓	✓
NCEA Level 1		Mostly	-	Partial	✓	✓	✓
Malaysian SPM		✓	-	-	NE	✓	✓

* Not explicitly evident in the mark scheme.

All five qualifications reviewed employ points-based (step-wise[17]) mark schemes in the assessment of student scripts. Some variations are nevertheless evident in the approaches used for marking different types of question. One key difference is the CBSE practice of awarding half marks for some questions, where only whole marks are allowed in the international marking practices.

A further difference in the marking approach concerns the level of guidance provided to examiners throughout the mark schemes. In particular, in the IGCSE and GCSE mark schemes there is clear consideration and acceptance of alternative approaches. The CBSE mark schemes, by contrast, do not

16 In comparison to the best method, as identified in the mark scheme.

17 Step-wise marking assigns marks to each step in solving a problem / completing a task.

tend to mention or give explicit direction to the examiners on how to approach answers which may deviate from specified approaches. This can be seen below:

Figure 17: GCSE Mark Schemes

The GCSE mark schemes are designed to include the following features:

- A separate column for additional guidance providing guidance on how to mark alternative answers
- Clear indication of where marks can be awarded "Four of the following" with the marks for each point given in brackets (1)
- The maximum number of marks for the question (4) in the final column

A clear indication of which assessment objectives are targeted in the question – AO1 and AO2.

Question number	Answer	Additional guidance	Mark
9(b)	An explanation linking four of the following: • adrenalin acts to increase heart rate / blood pressure (1) • so there is increased blood flow (1) • causes the release of glucose from glycogen (1) • so increased {oxygen/glucose} (1) • increased the rate of respiration (1) • to **release energy** (for the working muscles/body) (1)	accept more glucose released from liver/muscles accept ATP for energy	(4) AO 1 2

The GCSE, unlike mark schemes for the awards that are purely points-based, also uses levels of response descriptors in some questions that involve a more extended analytical response, to assess varying levels of skills demonstrated in addition to indicative content. For example, the following bands are used to assess a six-mark question, involving analytical and evaluation skills:

Figure 18: GCSE Extended Question Mark Scheme

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

4.2 Summary of the main similarities and differences – science

Similarities

Content: Inclusion of a broad range of topics is evident in Combined Science programmes, from biology, chemistry and physics in broadly equal proportions across international curricula.

Inclusion of core practicals and development of experimental skills is a common theme in all the science syllabi reviewed.

Assessed skills: Prescribed assessed skills focus on knowledge and understanding, problem solving (application) with analysis and evaluation.

Marking: A points-based (step-wise) approach is used in the CBSE, broadly similar to that employed in other systems.

Differences

- **Exam paper structure:** The IGCSE, GCSE, NCEA Level 1 and SPM incorporate a higher number of structured questions, broken down into sub-parts which assess different but related skills and knowledge related to the topics whereas CBSE past papers predominantly include single part stand-alone questions, although sometimes these may have multiple embedded tasks. Although the CBSE 2020 paper includes more multi-part questions, sub-parts are sometimes on sub-topic areas and are not always as closely interrelated as can be observed across the international exam papers reviewed.
- **Resources:** Calculators are permitted in the GCSE, IGCSE, SPM and NCEA Level 1 exams allowing for a much broader range of calculation type problems to be set, extending across biology, chemistry and physics. Formulae sheets are also provided so fewer demands are made on recall in the international papers – SPM, GCSE, IGCSE and NCEA Level 1 while no formulae are given in the CBSE papers
- **Question types:** A key difference is that the IGCSE, GCSE and NCEA Level 1 include assessment of mathematical application across all three sciences (biology, physics and chemistry), whilst CBSE only tends to include mathematical questions in physics and not in chemistry and biology.
- Multiple-choice questions are similarly used across all the exams reviewed and range from 10 to 40% contribution apart from the NCEA Level 1, although they are generally limited to assessing knowledge, understanding and some application. Multiple-choice questions do not typically and are not intended to assess higher order thinking skills of analysis and evaluation; instead, free-response questions are generally used to assess these skills.
- Optional questions are not used in the IGCSE, GCSE, NCEA Level 1 and only account for 5-10% of the marks in the SPM. Meanwhile, up to 33% of the marks can be allocated to optional questions in the CBSE.
- Experimental scenario-based questions account for up to around 20% of the marks in a number of other board exams, whereas there are significantly fewer experimental questions in the CBSE exams, primarily focused on remembering the key steps in pre-assigned practicals.
- Data analysis questions also feature more prominently in the GCSE, IGCSE and NCEA Level 1, with a greater number of marks allocated to questions which require analysis of datasets, which use a range of command words such as “explain”, “compare” and “contrast”.
- **Marking:** International examination mark schemes were observed to include more explicit guidance for marking alternative answers. Furthermore, they only permit whole point marking (no half marks) and some (the GCSE) include descriptors for assessing longer analytical questions.

4.3 Key findings and recommendations

There are a number of aspects in which the CBSE science programme – in terms of its curriculum and assessment – would benefit from review to more closely reflect the relevant principles of CBE curriculum design and assessment principles.

It was found that the CBSE science only had a broad introduction and vision. Adopting a consistent format of syllabus design, whereby key aims are clearly stated at the outset would provide additional transparency for teachers and students; reflecting the CBE curriculum design principle “**Clearly defined aims and objectives**”.

In terms of “**Relevant subject content depth and breadth**”, the content in science is observed to cover an appropriate range of topics when compared to other systems’ coverage of science at the same educational level. CBSE also include a list of core practicals which are similarly included in other international secondary qualifications, appropriately reflecting a focus in Standard X on experimental science. Furthermore, the feedback from teachers interviewed suggested appropriate coverage of

practical and real-world applications of science within the syllabus. Nevertheless, a significant number of teachers both in the interviews, surveys and focus groups also drew attention to the need for more experiential learning and practical work, acknowledging the more theory-based nature of existing curricula.

Based on the syllabus review, there is also less coverage of technology use and application compared with other systems. In particular, the restricted use of calculators reduces the opportunity for more flexibility and complexity in solving quantitative problems related to practical work across a broader range of topic areas.

Based on interviews with CBSE management and subject experts, review of the CBSE syllabus takes place on a regular basis which engages the opinion of teachers from across different types of school. Nonetheless, employers appear to have minimal input into CBSE Standard X, whilst most outcomes-based international systems engage closely with employers to ensure that the curriculum subject content in science addresses the practical requirements for successful application of science skills in the workplace.

In relation to facilitating an **outcomes-based curriculum**, the CBSE syllabus includes generic prescribed skills for assessment (Typology of Questions) alongside the specification of subject content which covers knowledge and understanding, application (problem solving), analysis and synthesis. Nevertheless, curriculum learning outcomes for subject delivery are currently primarily defined by NCERT and are not currently included on a subject level in the CBSE syllabi. In addition, the Typology of Questions includes skills on a general rather than a subject-specific level.

UK NARIC's focus group meetings, interviews and surveys with CBSE Standard X teachers confirmed that in practice, teachers are using the NCERT learning outcomes when creating lesson plans for science. Having conducted a broad review of the NCERT learning outcomes, these are observed to integrate a broad range of subject-specific skills as well as more practical oriented skills. These are defined on a fairly broad level, therefore allowing teachers further flexibility to adapt where necessary. Further guidance and integration of a fuller range of cognitive skills to utilise the full spectrum of Blooms Taxonomy could be beneficial for NCERT to consider moving towards a competency-based system of teaching. The future integration of learning outcomes within CBSE subject syllabi is recommended in facilitating a fully coherent approach to competency-based education to ensure a close connection between delivery and assessment.

Overall, the survey found that teachers thought students were prepared for further study, although, when asked about specific skill areas, there were some skill areas which appeared to be less well developed than others, specifically the planning, analysis and modification of experimental procedures. This supports the findings from the desk-based review of CBSE and NCERT materials which do not appear to make reference to these experimental skills as key skills/competencies as is evident in the GCSE / IGCSE / NCEA Level 1 specifications. Their absence from the textbooks perhaps explains why teachers may omit / place less emphasis on these skills, and that students may report feeling less well prepared for further study in these areas relative to others.

To ensure **equity and equality of opportunity in assessment** in science, sample question papers and past examination materials are made available to all students, offering support to each cohort in their revision and preparations for the final assessment. Nonetheless, there were a reportedly high number of failures in science in the previous cohort. A number of the science teachers interviewed expressed the view that introducing a lower / foundation tier paper, similar to mathematics, could be beneficial to encourage achievement and promote engagement at the lower ability levels.

In terms of **accessibility** of the CBSE examination papers, CBSE reportedly has processes in place to verify the wording of the questions prior to formulating the final paper, although it is not clear whether the questions are checked against a standardised guideline or checklist for clarity, accessibility and coherence. Review and comparative analysis of the exam papers, both SQP and previous papers, highlighted potential issues with the clarity of the wording and format of questions which could affect how accessible the questions are to candidates. There were a number of questions[18] where multiple tasks were embedded within the same question, making it difficult for the students to keep track of what is required in response. It is suggested that most of these questions could be restructured as multi-part questions. For example:

Figure 19: Extended CBSE question with multiple tasks

In a pea plant, the trait of flowers bearing purple colour (PP) is dominant over white colour (pp). Explain the inheritance pattern of F1 and F2 generations with the help of a cross following the rules of inheritance of traits. State the visible characters of F1 and F2 progenies.

Question 20 Science SQP 2019-2020

It is also observed that a number of questions both in the sample question paper (2019-2020) and in the previous papers in science may place particular demands on students'/on a student's reading comprehension ability, with use of complex syntax and technical vocabulary. Long sentences and complex language may sometimes (and unnecessarily in some instances) detract from the aim of a question, in particular the intention to assess the candidate's problem solving and / or conceptual understanding. Furthermore, there were a few noted instances, particularly in relation to the sample HOTS questions in science, where there was a large proportion of extraneous information (in that its relevance to the question is unclear), placing demands on reading comprehension that is not specifically intended to be assessed in the CBSE subject syllabus and prescribed skills for assessment. Question 3 in the SQP 2019-2020 and the 2020 Paper are examples of such questions where a large proportion of the text presented is not necessarily required to be able to answer the subsequent questions. Further review of the language and format of questions can be recommended, with reference to best practice principles used by international awarding bodies such as those detailed below:

Table 8: Comparative Review of Marking Methodologies for Written Examinations[19]

Best Practice Principles	Practices to avoid
• Use of simple and short sentence structures to minimise unnecessary burden on memory and interpretation. • Minimising the number of words used and ensure every word has a purpose. We make sure each sentence contains information which is necessary for students to be able to answer questions. • Use of simple verbs rather than the related abstract nouns. • Where there is a diagram, where appropriate we explain in words what is happening in the diagram. This reinforces what the diagram is showing and makes the question more accessible.	• Avoid using elaborate phrases and metaphors which introduce unnecessary complexity. • We avoid embedding more than one question in a single sentence so that key information is not missed. • Avoid the use of negatives where possible and words with a negative connotation because they can be difficult for students with weaker English skills to understand. • Where negatives are essential, it is advised to put them in bold type to ensure that students notice it.

A further issue relating to **accessibility** is the breakdown of marks. Ideally, each question and sub-question should show the number of marks to be awarded. It was found, however, that this practice is inconsistent across the CBSE exam papers reviewed in science. Although mark allocations are consistently shown for each stand-alone question, for structured questions there are some questions which do not break down the number of marks per sub-part, making it potentially difficult for the candidate to know how many

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Only one such question was observed in the 2020 Paper, whilst a greater number of questions with embedded tasks were observed in previous papers from 2018 and 2019.

19

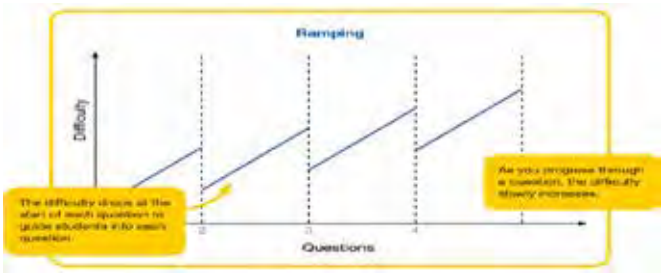
Pearson, 2016. Our Focus on Accessible Exam Papers. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Our_focus_on_accessible_exam_papers.pdf>.

steps are expected in each answer.

In terms of **accessibility** of the CBSE examination papers, CBSE has established a clear structure for the papers, set out in the SQP, which includes distinct sections starting with one-mark questions in Section A, moving onto higher mark questions in B and C. However, although mark allocations increase, questions are not necessarily ordered according to difficulty level with a number of one-mark items potentially of higher demand than some of the more extended items in later sections, particularly those that appear similar to the NCERT textbook tasks. This approach differs from the practice of international exam boards which typically employ a greater number of scaffolded structured questions, where progression through a paper is achieved through increasing question difficulty known as "ramping" rather than by differentiating by question type or mark allocation. It is acknowledged that the latest CBSE paper (2020) includes more structured questions than previous papers and the SQP 2019-2020, however, the sub-parts do not always assess the same topic (some are focused on distinct sub-topics) and there is not necessarily a close interconnection, differentiation in terms of assessed skills and progression in terms of challenge and demand between sub-parts to each question.

Ramping promotes accessibility by allowing candidates to settle into the paper and build their confidence before attempting more difficult questions toward the end of the paper. The figure below illustrates how ramping is achieved in GCSE science.

Figure 20: Ramping within questions[20]



As can be seen in the figure above, ramping can also occur within structured questions, with each question starting with easier lead-in sub-questions, culminating in more complex sub-parts towards the end of each question, while the overall difficulty of each question as a whole increases through the paper. The rationale for this is to steadily build the student's confidence through each question as well as through the paper as a whole, facilitating engagement of a broad range of abilities and ensuring the assessment of baseline knowledge and understanding of the concepts yet also enabling the brightest students to be challenged in a progressive manner as they work towards the end of each question and the end of each paper.

Engagement with the CBSE management team revealed a focus on developing **higher order thinking skill assessment** items, with 10% of the total assessment being allocated to their assessment, with a view to increasing this to 20% in next year's exam series. Review of the CBSE syllabus and assessment materials has also highlighted the intention to integrate higher order thinking skills assessment within the underpinning design of the assessment.

Review of the SQP (2019-2020) papers found that questions included as "HOTS" attempt to assess a broader range of skills, based on real-world situations. However, in all of those questions observed in the science papers, the sub-parts to these questions on closer inspection appear to place greater emphasis on recall, extracting factual information from passages and less on application and problem solving. One of the issues encountered in the science papers is that in Section A of the CBSE SQP exam and the 2020 papers, there is a limit of one mark per question, which reduces the scope of these questions to assess analytical and evaluative skills which are typically assessed using longer answer two to six mark questions in international science exams.

A feature of **higher order thinking competency-based assessments**, particularly those assessing analytical skills in science, is the inclusion of data analysis questions where the candidate is presented with an unseen dataset and expected to compare and contrast, interpret and evaluate scientific data drawing on knowledge and understanding. It is acknowledged from the CBSE syllabus that at least one of the HOTS questions is intended to be focused on assessing this skill. However, in the sample of questions observed from the SQP 2019-2020 and the 2020 paper, although datasets are presented, the subsequent questions were observed to focus more

20

Pearson, 2016. Understanding Our Exams: GCSE Science 9-1. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Edexcel-GCSE-Science-Explaining-our-exams-guide.pdf>.

on knowledge, extracting factual information and some extent of understanding using command words such as “describe”, “identify” and “name” without necessarily requiring any analysis of the data being presented.

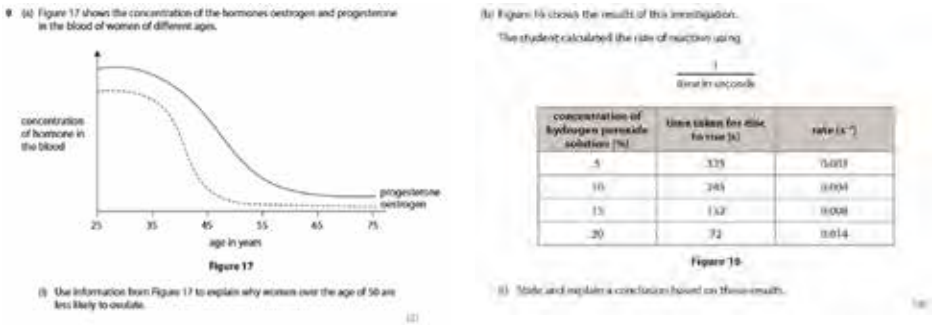
In reviewing the design development of data analysis questions in the CBSE papers, the following case study explains how data analysis and evaluation skills assessed in the GCSE Science could be of benefit.

Figure 21: Case Study: Assessing the ability to interpret, analyse and evaluate scientific data

In line with Ofqual national qualification design requirements for the reformed GCSEs, every awarding body incorporates an assessment objective (AO3) which includes the ability to interpret, analyse and evaluate scientific data. GCSE Assessment strategies set out guidelines for item development for questions targeting the assessment of data analysis, specifying the following:

- Selection of authentic data from real life sources that requires the student to “sift through some information” although not so much information as to lead to confusion
- Use of command words that require the candidate to describe, explain, contrast and compare values within a dataset
- Varying mark allocations from one to six marks per sub-part to a question
- Marking that awards credit for correct interpretation, application of theoretical knowledge and understanding[21]

In the below question, the candidate needs to apply their understanding of hormones and mechanism to explain a trend in the data presented in the form of a graph: [22]



21

Pearson, 2016. Understanding Our Exams: GCSE Science 9-1. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Edexcel-GCSE-Science-Explaining-our-exams-guide.pdf>.

22

Pearson, 2016. Understanding Our Exams: GCSE Science 9-1. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Edexcel-GCSE-Science-Explaining-our-exams-guide.pdf>.

In the international context, questions and tasks that assess experimental skills often provide scope for assessing **higher order thinking of planning, analysing and evaluation**. In the CBSE exams (SQP and previous papers), however, few experimental questions are set, and those that do feature tend to require recounting previously taught experiments from the NCERT textbooks, potentially limiting the scope for **higher order thinking skills assessment** within science. Inclusion of a number of questions that present new experimental scenarios or familiar experiments with different variables, data, procedures and / or hypotheses in the exam to those included in the textbooks, could allow for more emphasis to be placed on assessment of experimental skills as opposed to knowledge. A case study highlighting the approach to assessing experimental skills in the summative GCSE exams is highlighted for reference below:

Figure 22: Case Study: Assessing the ability to plan, implement and evaluate scientific experiments

In line with Ofqual requirements, GCSE science papers are required to include at least 15% of the marks assessing the ability to plan, analyse and evaluate scientific experiments. Questions on experimental skills vary, the following example of a question assessing planning and evaluation, asks how an experimental procedure could be improved:

(b) Two students, Alice and Bob, carry out an experiment to measure the speed of cars.

Alice paces out the distance between two lamp posts.

She records:

'Distance between lamp posts = 20 paces'

Bob starts to count when a car passes the first lamp post. He stops counting when he thinks it has passed the second lamp post.

He records:

'My estimate for the time taken for the car to pass between the two lamp posts = 3'

Give **three** ways the students could improve their experimental procedure.

More demanding experimental questions may assess the ability to plan a less familiar experiment (i.e. one not appearing in the core practical list) with newly presented variables in multiple steps:[23]

(b) When sodium hydroxide solution is neutralised with an acid there is a temperature change.

A student is given dilute hydrochloric acid and dilute ethanoic acid of the same concentration in mol dm^{-3}.

Devise a plan to compare the temperature changes produced when sodium hydroxide solution is neutralised with each of these two acids.

(4)

23

Pearson, 2016. Understanding Our Exams: GCSE Science 9-1. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Edexcel-GCSE-Science-Explaining-our-exams-guide.pdf>.

Moreover, the use of extended, open-ended questions worth five marks or more can allow additional scope for assessing analysis and evaluation. It is acknowledged that CBSE include longer questions (Section C/D). However, it is observed that the majority of these questions have a greater focus on knowledge and understanding of topics from the textbooks (reflected by the points-based mark scheme) whereas a more skills-based approach is taken by a number of international exam boards to introduce new information and variables, providing greater scope for assessing application and analysis. For example, in the item show in figure 23 overleaf, candidates are expected to apply their knowledge and understanding of dynamic equilibrium from the familiar context of the Haber process to a new scenario involving the production of sulphur trioxide in equilibrium outside of the GCSE syllabus:

Figure 23: Case Study – Use of Extended Questions to assess higher order thinking skills of analysis and evaluation in Science[24]

*(d) The reaction to produce sulfur trioxide reaches an equilibrium.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

The forward reaction is exothermic.
The rate of attainment of equilibrium and the equilibrium yield of sulfur trioxide are affected by pressure and temperature.

A manufacturer considered two sets of conditions, A and B, for this reaction.
In each case sulfur dioxide is mixed with excess oxygen.
The manufacturer changed the temperature and the pressure and only used a catalyst in B.
The sets of conditions A and B are shown in Figure 7.

set of conditions	pressure in atm	temperature in °C	catalyst
A	2	680	no catalyst used
B	4	425	catalyst used

Figure 7

The manufacturer chooses set of conditions B rather than set of conditions A.

Explain, by considering the effect of changing the conditions on the rate of attainment of equilibrium and on the equilibrium yield of sulfur trioxide, why the manufacturer chooses the set of conditions B rather than the set of conditions A.

(6)

To direct the assessment explicitly towards higher order thinking skills of analysis and evaluation in response to a specific situation, levels of response descriptors are used to evaluate the student's response, linking directly with assessment objectives (AO2 and AO3) of analysis and evaluation. Please see Section 4.2, marking methodologies for an example of these descriptors.

Meetings with CBSE subject experts and management team highlighted a clear aim to integrate questions assessing the **application of skills and knowledge in real-world situations** into the Standard X exams. Furthermore, review of SQP 2019-2020 exam papers found that a small number of items assess the application of knowledge in real-world scenarios in science. These include, for example, some of the structured HOTS questions in science as well as a number of multiple-choice items.

In science, the HOTS are presented as structured questions at the beginning of the SQP paper, with some multiple-choice where each sub-part is worth one mark each. In addition to the HOTS, there are also other questions in the SQP and previous examinations that include reference to scenarios that

24

Pearson, 2016. Understanding Our Exams: GCSE Science 9-1. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Edexcel-GCSE-Science-Explaining-our-exams-guide.pdf>.

could be related to real life. However, the context of these questions is sometimes observed to be similar to those presented in the NCERT textbooks, limiting the scope to assess application in non-familiar contexts.

In summary, the move to introduce questions with **real-world contexts and use of scenarios** is clearly beneficial in progressing towards a more competency-based model of assessment. However, the design of the CBSE scenario-based questions, from the choice and familiarity of scenario to the use of command words and mark allocations, could benefit from further review, to best exploit their potential to assess application and higher order thinking skills. A case study below explains how GCSEs and NCEA Level 1 assesses real-world application, while further guidance on how this could be achieved in practice in the context of CBSE Standard X is provided in the recommendations in Section 8.

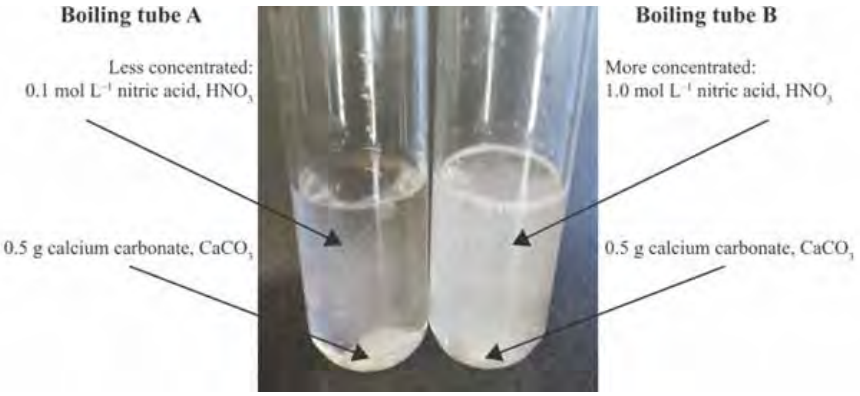
Figure 24: Case study: Real-world scenario assessment

A number of questions were reviewed from the GCSE, IGCSE and NCEA Level 1 exams which are set in a real-world context, which include elements unfamiliar to the candidate in order to assess their ability to apply their knowledge in novel, real world situations. Examples of questions from science papers include:

- Using an unfamiliar scenario-based on encountering different sized footprints in the sand to assess the physical relationship between the concepts of pressure, force and mass using a series of sub-questions, increasing in the level of demand (NCEA Level 1)
- A question asking how adults build up immunity to the Streptococcus bacteria which causes the Scarlet Fever infection, drawing on the candidate's understanding of immunity and assessing their ability to apply it in a new context outside of the syllabus (GCSE Combined Science).

The design and layout of real-world questions often utilise images or diagrams to help orient and explain the situation / scenario without the need for lengthy text, for example the following question is presented in the NCEA Level 1 paper[25]:

R
ir



NCEA Level 1 Unit Paper: Demonstrate understanding of aspects of acids and bases, Question 1 2019

25

NZQA, 2019. Level 1 Science Unit 90940 Exam Paper 2019. [pdf] Published by: NZQA. Available at: <https://www.nzqa.govt.nz/nqfdocs/ncea-resource/exams/2019/90940-exm-2019.pdf>.

exams particularly in the way they prepare for the exams and how the questions are perceived. For example, a significant number of teachers surveyed viewed the questions in the latest paper to be very similar to those appearing in the NCERT textbooks. Similarities have also been observed in the desk-based review of the CBSE SQPs, 2020 papers and the previous exam papers. The following points were noted:

- The use of questions that are very similar to those used in previous exams both in terms of wording and answers
- The use of questions that exhibit clear similarities with those in the NCERT textbooks with answers and workings provided to some questions in the textbooks, which potentially means students will already be familiar with the expected calculations and / or strategies.

The issue of predictability may be reflective of the assessment design processes, in which item setters and paper setter rely heavily on previous exam papers and NCERT textbooks as reference material when setting questions. Indeed, focus groups with subject experts as well as the interview with the CBSE Director of Assessment revealed an emphasis on using item banks and textbooks when designing questions. While sources of reference can provide a useful guide to item writers, particular attention could be given to encouraging greater innovation in creating freshly worded questions for each sitting to minimise their predictability. More explicit instruction could be provided to CBSE item developers and paper setters in this regard, including clear guidance in the CBSE assessment design specifications. Reference is made in this regard to the GCSE Technical Specification as follows:

Figure 25: Case Study – Quality assurance procedures to minimise predictability in exam design

Extract from the International GCSE Technical Specification[26]

Assessments should reflect the intentions of the content standards. To assess with validity, reliability and limited negative predictability, they should be written with the following considerations:

- Use the Sample Assessment Materials as a guide to the structure, types of questions and marks ranges and not as a definitive template to be replicated session after session
- Require candidates to engage with the question/resource and show understanding rather than excessive generic or rote learned answers
- Use a range of different question types targeted at different cognitive levels for particular topics therefore avoiding assessing particular topics in the same way each session
- Recycling of questions from previous exam sessions, Sample Assessment Materials or support materials is not permitted.

Optionality can also impact **assessment reliability** if optional questions assess varying skills and are of varying levels of difficulty. Optionality can provide flexibility where the assessed content is particularly broad or skills-based such as arts and languages; however, it is worth highlighting that most international exam boards no longer include optional questions in a content-based subject like science due to the potential impact optionality has on reliability. With alternative questions differing in terms of assessed

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Pearson Edexcel, 2016. International GCSE Technical Specification.

knowledge and level of demand, candidates are invariably being assessed differently depending on which questions are selected, raising the possibility that the choice of question may affect passing or failing the subject for candidates around the threshold (pass) level. In this context, further consideration could be given to reducing optionality or implementing further measures to ensure direct comparability in terms of skills, topic area and level of demand between optional questions.

Reliability in marking

In science CBSE mark schemes, credit is given for clear working out and strategy as well as for the correct answer in problem solving questions, and credit for partially correct or complete answers in open response in line with international exam board approaches to marking. The review of mark schemes, however, also highlighted areas where it was not clear which steps related to mark allocations and whether half marks or partial marks could be awarded in the absence of general marking guidelines. There are only a few instances within the mark schemes where alternative approaches or answers are given, potentially affecting the flexibility of the marking process and the consistency in assessing a broad range of different responses, particularly in the case of free response type questions. The following figure includes reference to best practice principles in mark scheme design, which may be used to inform future approaches:

Figure 26: Best Practice Principles in Points Based Mark Scheme Design[27]

Mark schemes are a key reference when an examiner is judging candidates' responses to an item or set of items. A mark scheme has to both capture the essence of the responses for a target item, whilst also facilitating reliable examiner judgement. The following general guidelines are adopted in the development of points-based mark schemes:[28]

- The aim is clarity
- Provide a clear statement of the target of the item
- Layout can often help to avoid error, for example using columns to identify different kinds of information. However too many columns may increase confusion rather than reduce it
- Total number of marks must be the same as or slightly fewer than the number of possible acceptable answers
- The more marks available, the less desirable it is for exact equivalence between marks available and number of acceptable answers
- Make sure all acceptable answers are distinct
- Make sure it is clear what level of variation is acceptable
- Make sure it is clear if two answers are regarded as alternatives rather an additionally acceptable
- Make sure it is clear if any answers are unacceptable (This is especially important if some answers are regarded as potentially negating correct material).

27

Alpha Plus Consultancy, 2019. Mark schemes in knowledge based qualifications. [pdf] Published by: Qualifications Wales. Available at: <https://www.qualificationswales.org/media/4201/mark-schemes-in-knowledge-based-qualifications.pdf>.

28

Alpha Plus Consultancy, 2019. Mark schemes in knowledge based qualifications. [pdf] Published by: Qualifications Wales. Available at: <https://www.qualificationswales.org/media/4201/mark-schemes-in-knowledge-based-qualifications.pdf>.

Reliability in standard-setting and grading

Establishing the threshold level of performance required to pass an assessment is a further consideration relating to **reliability** and is integral to the idea that competency-based assessment should be criterion focused, i.e. be related to specific pre-defined standards. The key principle that the standard required to pass one year should ideally be maintained, in order for the qualification / assessment to retain its currency and value over time, whilst allowing for the fact that the ability level of the cohort may change over time. Though the CBSE pass mark is generally fixed at 33% in each subject, interviews with the CBSE management team indicated a process for adjusting marks up or down, depending on the overall perceived difficulty of an exam, drawing on samples of student scripts. However, there is no documented process on exactly how this is achieved, including whether any statistical approach is taken to equate cut thresholds from year to year.

Based on interviews with CBSE assessment management staff, it is generally assumed that ability levels of cohorts will remain the same from year to year, which conflicts with criterion-referenced assessment models that ability levels can vary between cohorts and that students should be assessed in relation to the predefined standard of performance as opposed to where they stand in relation to their peers. In practice, a combination of criterion-referenced as well as reference to prior achievement may be used to determine grade (or pass) thresholds, nonetheless greater transparency on the processes used would enable stakeholders to recognise achievement more effectively:

Figure 27: Case study: establishing grade thresholds and cut scores – Cambridge IGCSE[29]

Applying a criterion referenced approach, grade thresholds are determined by Cambridge using a combination of professional judgement and statistical evidence to ensure that the standards required to gain specific grades are maintained from one year to another. Statistical evidence is collated and compared to statistics gathered on the performance of previous cohorts and taken into account in setting the grading thresholds.

Consideration of a broad range of evidence ensures accuracy in setting these thresholds. So in addition to results statistics, Cambridge seeks the views of teachers on the difficulty of individual exams in setting grade thresholds. In addition, independent measures of the ability of cohorts such as previous examination results are also taken into account as well as average estimated grades for cohorts established by centres to determine the ability of the cohort relative to their actual performance. An archive of marked scripts can also be referred to in order to compare the performance relative to the demand of examination papers in past exam series.

The overall grade for each candidate is calculated based on the weightings given to each component as specified in the syllabus and the marks given in each component are aggregated to produce an overall total. Final checks of the total marks and the grade conversions are conducted to facilitate accuracy. Comparisons are conducted between candidates at different centres to identify any cases where there are discrepancies between predicted grades and actual grades, and in relation to the performance of previous cohorts. Particular attention is given to candidates close to critical grade boundaries where results may affect progression to higher education or the failure.

29

Cambridge Assessment, 2018. Code of Practice. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/416992-code-of-practice.pdf>.

Interviews with CBSE subject experts and CBSE management staff indicated that there are a number of processes currently in place to facilitate the design of **a fair and valid assessment of the curriculum**. Measures currently used by CBSE, similar to other exam boards, include matrix approaches to ensure a spread of content representative of the curriculum and have prescribed skills with weightings attached and questions linked specifically to skills. The CBSE curricula show the breakdown of marks per question type and percentage allocations per topic area.

Good practice in assuring the **validity of assessment design** relies on a close connection between the prescribed skills in the subject syllabi and the questions and marks awarded in the actual assessment. In the CBSE assessment for science, however, it was observed that some of the higher order thinking skills such as analysis and synthesis may be difficult to assess via short, single statement type multiple-choice questions as is intended in the subject syllabi, highlighting a potential disconnect between the CBSE assessment design and the assessment itself. A further important observation relating to exam validity is that the prescribed skills in the CBSE science syllabi in some cases may not match the weighting and mark allocations given to questions in the exam. For example, in the 2019-2020 syllabus three marks are intended to be focused on assessing creating (Sr. No 5) via short answer questions, yet items assessing this skill were not found in the SQP for 2019-2020.

It is also important to note that, in tandem with assessed skills (set out in the Question Typology), internal exam development processes also take into account level of demand of each question (low, medium and high), which may not always necessarily be reflected by the mark allocation. CBSE subject experts have stated that question demand is a factor that is considered, although perhaps there is a need for further clarity on the process by which the spread of questions is decided on in the paper setting process. To this end, CBSE may want to consider approaches used by GCSE awarding bodies which facilitate validity and consistency in assessment design, by the use of tracking databases as described in the figure below:

Figure 28: Case Study: Use of tracking databases in exam development processes to facilitate validity of assessment of the GCSE

Tracking databases are used in the development of GCSE examination papers by all writers to map content coverage, cognitive operation and cognitive demand of each question to ensure a balanced combination of low, medium and high demand questions across each paper. Using the databases also helps to ensure that there is no overlap in the questions between papers or series. International GCSE examiners, as with GCSE examiners, have a number of materials available to assist them in the writing of questions and composition of exam papers including the following:

- Assessment objectives / content mapping grids
- Test specifications
- Design brief
- Sample assessment material.[30]

30

Pearson Edexcel, 2016. International GCSE Technical Specification.

In terms of post-exam review and evaluation, CBSE collates feedback from examiners and teachers and conducts quantitative analysis on student performance on each item as well as papers and subjects as a whole. It is not clear how far the feedback from examiners are able to influence the design of exam papers given the fact that the exam and syllabus, including the syllabus design, are managed by separate departments at CBSE.

Importantly there is currently no documented and published qualitative analysis of each item in the CBSE review process, which could potentially explore the possible reasons for student performance on particular items contributing to whole papers. There may be a need for more direct and clearer feedback mechanisms which combine qualitative and quantitative approaches to item and student performance analysis which can inform further development. Examiners feedback and reports also provide additional transparency to stakeholders including students and teachers, as a system which allows students to learn from previous mistakes is considered key to ensuring the effectiveness of competency-based assessment.

Figure 29 Case Study: examiner reporting and feedback – promoting transparency and identifying areas for further development

Examiners reports can provide a level of depth of insight about the quality of candidates' responses examiners have seen; these responses allow teachers to offer the proper advice and feedback from a detailed account. Examiners reports are designed to report not just on where students didn't achieve the higher levels, but also where students did perform well, in addition to using examples and indicative content to illustrate the points the examiners are making.

Examiner reports for GCSEs in science for instance cover feedback on the candidate's key exam skills as well as providing recommendations for further development for the next cohort of candidates. Some comments taken from past examiners reports in chemistry for instance include:

- **Key Skills:** Students often used pronouns such as 'it' and 'they' in their answers to questions. This wasn't specific enough for the mark scheme and students lost marks as result. [2018, 2019] Students should know that state symbols are lower case only and are written in brackets. [2019]
- Students would benefit from use of more specific terminology. For example, students rarely used the term 'giant lattice structure' to describe the structure of potassium chloride and this cost them marks. [2018] Students need to distinguish between 'bromide' and 'bromine'. [2018] 'Amount of acid' was often used instead of 'volume of acid'. [2019]
- **Area for Development:** Students had difficulty writing balanced equations where they had to determine the formulae of the products. [2018] Balancing equations is a skill that is examined regularly but is still not performed well by some students. [2019] .[31]

31

Pearson, 2019. Biology GCSE 2019 - Examiners Report Update. [online]. Published by: Pearson. Available at: <https://www.my-gcsescience.com/biology-gcse-2019-summary-of-examiners-reports/>

5. Mathematics

5.1 Review and comparative analysis of CBSE Standard X Maths

5.1.1 Aims

Overarching objectives are clearly defined for CBSE Standard X Mathematics as follows:

Table 10: Aims of the CBSE Standard X Maths[1]

Standard X Mathematics
The broad objectives of teaching of Mathematics at secondary stage are to help the learners to: • Consolidate the Mathematical knowledge and skills acquired at the upper primary stage; • Acquire knowledge and understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles and symbols and underlying processes and skills; • Develop mastery of basic algebraic skills; • Develop drawing skills; • Feel the flow of reason while proving a result or solving a problem; • Apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method; • Develop ability to think, analyze and articulate logically; • Develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases; • Develop necessary skills to work with modern technological devices and mathematical softwares; • Develop interest in mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc. • Develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics; • Develop interest in the subject by participating in related competitions; • Acquaint students with different aspects of Mathematics used in daily life; • Develop an interest in students to study Mathematics as a discipline.

1 CBSE, 2019. Mathematics Syllabus Classes IX and X 2019-2020.

The table overleaf compares the aims between the qualifications included within this study in relation to a global set of themes, some of which are indicative of competency-based approaches in mathematics:

Table 11: Comparative Review of the CBSE Standard X Maths Aims

Theme	CBSE[2]	IGCSE[3]	GCSE[4]	NCEA Level 1[5]	Malaysian SPM[6]
Developing enjoyment of mathematics	✓	✓	-	-	✓
Understanding the key principles of mathematics	✓	✓	✓	✓	✓
Mathematical communication	-	✓	✓	✓	✓
Logic and problem-solving skills	✓	✓	✓	✓	✓
Abstract reasoning and generalisation	-	✓	-	-	-
Application of mathematics to alternative situations	✓	✓	-	-	-
Awareness of the impact of mathematics on technology	✓	-	-	-	✓
Understanding the moral, social and ethical implications of mathematics	✓	-	-	-	-
Awareness of the contribution of mathematics to other disciplines	-	✓	-	-	✓
Experiment, interpret results, draw conclusions	Partial	✓	✓	✓	-
Determining the reasonableness of solutions	-	✓	-	-	-
Construction of mathematical proofs	-	-	-	-	-
Developing skills for everyday life and continuous learning	✓	✓	-	-	-

The CBSE, IGCSE, GCSE and SPM similarly prescribe syllabus aims on an overarching level, whereas the NCEA Level 1 has Achievement Objectives which are specific to the individual subjects being taught within mathematics. An observed commonality between the CBSE, IGCSE and SPM aims is the focus on promoting enjoyment and motivation to study mathematics.

When comparing the aims overall, similarities are apparent between the CBSE, IGCSE, GCSE and SPM in promoting knowledge and understanding of mathematical techniques and processes. Problem solving, logical deduction and manipulation in problem solving are similarly covered across the international qualification aims reviewed.

Some differences are apparent in mathematical communication, the SPM, GCSE and IGCSE include the aim of developing the ability to communicate mathematically whereas this is not directly expressed as an aim in the NCEA Level 1 or the CBSE syllabus. Only the CBSE aims to develop awareness of the ethical dimension of mathematics.

The IGCSE aims also refer to developing the ability to generalise mathematically, a skill which is not explicitly mentioned in the CBSE aims or other qualification syllabi reviewed, whilst acknowledging that the CBSE does include the aim to develop students' ability at constructing mathematical arguments. Application of mathematics to other disciplines is explicit in the IGCSE and SPM aims while both the IGCSE and the CBSE make reference to developing and / or applying mathematics to everyday living.

2

CBSE, 2019. Mathematics Syllabus Classes IX and X 2019-2020.

3

Cambridge International Examinations, 2020. Syllabus for IGCSE Mathematics. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/414416-2020-2022-syllabus.pdf>.

4

Pearson Edexcel, 2015. GCSE (9-1) Mathematics Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/mathematics/2015/specification-and-sample-assesment/gcse-maths-2015-specification.pdf>.

5

NZQA, 2020. standards and Assessment for NCEA Level 1 Mathematics. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=mathematics&view=exams&level=01>

6

Ministry of Education Malaysia, 2006. Integrated Curriculum for Secondary Schools - Mathematics Form 5.

5.1.2 Content and structure

The CBSE Standard IX and X key content areas are broken down into six and seven units respectively, each of which contains broad topic areas and sub-topic areas. The following table lists out the key topic areas by unit:

Table 12: Content of the Standard X Maths[7]

CBSE Standard X Maths	CBSE Standard IX Maths
Unit 1 Matter - Its Nature and Behaviour	**Unit 1 Chemical Substances-Nature and Behaviour**
• Nature of matter	• Chemical reactions
• Particle nature, basic units	• Acids, bases and salts
• Structure of atoms	• Metals and non-metals
Unit 2 Organization in the Living World	• Carbon compounds
• Cell - Basic Unit of life	• Periodic classification of elements
• Tissues, Organs, Organ System, Organism	**Unit 2 World of Living**
• Biological Diversity	• Life processes
• Health and Diseases	• Control and co-ordination in animals and plants
Unit 3 Motion, Force and Work	• Reproduction
• Motion	• Heredity and Evolution
• Force and Newton's laws	**Unit 3 Natural Phenomena**
• Gravitation	**Unit 4 Effects of Current**
• Floatation	• Effects of Current
• Work, energy and power	• Magnetic effects of currentr
• Sound	**Unit 5 Natural Resources**
Unit 4 Our Environment	• Sources of energy
• Physical resources	• Our environment
• Bio-geo chemical cycles in nature	• Management of natural resources

There are broad similarities in the core subjects covered across the qualifications reviewed. Each qualification, including the CBSE, includes coverage of number, algebra, shape and space (geometry) and handling data topics.

Some differences are apparent in the coverage of number. In the CBSE, more theory is focused around real numbers, rational and non-rational numbers whereas in the GCSE and IGCSE, the topics covered within 'number' are more practical in orientation. For example, there is more emphasis on mensuration and accuracy in the GCSE, with the IGCSE focusing on calculating lower and upper bounds and techniques used in approximation in real-world calculation problems.

7 CBSE, 2019. Mathematics Syllabus Classes IX and X 2019-2020.

Coverage of algebra is broadly comparable, although notably algebraic inequalities do not feature in the CBSE curriculum whereas they are covered in the GCSE, IGCSE, NCEA Level 1 and SPM. Many of the areas of algebra are covered across the systems, including linear, simultaneous and quadratic equations and algebraic fractions although polynomials are not normally covered until upper secondary level (A Level) in the UK or IGCSE.

The CBSE, in particular, has a somewhat heavier focus than the other international qualifications on trigonometry within Standard X, but does not include explicit coverage of vectors and transformations which is identified as a common topic included in other systems. Some of the aspects covered in Trigonometry in the Standard X curriculum (Unit 5) are covered at more advanced stages in the other four international qualifications reviewed (angles of depression and elevation, trigonometric identities).

Statistics and data handling are covered by all awards, including the CBSE, although the IGCSE and GCSE place comparably greater emphasis including a broader range of sub-topics in both statistics and probability. In statistics, for example, they include coverage of sampling methods and calculating which are not explicitly covered in the CBSE. And whilst the CBSE does include coverage of cumulative frequency and inter-quartile ranges, coverage of scatter charts, correlation and bivariate analysis is evident in the GCSE and IGCSE, but these are absent from the CBSE syllabus.

5.1.3 Assessment objectives / prescribed skills for assessment

The following table includes the CBSE Question Typology, which specifies the prescribed skills for assessment:

Table 13: Question typology of the Standard X Maths[8]

CBSE Standard X Maths
1. Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. (Standard: 25%, Basic: 40%)
2. 2. Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas (Standard:29%, Basic: 35%)
3. 3. Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way. (Standard: 22%, Basic: 15%)
4. 4. Analyzing and Evaluating: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations
5. Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.
6. Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions. (Standard: 22%, Basic: 10%)

8 CBSE, 2019. Mathematics Syllabus Classes IX and X 2019-2020.

The table below lists the key assessed prescribed skills for mathematics and indicates which programmes cover each skill area with a tick. The weightings (where applied) are given in brackets (based on the Standard level assessment for CBSE).

Table 14: Comparative review of prescribed assessed skills:

Assessed Skill Area		CBSE	Cambridge	GCSE[6]	NCEA Level 1[7]	Malaysian SPM[8]
Demonstrate knowledge	**mathematical**	✓ (25%)	✓ (60-70 in Core 40-50% in Extended)	✓ (50%)	✓	
Demonstrate knowledge	**mathematical**	✓ (24%)			✓	
Solve mathematical problems			✓ (30-40 in Core, 40-50% in Extended)	✓ (50%)	✓	
Interpret mathematical information		✓ (24%			✓	**N/A***
Communicate mathematically			✓	✓		
Solving problems in other contexts		Partial	✓	✓	✓	
Present mathematical arguments and proofs		-	✓	✓	-	
Synthesise information	**mathematical**	✓ (22%)*	-	-	✓	

*Creating (synthesis) is combined with analysis and evaluation in the maths Question Typology.

Demonstrating mathematical knowledge and understanding are covered as prescribed assessed skills across the qualifications reviewed, although these are included together in the same objective in the IGCSE and GCSE (AO1) whereas they are separate objectives in the CBSE. Solving mathematical problems is similarly a commonly covered skill area, although in the CBSE problem solving is a generic skill whereas in the other qualification specifications it is more explicitly linked to mathematics.

The IGCSE and GCSE, for example, include problem solving as a sub-skill of data handling, alongside other assessed skills such as communicating mathematically and reasoning skills. The CBSE, by contrast, splits application (i.e. problem solving) and analysis / evaluation into different objectives.

Application of mathematical principles in alternative situations is a separate assessment objective in the GCSE, whilst in the IGCSE it is included within the broader assessment objective of reasoning, interpreting and communicating mathematically when solving problems. Similarly, the CBSE syllabus makes reference to solving problems "in a different way" but doesn't make explicit reference to alternative contexts / scenarios or mathematical modelling.

Some skills included within the IGCSE and GCSE objectives including mathematical communication and presenting mathematical arguments and proofs are not directly referenced in the CBSE assessed skills, although the CBSE syllabus objectives include synthesis and creating, which could imply coverage of constructing mathematical arguments.

The CBSE, IGCSE and GCSE syllabi include varying weightings attached to skills. Some differences are evident in the weighting of assessed skills. For instance, the CBSE places more emphasis than the other awards on knowledge recall, which is weighted at 25% whereas in the IGCSE and GCSE this is combined with understanding and weighted at

around 40-60% depending on the tier of entry. The application skills covered under AO2 in the IGCSE and GCSE are weighted at between 30 and 50% whereas problem solving and application are weighted at 24% in the CBSE, although the CBSE assessed skills also make reference to analysis.

The IGCSE, GCSE and CBSE assessment objectives have different weightings for the two different tiers. Greater weight is placed on knowledge (remembering in the CBSE) and understanding in the Core, Foundation and Basic levels respectively. Comparatively less emphasis is on the higher order skills of application and problem solving, particularly in alternative situations.

9
CBSE, 2019. Mathematics Syllabus Classes IX and X 2019-2020.

5.1.4 Assessment methods

The following table includes the assessment methods and format of the CBSE Standard X mathematics, based on a review of the SQP (2019-2020) and the latest 2020 paper:

Table 15: Standard X assessment format[9]

	Standard X Mathematics SQP	Standard X Mathematics 2020 Paper
Number and type of assessments each examination series	1 written examination (3 hours) Internal assessment (pen and paper test and multiple assessment methods, including a portfolio and a lab practical component) 1 written examination (3 hours) Internal assessment (pen and paper test and multiple assessment methods, including a portfolio and a lab practical component)	
Duration	Written examination: 3 hours Internal assessment: Untimed	
Type(s) of question	Section A: 10 MCQ questions followed by 5 fill in the blank then 5 free response short answer questions Section B: 6 2-mark questions, some with sub-parts Section C: 8 3-mark questions, mostly stand-alone but one with sub-parts Section D: 6 4-mark extended questions	Section A: 10 MCQ questions followed by 5 fill in the blank then 5 free response short answer questions Section B: 6 2-mark questions, one with sub-parts Section C: 8 3-mark questions, all stand alone Section D: 6 4-mark extended questions
Total marks available	Final examinations: 80 marks Section A: 20 marks Section B: 12 marks Section C: 24 marks Section D: 24 marks	Final examinations: 80 marks Section A: 20 marks Section B: 12 marks Section C: 24 marks Section D: 24 marks
Weighting toward overall qualification	Final Examination: 80% of the marks for Mathematics Internal Assessment: 20% of the marks for Mathematics (pen and paper test and multiple assessment (10 marks), portfolio assessment (5 marks) and lab component (5 marks)	

The table below highlights the key features of the assessment frameworks of the CBSE and the selected international qualifications reviewed:

Table 16: Comparative review of assessment format and volume

		CBSE	IGCSE	GCSE	NCEA Level 1	SPM
Assessment Methods	**Internal**	✓ (20%)	-	-	✓ (Approx. 35%)	-
	External	✓ (80%)	✓ (100%)	✓ (100%)	✓ (65%)	✓ (100%)
Number and type of assessments each examination series		1 written exam and internal assessment	2 written exams	3 written exams	4 written exam papers 2 internal units	2 written exams
Duration	**Per paper**	3 hours	Paper 1-3: 1 hour and 2 hours Paper 2 and 4: 1.5 and 2.5 hours	Papers 1-3: 1 hour 30 mins each	1 -3 hours per paper*	Paper 1: 1 hour 15 minutes Paper 2: 2 hours 30 minutes
	Total exam time	3 hours	3 hours (Core) 4 hours (Extended)	4 hours 30 minutes	4 hours+*	3 hours 45 minutes
Optional questions		✓ (33%)	-	-	-	✓ (5-10%)
Calculators allowed		No	✓ All papers	✓ (Only Papers 1 and 2)	✓ All papers	✓ All papers
Other resources permitted		-	Formulae	Formulae sheet	Formulae sheet	Formulae
Tiers						
Question ramping		-	✓	✓	-	-
Question Types		✓ (Basic and Standard)	✓ (Core and Extended)	✓ (Higher and Foundation)	-	-
Sequencing: exam sections		3-4 sections (A, B C and D[10])	No sections	No sections	No sections	Paper 2: 4 sections
Question types		MCQ	160 marks	360 marks	90 marks	70 marks
Question ramping		-	✓	✓	-	-
Answer sheet format		Paper / pen answer booklet separate	Paper / pen question and answers integrated	Paper / pen question and answers integrated	Paper / pen question and answers integrated	Paper / pen answer booklet separate
Total marks available		80 marks	200 marks (Extended)	240 marks	30 marks per paper	70 marks
80% External exam		80% External exam 20% internal	Paper 1-2: 35% Paper 3-4: 65%	Paper 1-3: 33.3% each	Each externally assessed unit: 15%	Paper 1: 40% Paper 2: 60%

*Based on the average length of time a student will take to complete while acknowledging that the candidates are given a total of three hours per paper.

10 Varies depending on the year. The most recent SQP contains three sections: Section A, B, C and D

The GCSE, IGCSE and SPM qualifications notably do not include any internal assessment. There is also no internal assessment in the A Level in the UK and the Cambridge International A Level taken at 18 at the end of upper secondary level education. Internal assessment in the NCEA Level 1 comprises externally set investigative tasks which are marked by teachers but externally moderated whereas the CBSE internal assessment is set and marked by individual schools and involves portfolio and project work in addition to investigations.

5.1.4.1 Volume and format

The total exam time and volume vary: awards such as the IGCSE and GCSE, which rely solely on external examination for mathematics, have a total exam time ranging from four to five hours (three hours for the IGCSE Core) whilst the CBSE has a shorter exam time of three hours in a single paper, albeit with internal assessment (counting 20% towards the final result) increasing the breadth of assessment.

Different tiers of entry are offered in the CBSE, IGCSE and GCSE, although there are differences in the method and structure. In the CBSE assessment, the Basic paper assesses the same content as the Standard exam but with more emphasis on knowledge and understanding and less on problem solving. In the GCSE and IGCSE by contrast, both tiers assess the same skills, although the Higher and Extended tiers assess more complex content in addition to that prescribed for the lower tiers. The IGCSE and GCSE also have some overlap between the Foundation and Higher tiers, with the same questions targeted at grade C / Grade 4 included in both tier exams, whilst in the CBSE the Basic paper is entirely separate and neither the questions set nor the levels of achievement overlap with those of the CBSE Standard paper.

5.1.4.2 Exam paper structure

The sequencing of the exam papers differs between the CBSE and the other reviewed exams. Whilst the CBSE paper has distinct sections in which all questions carry the same mark allocations, the IGCSE and GCSE, for example, include structured questions of varying lengths throughout but do not have distinct sections. Generally, questions increase in difficulty throughout the GCSE and IGCSE papers, whereas the CBSE exam paper is structured according to question type and mark allocation rather than explicitly in terms of the difficulty of the questions.

5.1.4.3 Answer sheet format

It is important to note differences in the answer sheet format between systems. None of the examination systems reviewed yet use digital devices in external assessment: all are pen / paper assessments, although this may be subject to change in the near future. Whilst the CBSE Standard X and Malaysian SPM (with the exception of SPM Paper 2 Section A which has an integrated question and answer sheet) provide a separate answer sheet to the question paper for students to write their answers, the IGCSE, GCSE and NCEA Level 1 all provide integrated papers which include both the questions and space in the question/answer paper for the candidates to write their answers after each question. Whilst this approach results in longer answer question/answer booklets, it is arguably easier for candidates when cross-referencing their answers to the requirements and mark allocations for each question.

5.1.4.4 Resources

Calculators are generally allowed in the majority of the international exam papers reviewed. The GCSE has one non-calculator paper whilst the CBSE does not permit calculators in either the Basic or the Standard exams. Formulae are provided in the GCSE and to some extent in the IGCSE, NCEA Level 1 and SPM exams, whereas in the CBSE all formulae are expected to be recalled from memory apart from in a small number of questions where a formula is provided. Optionality is a key area of difference, where the CBSE places up to 33% on optional questions whilst all the other papers reviewed apart from the SPM Paper 2 do not have any optional questions, and all must be answered.

5.1.4.5 Question types and assessed skills

Overview of the CBSE papers (SQP 2019-2020 and 2020 Examination Set 30/4/1)

Section A

Half of the questions in Section A are multiple-choice in both the SQP and 2020 papers, most of which require a single operation or a single step calculation to solve. The questions include four options with three plausible distractors given in each item with one correct answer. The topics assessed vary, including number, trigonometry, data handling and algebra. The questions do not typically involve the application of mathematics to real-world situations, although some application of mathematical understanding in problem solving is assessed.

The next five questions in Section A in both papers (SQP and the 2020 paper) reviewed are gap-fill questions worth one mark each, again drawing on relevant conceptual understanding of topic areas including number, trigonometry, data handling and algebra. Diagrams are provided where necessary and typically do not require the candidate to draw a diagram in order to solve correctly. No additional marks or half marks are awarded for working or strategy.

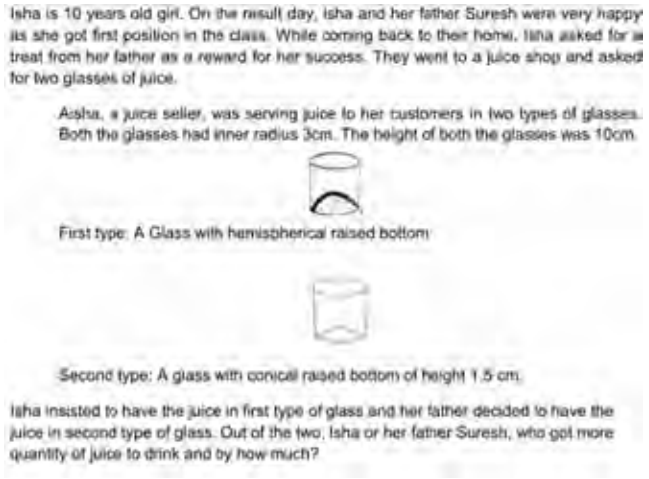
The final questions in Section A across both the SQP and the 2020 paper require demonstration of strategy and steps involved in solving two-step problems, worth one mark each but with half marks awarded for strategy.

Section B

Section B contains mostly stand-alone two-mark questions and two questions that are structured and broken down into two sub-parts in the SQP (2019-2020). In the 2020 exam paper, one of the questions is structured, whereas the other five are stand-alone questions. In both exams, the topics assessed vary across algebra, trigonometry, triangles and volumes of cones.

Two questions in the 2020 paper and the SQP from this section are scenario-based, which require a problem to be solved in response to a given real-world situation. An example of this type of question from the SQP is given below:

Figure 30: CBSE Maths example question 1a



Isha is 10 years old girl. On the result day, Isha and her father Suresh were very happy as she got first position in the class. While coming back to their home, Isha asked for a treat from her father as a reward for her success. They went to a juice shop and asked for two glasses of juice.

Asha, a juice seller, was serving juice to her customers in two types of glasses. Both the glasses had inner radius 3cm. The height of both the glasses was 10cm.

First type: A Glass with hemispherical raised bottom

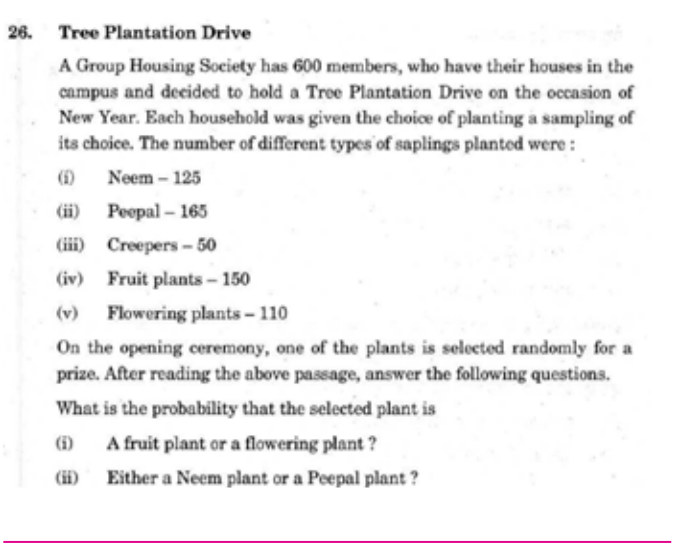
Second type: A glass with conical raised bottom of height 1.5 cm.

Isha insisted to have the juice in first type of glass and her father decided to have the juice in second type of glass. Out of the two, Isha or her father Suresh, who got more quantity of juice to drink and by how much?

The above question assesses application of formulae for working out volumes of solids to solve a real-world problem, although not all of the information given in the question could be considered essential to the problem (e.g. the reference to results day) Three operations are required to successfully determine the correct answer with marks given to each correct step in arriving at the solution. While the necessary information is provided in the question to solve the problem, the candidate is expected to recall and manipulate associated formulae for calculating volumes, taking into account the raised height of the glass. Question 25 in the 2020 paper is similarly focused on cylinders, albeit in the configuration of a tent, although its context is more mathematical than that presented in the SQP question above.

Question 26 is a scenario-based question from the 2020 exam paper, which similarly assesses real-world application, in this case of probability concepts to solve related problems:

CBSE Maths example question 1b



26. Tree Plantation Drive

A Group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year. Each household was given the choice of planting a sampling of its choice. The number of different types of saplings planted were :

(i) Neem – 125
(ii) Peepal – 165
(iii) Creepers – 50
(iv) Fruit plants – 150
(v) Flowering plants – 110

On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.

What is the probability that the selected plant is

(i) A fruit plant or a flowering plant ?
(ii) Either a Neem plant or a Peepal plant ?

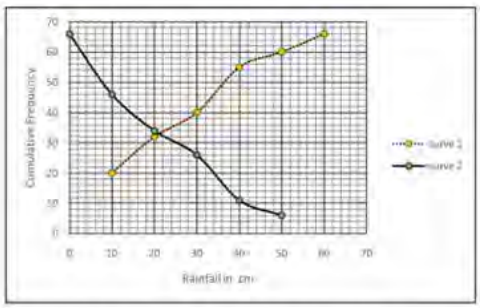
Although the above question requires some understanding of probability in a novel context, it could be considered relatively more straightforward in terms of requiring one-two step operations than the scenario-based question reviewed from the SQP which required rearrangement of formulae and a greater number of steps and deduction. The question assesses basic concepts in classical probability, rather than more complex conditional probability using tree diagrams.

Section C

Questions in Section C in both the SQP and the 2020 paper are worth three marks and vary from stand-alone problems to structured problems divided into sub-parts to each question. A number are scenario-based while some others are focused on solving a set problem. The SQP appears to include more structured questions in this section than the 2020 paper. The SQP also includes two questions that involve interpretation and manipulation of information presented in graphs (questions 31 and 34), skills are not assessed in this Section of the 2020 Paper , which has a stronger observable focus on solving problems involving algebra, circles and triangles. An example of a structured scenario-based question involving a graph from the SQP is given below:

Figure 31: CBSE Maths example question 2

34 A TV reporter was given a task to prepare a report on the rainfall of the c
Dispur of India in a particular year. After collecting the data, he analyz
the data and prepared a report on the rainfall of the city. Using this repc
he drew the following graph for a particular time period of 66 days



Based on the above graph, answer the following questions:

(i) Identify less than type ogive and more than type ogive from the given graph
(ii) Find the median rainfall of Dispur
(iii) Obtain the Mode of the data if mean rainfall is 23.4cm

The above question from the SQP involves correct interpretation of the graph to find the mean, median and mode data points; one mark is allocated to each. The strategy and context is provided in the question, with the main skill of data interpretation being assessed.

Stand-alone questions can involve multiple-step operations such as in question 33 of the SQP, which gives the dimensions of a right triangular field, but requires the candidate to apply the appropriate strategy and steps. Similarly, the 2020 Paper Section C includes a comparable question:

Figure 32: CBSE Maths example questions 3

SQP 2019-2020

33. Sides of a right triangular field are 25m, 24m and 7m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals.

2020 paper

34. Construct a triangle with sides 5 cm, 6 cm and 7 cm. Now construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of the first triangle.

Although the 2020 Paper Section C does not include data handling questions, the geometry questions in this section are complex and require multiple steps, although they are generally based on mathematical rather than real-world contexts.

Section D

Questions in Section D in both the SQP and the 2020 paper are all typically extended stand-alone questions which award marks for the various steps in solving the set problem. Two problems involving the application of algebra in situations involving distance, speed and time are highlighted in the figure below:

Figure 33: CBSE Maths example questions

SQP 2019-20

37 A train covers a distance of 360 km at a uniform speed. Had the speed been 5km/hour more, it would have taken 48 minutes less for the journey. Find the original speed of the train. 4

OR

Solve the following equation:

$$\frac{1}{x} - \frac{1}{x-2} = 3, x \neq 0, 2$$

2020 Paper

35. In a flight of 600 km, the speed of the aircraft was slowed down due to bad weather. The average speed of the trip was decreased by 200 km/hr and thus the time of flight increased by 30 minutes. Find the average speed of the aircraft originally.

The first option in the SQP question 37 sets a problem, in which the candidate is expected to construct an equation as the first step based on the information and identification of the unknowns in the question before determining the original speed of the train in a series of steps. The second option to Question 37 requires solving an equation in a

mathematical context. Similarly, in question 35 in the 2020 paper, the candidate is expected to translate the scenario into an equation, but in contrast, is required to work out the average rather than the original speed, although no alternate (optional) question is provided.

Other questions in the SQP and the 2020 Paper Section D include problems on triangles such as in the SQP Question 35 and 2020 Question 37 below. The SQP question gives the dimensions and requires the candidate to draw two triangles based on the information whereas the 2020 question requires the candidate to construct a mathematical proof:

Figure 34: CBSE Maths example questions

SQP 2019-20
35. Draw a triangle ABC with side BC=6.5cm, ∠ B=30°, ∠ A =105°. Then construct another triangle whose sides are ¾ times the corresponding sides of the triangle ABC.

2020 Paper

37. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

It is observable that Question 35 in the SQP is similar in scope to question 34 in the 2020 paper, yet is worth three marks in the 2020 paper but four marks in the SQP as it appears in Section D. This observation highlights a potential discrepancy between the allocation of marks and the scope of the question and how many steps it requires to solve.

Summary of similarities/differences of the SQP 2019-2020 and the 2020 Standard X examination paper

Overall, few differences were observed in terms of format and structure, in that the 2020 paper closely follows the template of the SQP. Both papers similarly assess a broad range of topics from across the curriculum, with neither observed to place particular weight on any one topic area. Both allocate a similar number of marks to optional questions. A similar range of command words is used across both papers.

One observable difference is that the SQP contains a few more structured questions, broken down into sub-parts (four), compared to the 2020 exam paper, which only contains one such structured question with all other questions being stand-alone problems.

Both SQP and the 2020 paper mainly contain questions set in mathematical contexts. The SQP found to include slightly more questions set in real-world scenarios. Around nine such questions are found in the SQP paper whilst in the 2020 paper, around four or five could be identified. The SQP contained more questions which involved the interpretation and manipulation of information presented in graphs, although one question in Section D of the 2020 paper involved drawing a graph based on a dataset provided.

Both the SQP and the 2020 paper include some questions which have illustrative diagrams, charts and tables, and more so than previous examination papers in 2019 and 2018, nevertheless, these are fewer than in the international examinations reviewed. In some questions, particularly in those mirroring NCERT textbook questions, across both papers the candidate would be required to draw a diagram themselves in response to a description.

Both the SQP and the 2020 paper are observed to include some questions which are very similar to questions appearing in NCERT textbooks. For example, the following questions were found to be very close including the same wording (nouns, syntax and grammatical structure), notation and numerical figures, meaning that students with a good memory for the textbook problems and their solutions would have a significant advantage without needing to engage mathematical problem solving and thinking skills.

Summary of the Comparison between the SQP Basic and 2020 Basic Mathematics Papers

The Basic papers were reviewed and found to be broadly comparable. Section A, B, C and D follow the

same format in the SQP and the 2020 paper. Minor differences were noted in that there are more structured questions in the SQP paper when compared to the 2020 exam paper. It was observed that the language and presentation of the questions is very similar to that of the Standard X exams, with similar command words used and notation displayed in the algebra questions.

Overall, although the demand may be considered slightly lower than that of the Standard X Paper, a number of individual questions may be considered of comparable complexity to those appearing on the Standard X paper. For example, questions such as 38 and 39 could be indistinguishable in terms of difficulty level from those appearing in Section D of the Standard X paper. This observation suggests the need to review the development of the paper, in closer parallel to that of the Standard X paper, ensuring more differentiation between the two in terms of demand if the intention is to offer a more accessible course for those of lower ability. It also perhaps highlights a need for CBSE to further examine and account for the demand of each question as well as the topic / skills assessed in maintaining balance across the examination papers.

Comparative analysis with international qualifications

The range of question types used is comparable across the examination papers reviewed, with all assessments using short answer questions, a proportion of structured questions as well as a number of stand-alone, longer or extended tasks. The use of multiple-choice questions varies; the IGCSE, CBSE and SPM use varying proportions of objective test questions in their examinations. Gap-fill questions are found in the CBSE papers (in those papers included in this review) and IGCSE, although it is acknowledged that gap fill and multiple-choice are newly introduced question types for the CBSE exam session 2019-2020. By contrast, there is observed to be a greater emphasis on mathematical communication in the IGCSE, GCSE and NCEA Level 1 with candidates expected to provide a full strategy and workings out in response to all or mostly all questions, including the short answer questions. Candidates are also directed to state their answers to an appropriate degree of accuracy, a requirement which is not as readily apparent in the CBSE papers. This can be seen in the example from the GCSE sample paper below:

Figure 35: GCSE example question

18 $m = \frac{\sqrt{s}}{t}$

$s = 3.47$ correct to 3 significant figures

$t = 8.132$ correct to 4 significant figures

By considering bounds, work out the value of m to a suitable degree of accuracy.
Give a reason for your answer.

Question 18, GCSE Sample Paper 2 (Higher Tier)

Short answer questions are typically worth 1-2 marks and in the CBSE are included in Sections B and C, primarily assessing mathematical knowledge and understanding of procedures and technique. In the IGCSE, short answer questions are only included in Paper 1, whereas in the GCSE they are found throughout the three papers, although the NCEA Level 1 unit exams only include structured questions. The CBSE includes a greater proportion of stand-alone shorter answer questions than the IGCSE, NCEA Level 1 and GCSE, which typically feature significantly more structured questions worth at least three marks in total but broken down into sub-parts. Before 2019-2020, all questions in the CBSE examinations were single stand-alone problems and did not include structured questions broken down into sub-parts. The SQP for 2019-2020, however, introduces a limited number of structured questions into Sections C and D although the 2020 paper includes fewer structured questions.There is a general distinction between questions in mathematical contexts and those that present a real-world scenario in which the candidate is expected to solve a number of related problems. Sub-parts to the structured questions may include some short answer one-/two- mark questions focusing on application in one-two step calculations and also some more extended parts of three to four marks requiring application of a longer strategy of multiple steps.

In questions which have a mathematical context or real-world context, diagrams are often provided in the international exams reviewed to orient the candidate, whereas a text description is usually provided in CBSE questions. As can be seen in the figure below, while both the GCSE and the CBSE questions focus on volumes of cones, the GCSE question provides a clearly labelled diagram as well as the relevant formula, placing the focus of the question on problem solving involving mass and density.

Questions assessing problem solving in probability

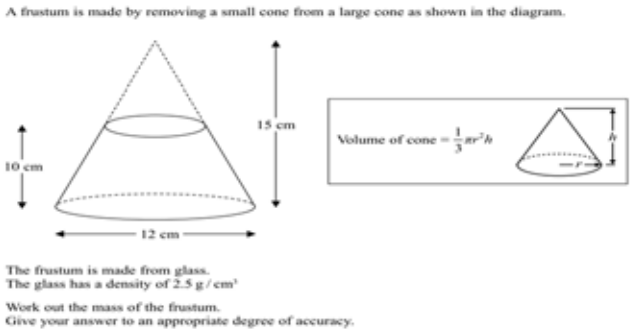
Figure 36: CBSE and GCSE example questions

CBSE

A petrol tank is in the form of a frustum of a cone of height 20 m with diameters of its lower and upper ends as 20 m and 50 m respectively. Find the cost of petrol which can fill the tank completely at the rate of Rs.70 per litre. Also find the surface area of the tank.

Two concentric circles are of radii 5cm and 3cm. Find the length of the chord of the larger circle which touches the smaller circle. (CBSE Question 17, 30-B 2018)

GCSE


22 A frustum is made by removing a small cone from a large cone as shown in the diagram.

The frustum is made from glass.
The glass has a density of 2.5 g / cm³

Work out the mass of the frustum.
Give your answer to an appropriate degree of accuracy.

Question 22, GCSE Sample Paper 1

are typically presented using real-world scenarios, similar types of questions are evident across the CBSE, IGCSE and GCSE papers, and some examples are provided below. While some similarities are evident, differences are also apparent in the level of guidance, presentation and scope of assessed skills between the GCSE and CBSE sample probability questions.

The questions above, taken from CBSE and GCSE

Figure 37: CBSE and GCSE example questions

CBSE

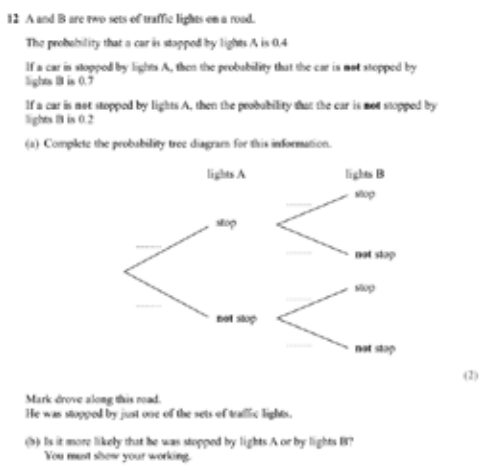
Jayanti throws a pair of dice and records the product of the numbers appearing on the dice. Pihu throws 1 dice and records the squares the number that appears on it. Who has the better chance of getting the number 36? Justify?

Question 25, SQP 2019-2020

A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is (i) white or blue, (ii) neither white nor black.

Question 7, CBSE Paper 30-B 2018

GCSE


12 A and B are two sets of traffic lights on a road.

The probability that a car is stopped by lights A is 0.4

If a car is stopped by lights A, then the probability that the car is **not** stopped by lights B is 0.7

If a car is **not** stopped by lights A, then the probability that the car is **not** stopped by lights B is 0.2

(a) Complete the probability tree diagram for this information.

(2)

Mark drove along this road.
He was stopped by just one of the sets of traffic lights.

(b) Is it more likely that he was stopped by lights A or by lights B?
You must show your working.

Question 12, GCSE Sample Paper 2 (Higher Tier)

sample exam papers, assess understanding and the solving of problems involving conditional probability. Whereas both the CBSE questions comprise a single problem, the GCSE problem is broken down into two sub-parts. The GCSE question has a lead-in question in which the candidate is given a visual context and has to complete a tree diagram, leading onto a problem involving calculating the likelihood based on the probabilities in the tree diagram. More explicit instruction is given in the GCSE exam question to show working out and marks are allocated accordingly to each sub-part, whilst the CBSE questions require the candidate to "justify" their findings.

When comparing the question context, throwing dice, a bag containing multi-coloured balls and traffic lights are similarly familiar contexts in which probability concepts may be assessed, yet the second part of the structured question in the GCSE allows for a less predictable element to be introduced by asking whether the overall likelihood is greater of being stopped by lights A and B, requiring the candidate to respond to a novel proble m without relying on procedural recall.

Extended stand-alone questions are included in the CBSE, GCSE, IGCSE and NCEA Level 1 which involve a longer mathematical argument or strategy, and as such often have higher mark allocations (between four and six marks). Extended questions also form part of structured questions, where lead-in shorter answer questions lead onto more extended sub-parts assessing higher order application of mathematics. Examples are shown below:

Comparing the above extended questions, the CBSE

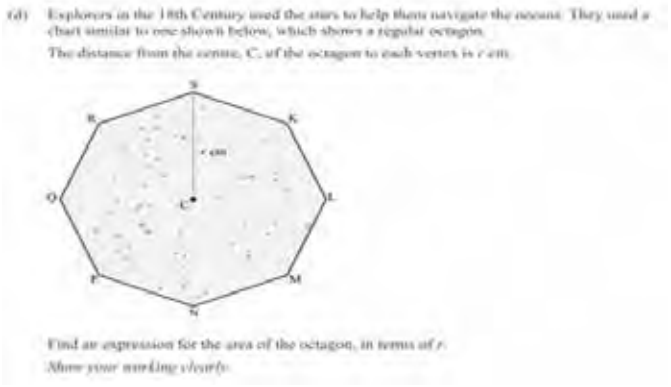
Figure 38: CBSE and NCEA Level 1 example extended questions

CBSE

On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. From a point 9 m away from the foot of the tower, the angles of elevation of the top and foot of the flag pole are 60° and 30° respectively. Find the heights of the tower and the flag pole mounted on it.

CBSE Standard X Paper (2018)

NCEA Level 1


(d) Explorers in the 18th Century used the stars to help them navigate the oceans. They used a chart similar to one shown below, which shows a regular octagon.

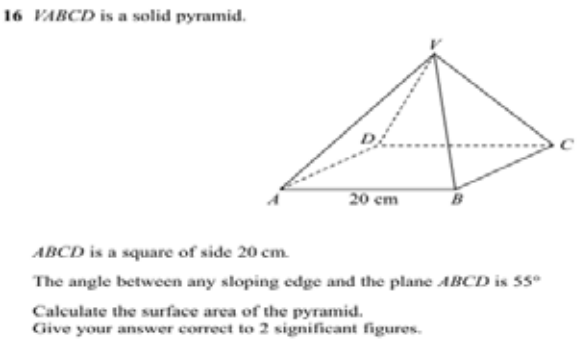
The distance from the centre, C, of the octagon to each vertex is r cm.

Find an expression for the area of the octagon, in terms of r.

Show your working clearly.

Question 3, NCEA Level 1 Unit Paper 2019: Apply geometric reasoning in solving problems

GCSE


16 *VABCD* is a solid pyramid.

ABCD is a square of side 20 cm.

The angle between any sloping edge and the plane *ABCD* is 55°

Calculate the surface area of the pyramid.
Give your answer correct to 2 significant figures.

Question 16, GCSE Sample Paper 3 (Higher Tier)

and the selected international exam questions from the NCEA Level 1 and the GCSE similarly assess the ability to infer and construct a strategy for solving a longer problem in a series of steps, in response to the given stimulus. In the CBSE, the scenario is given in written form, while in the GCSE and NCEA Level 1, diagrams are provided to facilitate problem solving in novel situations, where a lengthy textual description may be less conducive to the assessment of novel problem solving.

5.1.5 Marking

Marking is step-wise (points-based) in the CBSE assessment, the extract below illustrates this technique used to mark individual questions:

Figure 39: Extract from CBSE Mathematics Mark Scheme (SQP Mark Scheme)

CBSE

38	Capacity of tank = $\frac{1}{3}\pi \times 20 \times (10^2 + 25^2 + 10 \times 25)m^3$ $= \pi \times 20 \times 325m^3 = \pi \times 20 \times 325\,l$	$1\frac{1}{2}$
	Cost of petrol = $\pi \times 20 \times 325 \times 70 = ₹1430000$	$\frac{1}{2}$
	Slant height = $\sqrt{20^2 + (25-10)^2} = 25m$	1
	Surface area of tank = $\pi \times 25(10+25)m^2 = 2750m^2$	1
	OR	
	Quantity of water flowing through pipe in 1 hour $= \pi \times \frac{7}{100} \times \frac{7}{100} \times 15000m^3$	2
	Required time = $\left(50 \times 44 \times \frac{21}{100}\right) \div \left(\pi \times \frac{7}{100} \times \frac{7}{100} \times 15000\right)$ = 2 hours	2

mathematics mark scheme, step-wise marking is employed where each step is allocated a mark or marks, although it is not always clear how marks are broken down per step. For example, in the second question above, it is not clear which steps would need to be demonstrated to gain one mark out of four as only two sets of 2 marks are given. In the first question, it is not clear whether it is possible to gain half a mark / a half mark for the first step in solving the problem.

The following table summarises the similarities and differences in marking methodologies employed by the CBSE and the four international qualifications reviewed:

The marking methods used across the CBSE, IGCSE,

Table 17: Comparative Review of Marking Methodologies for Written Examinations

Qualification	Half Marks Awarded	Method Marks Awarded	Accuracy marks awarded	Credit Given for Alternative Methods[11]	Breakdown of marks given in the mark scheme	
					Per sub-question	Per Step
CBSE	✓	✓	✓	NE	-	✓
IGCSE	No	✓	✓	✓	✓	✓
GCSE	No	✓	✓	✓	✓	✓
NCEA Level 1	No	✓	✓	✓	✓	✓
Malaysian SPM	No	✓	✓	NE	✓	✓

* Not evident within the mark scheme itself.

11 In comparison to the best method, as identified in the mark scheme.

GCSE, NCEA Level 1 and the SPM are fairly similar, with a points-based approach used in each marking process whereby one mark is awarded per correct step. Mark schemes typically provide a breakdown of marks per sub-question and per step in the CBSE and across the international qualification mark schemes reviewed. As in the international exam mark schemes, this allows CBSE candidates to gain credit for partially correct answers or answers where they have used the correct strategy in certain steps but have given a final incorrect answer. The CBSE is, however, the only exam which awards half marks for strategy whereas half marks are not permitted in the GCSE, IGCSE, NCEA Level 1 and SPM.

Differences are apparent in the award of credit for alternative strategies. Although CBSE states that alternative answers can be accepted, the mark schemes do not provide explicit guidance or suggestions of alternative methods that may be presented, whereas the GCSE and IGCSE mark schemes frequently include alternative methods / strategies under a notes column or a guidance column which lists answers for partial credit and directs examiners on which to accept or reject.

An extract from a mark scheme used for marking a GCSE examination in mathematics is given below:

Figure 40: Extract from a GCSE Mark Scheme

Working	Answer	Notes
	11A	M1 For a cumulative frequency diagram with at least 5 points plotted correctly at the ends of the intervals C1 For correct graph with points joined by curve or straight line segments [SC B1 if the shape of the graph is correct and 5 points of their points are **not** at the ends but consistently within each interval **and** joined.]
	26.5	B1 25 – 28
$80 \div 4 \times 3 = 60$ Draw line parallel to mark axis from CF = 50	36.5	P1 For process to find number who failed eg $80 \div 4 \times 3 = 60$ P1 Draw line parallel to mark axis from CF = "60" and read off A1 For 35 - 38
	6.8×10^{-5}	B1

In the above GCSE mark scheme, method marks are indicated by M1, process marks are awarded for the correct step in a calculation problem indicated by P1, and sometimes communication marks are also awarded in graphical questions indicated by C1. B1 indicates an unconditional accuracy mark where no working is required and the mark is dependent on a single correct answer. By differentiating between the different types of marks and how they are awarded, the examiner can more clearly judge the correct number of marks to be given for varying responses to a question.

5.2 Summary of the main similarities / differences – Maths

5.2.1 Similarities

Content: A shared focus on broad topic areas of number, algebra, shape and space, mensuration and handling data (statistics and probability) is apparent.

Assessment methods: All systems, including the CBSE Standard X, combine assessment questions set in a mathematical context with those which use real-world scenarios.

Different tiers of entry are generally offered in international mathematics assessments at secondary level. As with the IGCSE and GCSE which have Higher and Foundation, CBSE has two tiers of entry (Basic and Standard).

Question types: The latest CBSE SQP, the CBSE 2020 paper and the international examination papers reviewed use a similar combination of question types, including the use of structured and stand-alone longer answer questions.

CBSE uses a proportion of real-world questions in areas also commonly observed in the international examinations reviewed, for example, in probability, statistics but also shape and space and to a lesser extent in algebra.

Marking: In terms of marking, all mark schemes, including the CBSE mark schemes, award credit for correct steps / strategy as well as the final answer in open-ended questions.

5.2.2 Differences

Content: Content is generally observed to be more theory-based across many areas in the CBSE but particularly in number (numerical concepts) when compared against other systems.

Resources: Use of calculators is a key area of difference with all other systems including exam papers permitting and / or requiring the use of calculators, the only exception being the GCSE in which one of three papers is a non-calculator paper.

Formulae are also included across all four comparator systems, whilst CBSE does not typically provide formulae, placing greater emphasis on recall.

More explicit guidance is often provided in international board papers that candidates should show their working and give a final answer to a specific degree of accuracy. In the CBSE papers the

expectation that students will show their working is implicit, rather than a direct instruction or requirement.

International examination papers were all observed to include greater use of diagrams and visual aids to assist problem solving, whereas the CBSE papers include a number of questions with longer textual descriptions.

Question types: Greater use of structured questions broken down into interconnected sub-parts is evident in the GCSE, IGCSE, NCEA Level 1 and SPM exams, whereas the CBSE papers contain a greater proportion of stand-alone questions / tasks with only a small number of structured questions in the most recent SQP and the 2020 paper. The structured format in the international papers frequently allows for more flexibility in the range of skills a question can assess, including the integration of less predictable yet interconnected question sub-parts to assess application and novel problem solving.

Multiple-choice and gap-fill questions are used in the CBSE and SPM mathematics but are not in other board exams, in which students are required to show working out in all question responses across all papers.

Exam paper structure: Whereas in the international qualifications reviewed, the exam papers order questions progressively according to difficulty level; in the CBSE papers, questions are ordered in terms of total mark allocation.

Marking: CBSE is the only system to award half marks, whereas this practice is either not implemented or expressly prohibited in other exam marking practices. A greater level of guidance is provided to examiners in the IGCSE and GCSE mark schemes on what to accept and reject in terms of alternative approaches and strategies.

5.3 Key findings and recommendations

There are a number of aspects in which the Mathematics programme – in terms of its curriculum and assessment - would benefit from review to more closely reflect the relevant principles of CBE curriculum design and assessment principles.

It was found that the CBSE maths syllabus had **clearly defined overarching aims and objectives**. Overall the aims are found to be broadly appropriate and comparable when considering the level of education in mathematics, although they may benefit from review in relation to skills coverage and whether real-world application of mathematics should be included as a prioritised aim with the move to a more competency-based model of education.

On review of the subject syllabi and following stakeholder engagement, CBSE has made significant progress towards developing a more **outcomes-oriented qualification design** for Standard X. This includes the inclusion of the generic prescribed skills for assessment (Typology of questions) alongside the specification of subject content which covers knowledge and understanding, application (problem solving), analysis and synthesis. Further guidance and integration of a fuller range of cognitive skills to utilise the full spectrum of Blooms Taxonomy could be beneficial for NCERT to consider moving towards a competency-based system of teaching. The future integration of learning outcomes within CBSE subject syllabi is recommended in facilitating a fully coherent approach to competency-based education.

In terms of **content and its relevance** in mathematics, when compared to other systems, similar broad areas of study are covered. The CBSE sub-topics were observed to go into more depth and be more theoretical than those covered in other systems at the same level. Particular differences were noted in number: the coverage of numerical concepts is more theoretical covering concepts typically included at A Level in the UK system while focusing less on practical applications such as estimation and technology use, including calculations using large and small numbers. Nevertheless, the emphasis on theoretical maths and mathematical proof in the CBSE coverage of algebra and geometry could be considered of benefit, enabling students to have acquired a foundation level of knowledge prior to progressing onto more advanced maths in Standard XI, this was also supported by the views of teachers during the stakeholder engagement. Teacher focus groups, interviews and surveys however highlighted a potential need for commercial mathematics topics to be added to the curriculum. In terms of activities and themes, teachers also drew attention to the benefits of core experiments, investigative maths and cross-disciplinary application, which are felt to receive less attention in the current curriculum.

Future engagement with employers would be beneficial to ensure the alignment of the curriculum with employers' needs, as engagement and alignment represent a key feature of CBE oriented systems. The use of calculators and other technology was one of the key areas highlighted in the surveys where teachers feel students were less well prepared

for employment / further study. Given that calculator use would be an expected skill across different careers involving numeracy and mathematical application, this could involve exploring ways of integrating the practical, calculator-based problem solving into the CBSE Standard X curriculum content.

Publishing the SQP can be considered of particular value in enabling **equity and fairness** in the assessment, as it provides an open resource to all students, enabling familiarity with the question types and skills, the format of which is evolving every year. Nevertheless, the particularly high failure rates in the Standard X exams in maths, together with a significant number of students scoring maximum marks in the exam (100%) at odds with the traditional bell curve of achievement commonly associated with secondary level exam performance calls into question the inclusivity and accessibility of the CBSE exams as well as their ability to discriminate and stretch the brightest candidates at the higher end. In comparison, it is extremely rare for any candidate to score maximum marks in the GCSE, with only 3-4% of the cohort nationally able to score above 80% of the marks on the higher tier, given the lower predictability and high demand of certain questions. This contrasts with around 25% of CBSE candidates gaining a score of 80% or over. At the same time, relatively few GCSE candidates (around 4-5%) score below 20-30% of marks on the higher and foundation tiers, given the accessibility and structured layout of the questions. By contrast, up to around 15% may score lower than 30% in the CBSE exams.

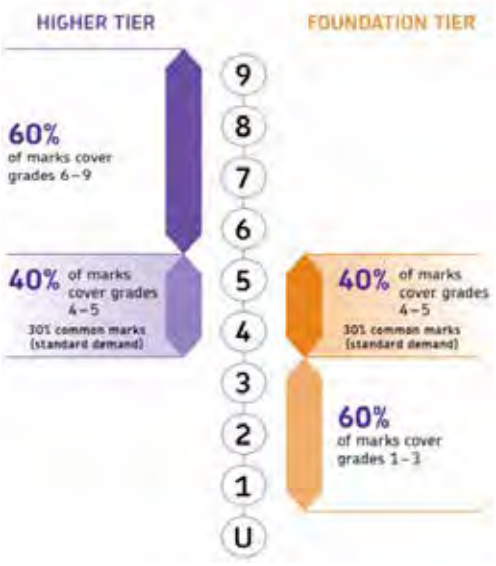
In mathematics, a subject where there is perhaps the widest range of abilities and levels of performance, CBSE has introduced the Basic level to facilitate recognition of achievement at the lower levels. Whilst recognising the benefit of offering a Basic maths course for less able students, a number of teacher focus groups from different schools raised the issue of the perception of a two-tier system for maths. Specifically, Basic level maths is currently being perceived to be of a lower value by stakeholders as it appears on the CBSE transcript of results as distinct from Standard maths. The following case study looks at how the GCSE offers different tiers of entry to **promote equity** while also maintaining student engagement:

While being set at a lower level of demand than

Figure 41: Case Study: Tiering in GCSE Mathematics and Science, providing equal opportunity to attain a passing grade

The GCSE aims to assess students with a very wide range of abilities. Assessments were structured to provide opportunities for students to demonstrate positive achievement, and to allow students to perform to the best of their ability (Bishop, Bullock, Martin, & Thompson, 1999). However, the challenge of designing assessments which were able to effectively differentiate between students of very different abilities was recognised from the earliest stages of the development of the GCSE.

Since 1994, the use of tiering has become more widespread, and in 1998 the number of tiers and the overlapping grade range was unified across specifications to the current two-tier design, as shown overleaf. As can be seen overleaf, the number of marks targeted at each grade is carefully calibrated to ensure overlap in terms of questions at Grades 4 and 5 between Foundation and Higher:



The foundation tier spans grades 1-5, and the higher tier grades 4-9, with an allowed grade 3 for examinees who narrowly miss grade 4. The two tiers, therefore, overlap primarily at grades 4 and 5. Foundation tier examinees are capped at grade 4, while higher tier examinees who do not achieve an allowed grade 3 or better are ungraded. This model allows all students to access the grade 5, which is considered to be a good pass in the GCSE. It is important to note that only the final grade achieved and not the tier of entry are shown on the student certificate on receiving the results, facilitating equity in the way GCSE results are viewed by employers and institutions[12].

12

AQA, 2018. Tiering Guide: Foundation or Higher? . [pdf] Published by: AQA. Available at: <https://filestore.aqa.org.uk/resources/science/AQA-GCSE-SCIENCE-TG-FH.PDF>.

Standard mathematics, there could be scope for CBSE to attempt some level of alignment / overlap between Basic and Standard. Overlap could promote further incentive and motivation to those taking the Basic level maths to achieve to the best of their ability, thereby providing all CBSE students a more meaningful and inclusive assessment in line with CBE approaches to assessment. Having reviewed the 2020 Basic Mathematics paper, there may be scope to include questions that assess mathematical literacy and practical maths as opposed to theoretical topics such as advanced algebra and trigonometry which students taking Basic mathematics may be able to use in employment or further study.

Moreover, using a grading system as opposed to numerical percentage scores may be considered as a potential solution, whereby a high grade / score on the Basic level maths may be equated to a lower / lowest passing score on the Standard to facilitate comparability in standards and to provide clarification to stakeholders on the level / range of performance that could be expected from those taking the Basic level maths. This perhaps underscores the importance of considering question demand (complexity), as well as the skills and topic area assessed, when constructing the Basic maths paper which ideally could be more practical and accessible to lower ability students than the Standard X exam.

These findings and recommendations are supported by some of the feedback from the student and teacher surveys and interviews. The feedback highlighted the benefits of the Basic level maths, whilst also highlighting the need to differentiate core mathematics topics to be covered at Basic level from more advanced topics at Standard level.

In terms of **accessibility**, a key **CBE assessment principle**, as in science, in CBSE mathematics a number of questions were observed to include complex language both in terms of technical vocabulary and grammatical constructions. Most apparent were a number of questions in previous papers (2019 and 2018) where multiple tasks are embedded within the same question, making it difficult for the students to keep track of what is required in response, for example, the following question below contains three separate tasks embedded within a single paragraph:

Figure 42: Examples of extended questions from CBSE past paper in Mathematics with multiple embedded tasks

A milkman uses a container, in the shape of frustum of a cone, to store milk. The container opens from the top, is of height 40 cm with radii of its lower and upper circular ends as 14 cm and 35 cm respectively. Find the volume of milk (in litres) which can completely fill the container. If he sells the milk at 35 per litre, for how much amount he can sell the whole milk? He had a desire to give one-tenth of the whole milk free to the children of economically weaker section of society. What value is reflected by his desire?

30-B Question 29 CBSE Paper 2018

Questions such as that illustrated above may place particular demands on a student's reading comprehension ability. While it may be expected that students should be able to understand in English or their home language, long sentences and complex language may, unnecessarily in some instances, detract from the aim of a question, in particular, the problem solving and / or analytical skills the question seeks to assess. In the 2020 paper there are notably fewer questions with embedded tasks, there is nonetheless still scope to simplify the language in places and to provide additional visual cues / diagrams to assist students so that the focus is placed only on problem solving rather than relying also on lower order, yet time-consuming activities of comprehension and memory.

The teacher feedback from the interviews indicated that some of the extended questions in the exams are difficult for students as students might not be aware that they have to indicate every step of the process to their answer. This supports these

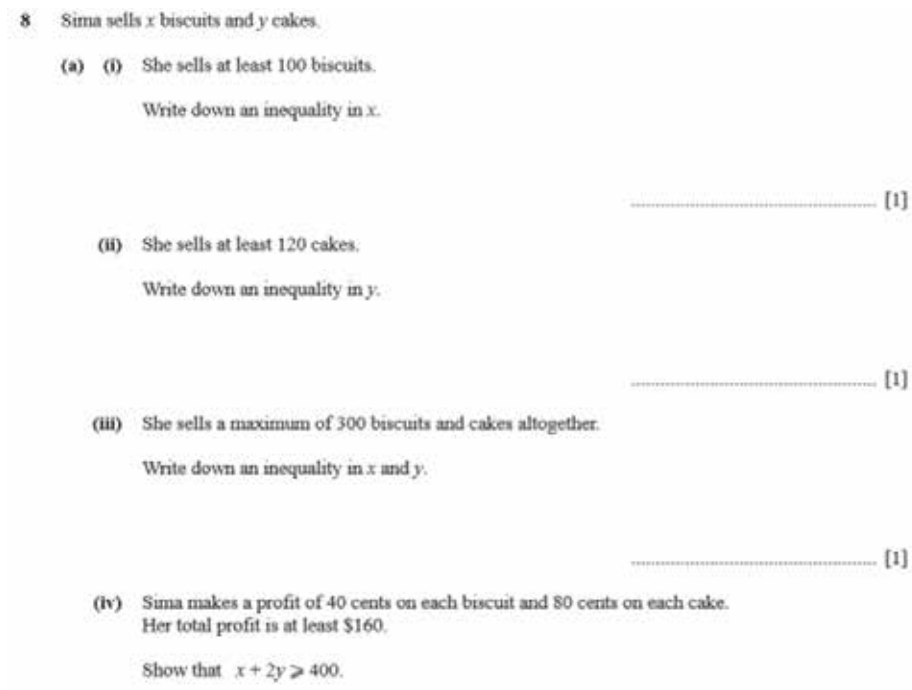
observations on the CBSE papers and indicates that accessibility is still an issue in the 2020 series that needs to be addressed.

A further issue relating to accessibility is the breakdown of marks. Ideally, each question and sub-question should show the number of marks to be awarded. It was found however, that this practice is inconsistent across the CBSE exam papers reviewed in maths. Although mark allocations are consistently shown for each stand-alone question, for structured questions there are some questions which do not break down the number of marks per sub-part making it potentially difficult for the candidate to know how many steps are expected in each answer, as is the case in the example below. This contrasts with the approach taken in the GCSE and IGCSE, for example, where the mark allocation is clearly shown for each question:

CBSE has however established a clear structure for the paper, set out in the SQP, which includes distinct sections starting with one mark questions in Section A, moving onto higher mark questions in B, C and D. Adopting a consistent structure is intended to facilitate **accessibility** by familiarising students with the format prior to the exam and enables extended questions to be set at the end of the paper. However, although mark allocations increase, questions are not necessarily ordered according to difficulty level with some of the one-mark items proving to be higher demand than some of the extended items in later sections.

This approach differs from the practice of international exam boards which employ a greater number of structured questions, where progression through a paper is achieved through increasing question difficulty known as “ramping” rather than by differentiating by question type or mark allocation. Ramping promotes accessibility by allowing candidates to settle into the paper and build their

Figure 43: Sample IGCSE structured question



8 Sima sells x biscuits and y cakes.

(a) (i) She sells at least 100 biscuits.

Write down an inequality in x.

..... [1]

(ii) She sells at least 120 cakes.

Write down an inequality in y.

..... [1]

(iii) She sells a maximum of 300 biscuits and cakes altogether.

Write down an inequality in x and y.

..... [1]

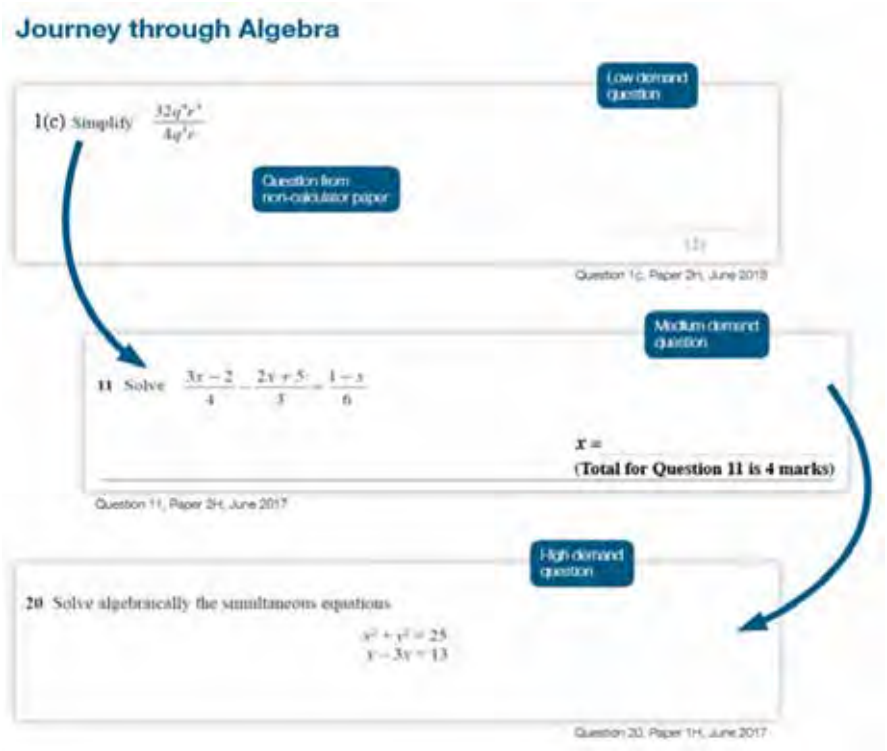
(iv) Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake.
Her total profit is at least $160.

Show that $x + 2y \geqslant 400$.

IGCSE Sample Paper Question 8

confidence before attempting more difficult questions toward the end of the paper. The figure overleaf illustrates how ramping is achieved in GCSE mathematics, by charting the journey through algebra starting with lower demand and ending with high demand questions of varying mark allocations:

Figure 44: Sequencing of questions and ramping throughout exam paper – GCSE Mathematics Journey through Algebra[13]



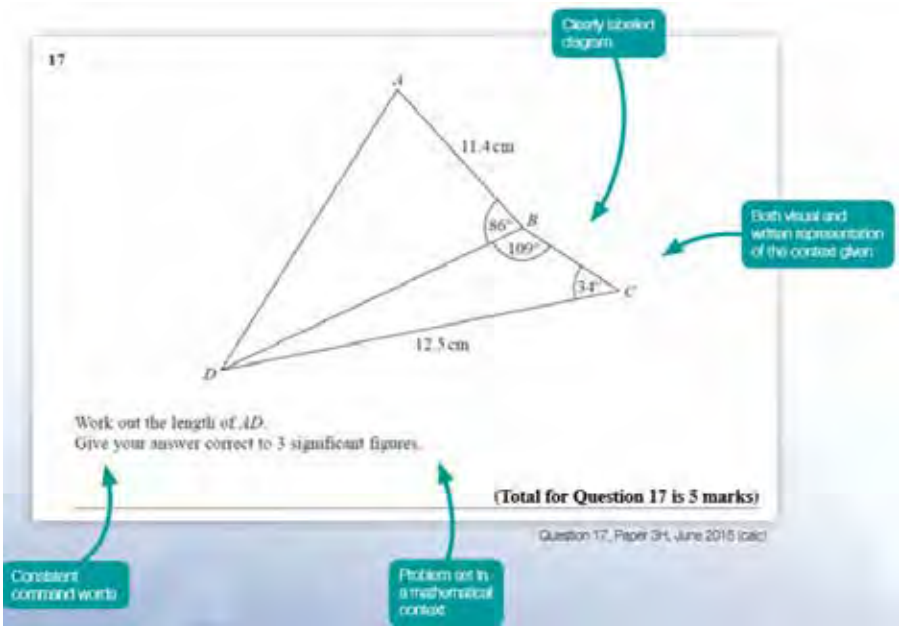
Engagement with the CBSE management team revealed a focus on developing **higher order thinking skill assessment** items reflecting **CBE approaches**, with 10% of the total assessment being allocated to their assessment in mathematics, with a view to increasing this to 20% in next year's exam series. Whilst command words may vary and not necessarily be tied to question demand in mathematics, higher demand questions in mathematics typically involve multiple processes, drawing on skills of deduction and inference. Some of the CBSE questions, particularly those in Sections C and D involve these processes, however, there remains scope to incorporate diagrams to support candidate

13

Pearson, 2016. Our Focus on Accessible Exam Papers. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Our_focus_on_accessible_exam_papers.pdf>.

understanding, meaning that the focus of the question is placed on higher order problem solving as in the following example:

Figure 45: Higher order problem solving in GCSE Mathematics[14]



In contrast to the approach illustrated above, CBSE candidates often have to construct their own diagram based on a description, placing demands on memory and visualisation but potentially detracting from the assessment of problem-solving ability, which would be one of the main aims of a competency-based assessment. It is suggested that including a greater number of diagrams in the questions would assist the candidates by allowing the assessment to focus more on mathematical problem solving, as is also intended in the CBSE syllabus.

In regard to the assessment of **real-world application**, focus group meetings with CBSE mathematics subject experts and management team highlighted a clear aim to integrate questions assessing the application of skills and knowledge in real-world situations into the Standard X exams. Furthermore, review of SQP 2019-2020 exam papers found that a small number of items assess the application of knowledge in real-world scenarios in mathematics.

In mathematics, whilst the real-world scenarios in a small number of questions may not be familiar to the candidate in the latest version of the SQP, a number of scenario questions (excluding the HOTS) were observed to be similar or the same as those already met by students in the NCERT textbooks. This potentially impacts problem solving assessment as if the student has had prior exposure to similarly worded questions in the textbooks, the strategy and / or the calculations will already be immediately clear and require less in the way of inference, logic and deduction and more on recall, albeit with an emphasis on mathematical accuracy and precision. In some cases, the numerical values provided in the questions are similar or the same as in previous exercises which although may make such questions more accessible without a calculator (which are not allowed in CBSE maths exams), could

14

Pearson, 2016. Our Focus on Accessible Exam Papers. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/teaching-and-learning-materials/Our_focus_on_accessible_exam_papers.pdf>.

limit the scope for assessing higher order problem solving. Some examples of the similarities are given below:

Figure 46: Similarities between CBSE Standard X Scenario-based questions and previous papers / NCERT textbooks

On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. From a point 9 m away from the foot of the tower, the angles of elevation of the top and foot of the flag pole are 60° and 30° respectively. Find the heights of the tower and the flag pole mounted on it.
CBSE Past Paper Mathematics

Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles and the distances of the point from the poles.
NCERT Mathematics Standard X Textbook: Elevations

8. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.
CBSE Past Paper Mathematics

A train covers a distance of 360 km at a uniform speed. Had the speed been 5km/hour more, it would have taken 48 minutes less for the journey. Find the original speed of the train. *SQP Mathematics 2019-2020*

These observations from the documentation review on the predictability and similarity of the questions were also borne out in the surveys and focus groups, but to a lesser extent in the interviews. The surveys highlighted question similarity: when asked how similar the questions were in the board exam to NCERT, SQP and previous exam questions, the majority said they were similar, in particular to the NCERT textbook questions. This was coupled with the finding from the survey that 44.95% of students reportedly found the maths examination easy, suggesting that the papers do not include a sufficient number of unfamiliar and novel scenario-based questions to assess a student's mathematical thinking skills.

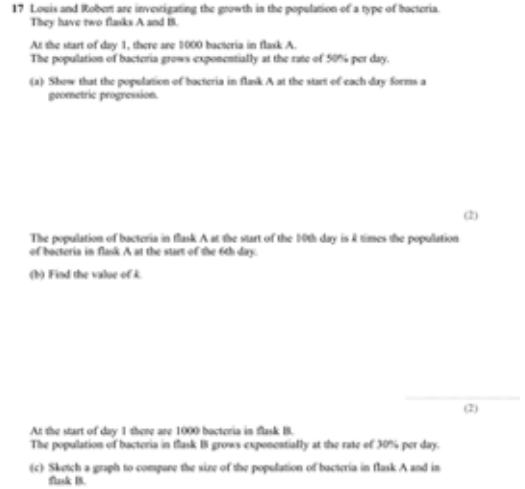
In summary, the move to introduce questions with **real-world contexts** and the use of scenarios is clearly beneficial in progressing towards a more competency-based model of assessment. Indeed, the majority of teachers surveyed acknowledged the value of real-world application within the assessment, and also felt that the current Standard X exams integrated some assessment of these skills. However, the design of the CBSE scenario-based questions, from the choice and familiarity of scenario to the use of command words and mark allocations, could benefit from further development, to best exploit their potential to assess application and higher order thinking skills. Moreover, the number of such questions and their mark allocations could be increased to place more overall emphasis on real-world application; a point which emerged from the teacher interview and focus group feedback.

Such a review could also facilitate the **reliability of assessment**, enabling all candidates to be assessed to the same standard. The fact that some students but not all may have covered the relevant similar questions in past papers / textbooks may negatively impact reliability if previously set questions are to reappear in future exams.

A case study below explains how the GCSE assesses real-world application, while further guidance on how this could be achieved in practice in the context of CBSE Standard X is provided in the recommendations section.

Figure 47: Case study: Real-world scenario assessment

In mathematics, AO3 in GCSE focuses on solving mathematical problems in other contexts, and this includes translating problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes. For example, the question below involves modelling a specific scenario involving growth in a population of a type of bacteria using principles of geometric progression:



17 Louis and Robert are investigating the growth in the population of a type of bacteria. They have two flasks A and B.

At the start of day 1, there are 1000 bacteria in flask A.
The population of bacteria grows exponentially at the rate of 50% per day.

(a) Show that the population of bacteria in flask A at the start of each day forms a geometric progression.

(2)

The population of bacteria in flask A at the start of the 10th day is k times the population of bacteria in flask A at the start of the 6th day.

(b) Find the value of k.

(2)

At the start of day 1 there are 1000 bacteria in flask B.
The population of bacteria in flask B grows exponentially at the rate of 30% per day.

(c) Sketch a graph to compare the size of the population of bacteria in flask A and in flask B.

Question 17, GCSE Sample Paper 3 Higher Tier

Optionality can impact **assessment reliability** if the optional questions assess varying skills and are of different levels of difficulty. While it is acknowledged that optionality can provide flexibility where the assessed content is particularly broad or skills based such as arts and languages, it is one variable that can potentially impact reliability and fairness / equity of assessment, and one area that CBSE differs from most international exam boards in maths assessment, with up to 33% of the marks allocated to optional questions in the CBSE exams. In this context, further consideration could be given to reducing optionality or implementing further measures to ensure direct comparability in terms of skills, topic area and level of demand between options.

In regard to the **reliability of marking processes**, the focus groups with CBSE subject experts and review of exam mark schemes highlighted the use of the step-wise method for marking exam papers in maths whereby each correct step gains a mark or half a mark. The review of CBSE mathematics mark schemes however also highlighted areas where it was not clear which steps related to mark allocations and whether half marks or partial marks could be awarded in the absence of general marking guidelines. A further observation was that only in a few instances alternative approaches or answers were given, potentially affecting the flexibility of the mark schemes and their consistent application to assessing a broad range of different responses, particularly in the case of longer / extended questions where there is more emphasis on the candidate devising their own strategy. Guidance on best practice principles in mark scheme design in knowledge-based qualifications like maths are given in the science Section 4.3 of this report.

Reliability in standard-setting and grading is assessed in general in Section 4.3 of this report; the key findings also relate to CBSE mathematics.

Similarly, the observations on **assessment validity** for science also predominantly apply to CBSE mathematics. In particular, it was observed that the scope for analysing, evaluating and creating is particularly low in the multiple-choice and short answer questions yet the CBSE syllabus Question Typology states that a number of marks (14) are allocated to these skills in Sections A-C of the exam. This observation highlights a potential disconnect between the CBSE subject syllabus and the skills that are actually assessed or realistically can be assessed by the question types used in the exam. Reference to best practices in linking assessment objectives with exam questions and papers may be of benefit in reviewing CBSE mathematics.

Further observations on validity, including examiner reporting, apply equally to mathematics as in science (as indicated in Section 4.3 of this report).

6. Reading

The CBSE Standard X English Language and Literature was reviewed and compared against the GCSE English Literature, the Estonian State Examination in English, the IGCSE in English as a Second Language, and further reference has been made at item level to international English language tests.

As outlined in the methodology, in contrast to maths and science, there is a well-established international competency-based framework for language acquisition – the Common European Framework of Reference for Languages (CEFR).

The CEFR articulates language proficiency across competencies, strategies and activities; as outlined in Appendix 4 these need to be considered together to understand a language user's overall language proficiency. The CEFR informs all of the chosen case studies at a top level, as outlined in the appendices. Throughout the comparative analysis specific reference has been made to language-based competences as conceptualised in the CEFR. See Appendix 4 for a detailed overview of how the CEFR frames language acquisition and the competences within.

6.1 Review and comparative analysis of CBSE Standard X English

6.1.1 Aims

The CBSE Standard X English course covers both English language and literature and the syllabus is designed across Standard IX and X. Competency-based learning is integrated into the syllabus, with competencies outlined across the different language skills, for example as detailed in the aims and learning outcomes:

Table 18: Aims and learning outcomes of the CBSE Standard X English Language and Literature, 2020-2021[1]

Standard X English Language and Literature
The general objectives at this stage are to: • Build greater confidence and proficiency in oral and written communications • Develop the ability and knowledge required in order to engage in independent reflection and inquiry • Use appropriate English to communicate in various social settings • Equip learners with essential language skills to question and to articulate their point of view

1 CBSE Curriculum English Language and Literature, Standard IX and X. Published by: CBSE. Available at <http://cbseacademic.nic.in/web_material/CurriculumMain21/Language-Secondary/English_Sec_2020-21.pdf>..

Standard X English Language and Literature

- Build competence in the different registers of English
- Develop sensitivity to, and appreciation of, other varieties of English, like Indian English, and the culture they reflect
- Enable the learner to access knowledge and information through reference skills (consulting a dictionary / thesaurus, library, internet, etc.)
- Develop curiosity and creativity through extensive reading
- Facilitate self-learning to enable them to become independent learners
- Review, organise and edit their own work and work done by peers
- Build listening and speaking into the curriculum

At the end of this stage, learners will be able to do the following:

- Give a brief oral description of events/incidents of topical interest
- Retell the contents of authentic audio texts (weather reports, public announcements, simple advertisements, short interviews, etc.)
- Participate in conversations, discussions, etc., on topics of mutual interest in non-classroom situations
- Narrate the story depicted pictorially or in any other non-verbal mode
- Respond in writing to business letters, official communications email etc.
- Read and identify the main points / significant details of texts like scripts of audio-video interviews, discussions, debates, etc.
- Write without prior preparation on a given topic and be able to defend or explain the position taken / views expressed in the form of article, speech, or a debate
- Write a summary of short lectures on familiar topics by making / taking notes
- Write an assessment of different points of view expressed in a discussion / debate
- Read poems effectively (with proper rhythm and intonation)
- Transcode information from a graph / chart to a description / report and write a dialogue, short story or report

The aims indicate that all competency-based education is integrated into the overall design of the qualification across the four skills (reading; writing; listening; speaking). A number of different linguistic competencies are covered in the aims and learning outcomes, such as:

- Sociolinguistic competence (e.g. the understanding of which registers/style is appropriate to different contexts)
- Mediation skills (e.g. the interpretation of a text and the mediation of it into a different format such as a graph to a report)
- Reading for information, argument and detail
- Spoken production and interaction, including spontaneous oral communication and conversation skills.

These competencies are considered in more depth below in the assessment question analysis. In addition, some wider competencies are valued, such as appreciation of different Englishes, and assessment for learning (AfL) skills including peer- and self-assessment.

Qualification aims, outcomes and objectives of the CBSE Standard X and the three case-study qualifications have been compared in the table overleaf by extrapolating general themes relating to the language areas covered. Each qualification uses different terminology and, when contrasting, in some cases an 'aim' is expressed generally, whilst in others aims reflect very specific competencies.

In an attempt to reconcile these terminological differences yet still present the overall coverage of competencies, a colour-coding system has been used. Where the theme appears in an overall course aim it has been coloured green. Where it appears in a learning outcome or a content area, it has been coloured blue. Where it is specifically an assessment objective, it has been coloured red. The table has been further divided into linguistic themes, aims or competences (e.g. grammatical accuracy) and more general competences (e.g. 'lifelong learning').

Table 19: General and linguistic competences covered across the qualifications

Theme	CBSE[2]	Estonia	IGCSE English Language	GCSE English Literature
Develop spoken communication	✓	✓ ✓	✓ ✓ ✓	
Develop written communication	✓	✓ ✓	✓ ✓ ✓	✓
Awareness of social use of English/politeness registers	✓	✓	✓	
Understand content from a range of sources		✓ ✓	✓	✓
Interpret content	✓	✓		✓
Develop awareness of the nature of language and language learning skills		✓	✓	
Read, interpret, and critically evaluate literature	✓			✓ ✓ ✓
Understand how language can create meanings/effects	✓			✓ ✓
Explore plot, characterisation contexts	✓			✓ ✓
Give a personal response to a literary text	✓			✓ ✓
Refer to quotations or references within a text				✓ ✓
Describe in detail	✓	✓		
Read extensively	✓			✓
Make connections across/compare different texts				✓ ✓ ✓
Develop reference skills e.g. internet, dictionary skills	✓	✓ ✓		
Include listening and speaking into the curriculum	✓			

Participate in conversations or discussions	✓ ✓	✓ ✓	✓ ✓	
Narrate a story (e.g. based on images)	✓			
Write formal outputs (e.g. letters, emails) using appropriate register or style	✓	✓	✓ ✓	
Read and identify key points or significant details, opinions or attitudes	✓ ✓	✓	✓ ✓	✓ ✓
Be aware of social, historical and cultural contexts and the impact on texts				✓ ✓
Understand connections between ideas	✓		✓	
Understand implicit meaning (intention, purpose)	✓		✓ ✓	✓
Communicate facts	✓		✓	
Write in paragraphs and use linking devices and create coherent, logical, organised texts	✓	✓*	✓ ✓	✓
Defend and explain their opinions	✓ ✓ ✓	✓	✓	✓ ✓
Talk about their plans		✓		
Take notes and/or summarise input texts	✓	✓*		
Read poems effectively with proper rhythm and intonation	✓			
Write a short story, dialogue or report or other short text	✓	✓	✓	
Transcode information from a graph	✓			
Make presentations				
Understanding a range of audio sources with different accents and voices			✓	
Communicate abstract ideas	✓		✓	
Communicate factual information	✓		✓ ✓	
Good control of pronunciation		✓	✓ ✓	
Good control of punctuation and spelling	✓		✓	✓
Able to use a wide range of language structures accurately (grammar/vocab)	✓	✓	✓	✓ ✓
Acquire literary terminology				✓ ✓
Make presentations		✓*		
Understand simple/fact-based texts		✓	✓ ✓	
Understand complex texts		✓*2		
Understand abstract themes		✓*	✓	
Appreciate literary heritage/literature	✓			✓
Interest in the culture of the country		✓		
Integrate their knowledge in other areas		✓		
Review own/peer work	✓			

Cultural understanding/awareness/valuing other cultures or other Englishes	✓	✓✓		
Appreciate literary heritage				✓
Acquired skills for lifelong learning or employment	✓	✓	✓	
Set learning goals, assess their achievement, develop select/ change learning strategies		✓	✓	
Personal development			✓	✓[3]
Develop independent reflection and inquiry skills	✓			

As can be seen, there is a degree of overlap across these aims, objectives, outcomes and content areas. The following points can be discerned:

- All qualifications test vocabulary and grammar range and accuracy.
- All qualifications test the ability to identify and understand key points or main ideas, opinions and attitudes in input texts
- The development of spoken and written communication is a focus of all qualifications, although not explicitly an assessment objective
- The ability to write short output texts such as a report or article is included in three of the qualifications
- Coherent, organised and flowing text is a feature of all qualifications
- The sociocultural ability or cultural awareness is considered to be a priority across most qualifications
- Across all qualifications, candidates are expected to be able to give their opinions and defend their points of view
- The ability to participate in conversations and discussions is considered to be important across most qualifications, although it should be noted that speaking is not a feature of the CBSE Standard X examination.
- The ability to understand implicit meaning, typically associated with intermediate CEFR levels and above, is included in three qualifications
- Most qualifications include the expectation that candidates or students are able to engage with a range of texts and text types.
- Both of the qualifications testing literature (CBSE/ GCSE English Literature) expect students to be able to critically evaluate texts, understand how writers use language to create meaning or effects, explore elements such as plot and characterisation, and to be able to give a personal response to texts.
- Beyond linguistic skills, most qualifications also expect students to develop skills for lifelong learning.

It is key to note that these overall aims and objectives are the starting point to shape the entire qualification and examination design: if, for example, spoken production is not a feature in the aims, then it should not appear in the assessment. It is also important to ensure that the assessment reflects and is driven by these overall aims and objectives

2

Note that the * in the Estonian column reflects an additional competency associated with the higher level (e.g. B2)

3

A number of transferable skills are outlined in Appendix 1 of the GCSE syllabus, including cognitive skills, interpersonal skills and intrapersonal skills.

which, in turn, have been informed by interrogation of the qualification purpose and demographic.

6.1.2 Content

The CBSE Standard X covers both English literature and language. Background overview states that 'traditionally, language-learning materials beyond the initial stages have been sources from literature: prose, fiction, and poetry. While there is a trend for inclusion of a wider range of contemporary and authentic texts, accessible and culturally appropriate pieces of literature should play a pivotal role at the secondary stage of education. The English class should not be seen as a place merely to read poems and stories in, but an area of activities to develop the learner's imagination as a major aim of language study, and to equip the learner with communicative skills to perform various language functions through speech and writing.'[4] This indicates the high priority given to literature alongside a focus on the development of communicative skills. This was generally considered to be a positive element in the stakeholder engagement, with only one respondent in a 1-2-1 interview suggesting that literature should be an optional component for students to allow more focus on skills. Syllabus content is covered across three sections with the following weighting in terms of class time:

Table 20: CBSE Standard X English Language and Literature syllabus coverage and allocated class periods

Section	Area	Class Periods
A	Reading	50
B	Writing & Grammar	30
C	Literature Textbooks and Supplementary Reading text	60
D	Internal assessment of Listening and Speaking Skills	50

For literature, a number of set texts ('prescribed books') are to be covered, varying at Standard IX and X. For Standard X, students are expected to study the books *First Flight* and *Footprints without Feet* published by NCERT across 60 lesson periods focused on 'literature textbooks and supplementary reading texts'. *First Flight* is the text for Class X, and *Footprints without Feet* is the supplementary reader. The literature textbook and supplementary reading text form Section C of the

4 CBSE Curriculum English Language and Literature, Standard IX and X. Published by: CBSE. Available at <http://cbseacademic.nic.in/web_material/CurriculumMain21/Language-Secondary/English_Sec_2020-21.pdf>

examination. The textbooks and literature reader include the following prose and poetry texts:

Table 21: English Language and Literature Set Texts

Literature Reader (First Flight)
Prose (First Flight)
1. A Letter to God
2. Nelson Mandela: Long Walk to Freedom
3. Two Stories about Flying
4. From the Diary of Anne Frank
5. The Hundred Dresses – I
6. The Hundred Dresses – II
7. Glimpses of India
8. Mijbil the Otter
9. Madam Rides the Bus
10. The Sermon at Benares
11. The Proposal
Poetry
1. Dust of Snow
2. Fire and Ice
3. A Tiger in the Zoo
4. How to Tell Wild Animals
5. The Ball Poem
6. Amanda
7. Animals
8. The Trees
9. Fog
10. The Tale of Custard the Dragon
11. For Anne Gregory
Supplementary Reader (Footprints without Feet)
1. A Triumph of Surgery
2. The Thief's Story
3. The Midnight Visitor
4. A Question of Trust
5. Footprints without Feet
6. The Making of a Scientist
7. The Necklace
8. The Hack Driver
9. Bholi
10. The Book that Saved the Earth

It is not fully clear as to whether students will be expected to be familiar with all texts, although there is question optionality in the examination, and the syllabus states that 'internal choice will be there,' which may indicate that teachers can choose which texts their classes will study in detail. Feedback from survey responses indicated that a minority of teachers found the quantity of set texts a challenge, whilst some students in 1-2-1 interviews suggested that texts were too easy, or that they would like additional texts to refer to as extensive reading. Nevertheless, the majority of respondents seemed to be happy with the literature component of the examination.

For the language side, the key content areas are outlined in terms of language items as below:

Table 22: Content of the Standard X English Language and Literature

CBSE Standard X English Language and Literature
The grammar syllabus will include the following topics in Class X:
1. Tenses
2. Modals
3. Use of passive voice
4. Subject-verb concord
5. Reported speech
• Commands and requests
• Statements
• Questions
6. Clauses
• Noun clauses
• Adverb clauses
• Relative clauses
7. Determiners
8. Prepositions

It is emphasised in the syllabus documentation, however, that although these may be tested through cloze, gap fill, error correction, and dialogue writing, there is 'no division of syllabus for Grammar', and students' productive competence in it is primarily assessed in the Writing and Grammar section in the examination.

The table below indicates content coverage of the CBSE compared with the three case studies:

Table 23: Content coverage across international case studies

	CBSE	Estonia	IGCSE English as a Second Language	GCSE English Literature
Literary set texts	✓			✓
Unseen literary texts				✓
Language items (e.g. grammar / vocab)	✓	✓	✓	✓[5]

No specific set texts are outlined in the Estonian curriculum, although literature is included in the unit 'Culture and Creation' under 2.1 'creativity' so it is likely that students have some exposure to it. The syllabus does not include a specific grammatical/vocabulary item list, but states, e.g. 'in order to acquire the vocabulary corresponding to the level of language proficiency and to use more complex linguistic constructions, students have to perform tasks which enable them to apply their communication skills… to reach the target level of language proficiency, teachers plan their activities in cooperation with students, and it is stated that 'knowledge of the language is not an aim in its own right, but a means for achieving a better command of the language. The structure of the language is studied in context.'[6] Levels of proficiency across language are tied to the CEFR and therefore do not reflect specific English language items (e.g. to the expectation that they have a 'broad reading vocabulary' or 'use diverse expressions').

The IGCSE English as a Second Language does not include set texts either, although candidates are expected to be able to deal with 'a wide range of texts'. For language items, no specific list is provided, although it should be noted that a number of published textbooks can accompany the course which may include specific vocabulary or structural lists. At syllabus levels, the outputs reflect the Estonian approach (and the CEFR), with candidates expected to be able to demonstrate 'a wide range of language structures (i.e. grammatical and lexical).

In the GCSE English Literature, language accuracy is prized, with students expected to be able to have acquired specific grammatical and lexical terminology to, e.g. describe literary effects. Spelling, punctuation and grammar are also assessed for accuracy. Nevertheless, the focus is more strongly on literary analysis: students study set texts chosen by schools from a list, with the stipulation that 'teaching should focus on the study of **whole texts**' (emphasis in bold is in the syllabus).

In addition, the syllabus states that students will need to be able to analyse the ideas, language, form and structure of two unseen poems and compare them in the assessment. In comparison, it seems that students do not need to engage with unseen texts in the CBSE: if the literature component of the CBSE Standard X qualification is considered

5 CBSE Curriculum English Language and Literature, Standard IX and X. Published by: CBSE. Available at <http://cbseacademic.nic.in/web_material/CurriculumMain21/Language-Secondary/English_Sec_2020-21.pdf>..

6 Estonian upper secondary national curriculum 2014 appendix 2, page 11-12. Published by: Republic of Estonia Ministry of Education and Research. Available at: <https://www.hm.ee/en/national-curricula-2014>.

Table 24: GCSE English Literature set texts[7]

Component 1		Component 2	
Shakespeare	**Post-1914 British play or novel**	**19th-century novel**	**One collection of 15 poems from the Pearson Poetry Anthology**
• Macbeth • The Tempest • Romeo & Juliet • Much Ado about Nothing • Twelfth Night • The Merchant of Venice	• An Inspector Calls • Hobson's Choice • Blood Brothers • Journey's End • Animal Farm • Lord of the Flies • Anita and Me • The Woman in Black • The Empress • Refugee Boy • Coram Boy • Boys Don't Cry	• Jane Eyre • Great Expectations • Dr Jekyll and Mr Hyde • A Christmas Carol • Pride and Prejudice • Silas Marner • Frankenstein	One collection from: • Relationships • Conflict • Time and Place • Belonging Note: each collection contains 15 poems and includes romantic, literary heritage and contemporary poetry. All 15 poems must be studied.[8]

to be an important area to demonstrate student competencies, it may be worth considering whether unseen texts should be included in order to reduce predictability and to provide a clear opportunity for candidates to demonstrate literary analysis skills such as the ability to recognise the use and effectiveness of literary devices beyond what is directly studied (and could potentially be memorised) in class, although this was not a common concern raised by teachers or students in the stakeholder engagement.

6.1.3 Assessment objectives

Assessment objectives, expressed as 'testing competencies' are articulated for each externally assessed section in the CBSE Standard X as follows:

7

Pearson Edexcel GCSE English Literature syllabus page 17. Published by: Pearson. Available at <https://qualifications.pearson.com/en/qualifications/edexcel-gcses/english-literature-2015.html>

8

A full list of poems can be found in Appendix 3 of the Pearson Edexcel GCSE English Literature syllabus. Published by: Pearson. Available at < https://qualifications.pearson.com/en/qualifications/edexcel-gcses/english-literature-2015.html>

Exam paper sections and target competencies

Sections	Competencies	Total marks	% weightage
Reading Comprehension	Conceptual understanding, decoding, analysing, inferring, interpreting and vocabulary	20	25%
Writing Skill and Grammar	Creative expression of an opinion, reasoning, justify, illustrating, appropriacy of style and tone, using appropriate format and fluency, applying conventions, using integrated structures with accuracy and fluency.	30	37.5%
Literature Textbook and Supplementary Reading Text	Recalling, reasoning, appreciating, applying literary conventions extrapolating, illustrating and justifying etc. Extracting relevant information, identifying the central theme and subthemes, understanding the writer's message and writing fluently.	30	37.5%
Total		**80**	

It is less easy to compare assessment objectives across the other qualifications as the qualification purposes vary (e.g. the GCSE English Literature does not have a particular focus on language acquisition across the four skills as in the Estonian qualification), although Table 19 at the top of this section provides an overview of the similar competences covered across the four qualifications, indicating some degree of overlap.

6.1.4 Assessment methods and format

This section will focus on the similarities and differences between assessment formats in the qualifications.

In both Standard IX and X, students have an annual examination and internal assessment. The annual examination in Standard X, worth 80 marks and equivalent to 80% relative weighting, focusses on:

- Reading skills
- Writing skills with grammar
- Literature textbook and supplementary reading text.

20 marks (20% relative weighting) are derived from internal assessment focusing on listening and speaking activities.

The table below shows the external assessment format of the different qualifications:

Table 25: Assessment format and structure of the case study qualifications

	CBSE	Estonia	IGCSE English as second Language	GCSE English Literature
Reading	✓	✓	✓	✓
Writing	✓	✓	✓	✓
Listening		✓	✓	
Speaking		✓	✓	
Literary Analysis/Critique	✓			✓
Duration of examination	3 hours (plus internal assessment)	Writing – 90 mins Listening – 40 mins Reading – 90 mins Speaking – 15 mins	Reading & Writing – 2 hours Listening – approx. 50 mins Speaking – 10-15 mins	1 hr 45 mins (component 1) 2 hrs 15 mins (component 2) = 4 hours total
Grading	0-100% with a pass mark of 33%	0-100% B1 awarded when the total grade is 50-74% B2 awarded when the total grade is 75-100% Award of B1/B2 is conditional on no subskill being at 0 points	A*-U (A* highest, G lowest, U as ungraded)	9-1 (9 highest)
Marks available	Reading – 20 marks Writing & Grammar – 30 marks Literature – 30 marks	Writing – 25 marks Listening – 25 marks Reading – 30 marks Speaking – 20 marks = 100 marks	Reading & Writing- 80 marks Listening – 40 marks Speaking – 30 marks = 150 marks	80 marks (component 1) 80 marks (component 2) = 160 marks

The IGCSE and the Estonian state examination test all four skills: reading, writing, listening, and speaking in external examinations. Listening and speaking skills are not reflected in course aims for the GCSE English Literature examination. In the other qualifications, both skills are heavily weighted, constituting 45% of the Estonian state examination and over 45% of the IGCSE. In international English language tests, also, listening and speaking are typically equally or almost equally weighted with reading and writing skills.[9] For CBSE Standard X, in contrast, speaking and listening form part of the internal assessment only.

It may be worth CBSE revisiting this: best practice would see the assessment reflecting and being driven by the overall course aims. For the CBSE both listening and speaking seem to be strongly valued as highlighted in the outcomes below (noting that some of these apply also to writing, e.g. building competence in the different registers of English). It is interesting to see how prevalent speaking and listening are, which seems to translate to the assessment format less well given that they are assessed only internally and in a non-standardised manner:

Table 23: Content coverage across international case studies

Standard X English Language and Literature

The general objectives at this stage are to:

- **Build greater confidence and proficiency in oral and written communications**
- Develop the ability and knowledge required in order to engage in independent reflection and inquiry
- **Use appropriate English to communicate in various social settings**
- **Equip learners with essential language skills to question and to articulate their point of view**
- **Build competence in the different registers of English**
- Develop sensitivity to, and appreciation of, other varieties of English, like Indian English, and the culture they reflect
- Enable the learner to access knowledge and information through reference skills (consulting a dictionary / thesaurus, library, internet, etc.)
- Develop curiosity and creativity through extensive reading
- Facilitate self-learning to enable them to become independent learners
- Review, organise and edit their own work and work done by peers
- Build listening and speaking into the curriculum

At the end of this stage, learners will be able to do the following:

- **Give a brief oral description of events/incidents of topical interest**
- **Retell the contents of authentic audio texts (weather reports, public announcements, simple advertisements, short interviews, etc.)**

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See e.g. IELTs General Training. Published by: IELTS. Available at <https://www.ielts.org/about-the-test/test-format>; Pearson PTE Academic. Published by: Pearson. Available at <https://pearsonpte.com/the-test/format/>

- **Participate in conversations, discussions, etc., on topics of mutual interest in non-classroom situations**
- **Narrate the story depicted pictorially or in any other non-verbal mode**
- Respond in writing to business letters, official communications email etc.
- Read and identify the main points / significant details of texts like scripts of audio-video interviews, discussions, debates, etc.
- Write without prior preparation on a given topic and be able to defend or explain the position taken / views expressed in the form of article, speech, or a debate
- Write a summary of short lectures on familiar topics by making / taking notes
- Write an assessment of different points of view expressed in a discussion / debate
- Read poems effectively (with proper rhythm and intonation)
- Transcode information from a graph / chart to a description / report and write a dialogue, short story or report

In contrast, all of the case study qualifications, which include spoken communication or receptive understanding of audio texts as an aim or objective, include them in their formal assessment. The GCSE English literature does not assess speaking or listening; but nor do they appear in overall course aims.

It may be worth CBSE considering the washback effect here: if speaking and listening do not form a part of standardised formal assessment, and if teachers have such freedom to assess them as indicated in the syllabus, it may be that these two skills are seen as having less importance and less value placed on them and development of these skills may be less a focus in class (as was seen in observed classes where the majority of student-student interaction was not undertaken in English). In 1-2-1 interviews in particular, stakeholder engagement indicated that the ASL (assessment of speaking and listening) component was well received, suggesting that teachers saw value in developing those skills in students. One option may be to standardise the internal assessment more to ensure that students are assessed in a similar way on these skills and to integrate some external monitoring (e.g. to externally verify or second mark a sample of internal assessment). The other may be to opt to integrate speaking and listening testing into the formal assessment in the examination itself.

6.1.4.1 Volume of assessment

Exam durations are broadly comparable between the CBSE and the IGCSE at around three hours, although the GCSE and the Estonian examinations are nearer four hours in duration. As reviewed in more detail below in item analysis, the allocated marks for the literature questions in the GCSE are considerably more than in the CBSE, with the CBSE typically awarding 8-10 marks, and the GCSE awarding 20-40 marks. As noted above, the CBSE is the only qualification with internal assessment.

6.1.4.2 Exam paper structure

Exam paper structures vary, although, in contrast to the maths and science qualifications, it is important to recognise the quite varying contexts and purposes of the qualifications. The GCSE in English literature is comprised of extended questions, worth a minimum of 20 marks. No short answer questions are included. The IGCSE, Estonian state examination and CBSE are composed of a wider range of item types.

In the IGCSE, some skills are integrated, so for example, reading and writing are combined into the Reading and Writing Extended Paper. In this, candidates have short answer, matching, note-taking, and an extended (150-200 word) response questions. In the Listening Extended Paper, they are expected to give short answer responses, complete gap fills,

and respond to matching and multiple-choice questions. In the speaking test, they have a 'ong turn' where they have a conversation (non-assessed) as a 2-3 minute 'warm-up'; followed by an assessed 6-9-minute conversation based on a speaking test card that they have 2-3 minutes to prepare for.

In the Estonian state examination, the test is structured across the four skills with one paper for each skill (writing, reading, listening and speaking). In the writing paper students write a 120-word and a 200-word extended response question; the first is typically a semi-official letter and the second is typically an essay or a report. In the listening paper, students answer a range of short answer questions including multiple-choice, gap fills, and matching. In the reading paper, similarly, short answer questions are used including marching, multiple-choice, gap fills, word formation (morphology) tasks, or error correction tasks. In the speaking paper, students are expected to describe some pictures, give a monologue on a topic (provided in the assessment), and then hold a conversation with the examiner.

The CBSE is, as mentioned above, structured in three sections. In Section A Reading, students have a number of short answer responses on two texts (multiple-choice, gap fill and true/false). For the second reading texts responses may be a little longer - in 2.1, for example, students need to respond in 30-40 words each, though it should be noted that these responses can be directly copied from the input text so no true test of productive skills is covered here. Section B Writing & Grammar includes some extended response questions (100-150 words) with optionality. The first output text is a formal letter or article. The second is a creative writing piece – either to complete a story stem or to use a photo as a cue for a creative piece. This is followed by some gap-fill grammar-based questions, an error correction task, and some reordering questions aimed at testing understanding of sentence structure. Section C is a literature focus. In the first section (with optionality) students are given an extract from a poem studied in class, and need to answer short questions- some are recall questions (e.g. the poet's name), others focus more on the language of the poem ('the phrase 'lurking in the shadow' here means…?). Question 9 is based on set texts and candidates need to respond to 5 out of 6 texts in 30-40 words each. The final questions are more extended (100-150 words) and based on the literature studied in class.

Generally, the stakeholder engagement did not reveal any clear trends regarding potential changes to content, although some further integration of grammar was suggested, with the majority of feedback indicating that content was considered to be appropriate.

6.1.4.3 Question types

The table below summarises the different question types used across the examinations:

Table 27: Question types in the case study qualifications

	CBSE	Estonia	IGCSE English as second Language	GCSE English Literature
Multiple-choice	✓	✓		
True/False	✓			
Gap fill	✓	✓	✓	
Matching		✓	✓	
Error correction	✓	✓		
Word formation		✓		
Short Answer	✓		✓	
Extended question (c.100-250 words)	✓	✓	✓	
Very extended question (likely output more than 250 words)	✓	✓	✓	✓ (20-40 marks)
Monologue/Presentation (spoken production)		✓		
Conversation/Discussion (spoken interaction)		✓	✓	

There is a significant degree of overlap across the qualifications, with most using short objective questions (multiple-choice, true/false, gap fill, matching) question types for receptive skills, reflecting the generally comprehension-based focus of these items. Longer and extended items are more typically associated with productive skills, with candidates expected to demonstrate their ability to engage in long turns which provide scope to test their abilities to develop their points and ideas. It should be noted that the comparable literature qualification – the GCSE English Literature – includes very extended literature-based questions, typically worth 20-40 marks; not found in the CBSE Standard X literature section where literature-based questions are at most worth 8 marks. This may indicate a reduced opportunity to see coverage of competences in the CBSE although the typical demographic of the GCSE (native or highly proficient English speakers) may go some way to explaining these differences.

6.1.4.4 Question types and assessed skills and competences

The following sub-sections compare some of the different item types used across the case study qualifications and, additionally, across some of the international English language examinations. These have been divided into skills and typical question types:

- Writing
- Reading
- Listening
- Speaking
- Grammar-based questions
- Literature-based questions

The objective of this section is to consider the comparable competencies tested by different items and to highlight best practice where relevant.

Writing

Exemplar written production questions from the Estonian state examination, TOEFL iBT, and the CBSE are presented below. It is important to analyse productive skill questions in conjunction with an understanding of what the output will be marked for- for example, with the accompanying mark scheme, so these are also referred to below:

The first examples are from Section B of the CBSE Standard X examination 2019 SQP and the 2020 Set 1 papers taken from Section B: Writing & Grammar. The questions are worth 8 marks and include optionality.

Figure 48: Example 1: CBSE Standard X English Language and Literature SQP 2019 Question 3 - written production question

	Section B: Writing & Grammar	30 Marks
Q3)	You are Neha/Nihal Singh, Computer In-charge of Army Public School. Your school wishes to buy 20 computers and computer accessories from Apple Inc., Nehru Place, New Delhi. Draft a letter placing an order for the same. (100-150 words) OR The government has urged the people of India to realize the dream of 'Clean India'. Write an article describing the measures that people can take for a cleaner and greener India. You are Anju/Amit Kumar (100-150 words)	(8)

- In the 2020 Set 1 papers, students have the following questions:

Figure 48: Example 1b: CBSE Standard X English Language and Literature 2020 Set 1 paper, Question 3 - written production question

SECTION B – (Writing and Grammar) ***30 marks***

3. You are Mukesh/Manju living at 7/31, Kamla Nagar, Kanpur. There are many stray dogs in your colony. They chase vehicles, trouble strangers and sometimes bite the children. They are a nuisance. Write a letter of complaint to the Municipal Commissioner, Kanpur requesting him to instruct the concerned staff to take appropriate action. (100 – 150 words) *8*

OR

You are Sarita/Saurabh. Your school organised an adult literacy camp. Many people benefitted from it. You realised the importance of educating the adults. Write an article on 'Importance of Adult Education' for your school magazine in 100 – 150 words. *8*

In both the 2019 SQP and the 2020 Set 1 papers, both options allow for a similar word limit (100-150 words), and the expected output is similar in terms of sociolinguistic considerations (style, formality) given that for both papers one expected output is an article and one is a letter. It might be helpful in the second question option in the 2019 SQP to provide some context for the audience of the article, such as whether it is for a specific magazine or newspaper in order to support the student to tailor their response accordingly. This is presented more clearly in the 2020 Set 1 paper, which states that the student needs to write for their school magazine.

The first question in both papers requires candidates to produce a neutral-formal output and would test their abilities to use standard letter-writing conventions, such as addressing and salutations. Some technical lexis is likely to be required. In the 2019 SQP students will need to be able to use language related to computer accessories set within

an overall lexical set relating to technology. Technical language may be less of a requirement in the 2020 Set 1 paper. Both tasks have an authentic output reflecting a 'real-life' task- reflecting stakeholder feedback which, on the whole, considered real-life application to be a key feature of the English Standard X assessment. A range of structures and functions could potentially emerge, including modal verbs for requests (we/I would like), giving information, explaining, describing and requesting. Additionally, the 2020 Set 1 paper is likely to also include complaining as a function.

The mark scheme for the first questions appears as overleaf for the SQP 2019 and the 2020 Set 1 paper. The mark schemes have been placed side-by-side to allow for comparison. Blue shading indicates changes considered to have some impact on difference in marking across the papers.

Figure 49: Example 2: CBSE Standard X English Language and Literature Question 3 mark schemes

SQP 2019 mark scheme	2020 Set 1 paper mark scheme
Note: No marks to be awarded if only the format is given. Credit should be given to the candidate's creativity in presentation of the ideas, appropriate use of language and skills of reasoning. **Letter to place an order** **Word limit: 100-150 words** **Format: 1 mark (sender's address, 2. Date, 3. Receiver's address, 4. Subject heading, 5. Salutation, 6. Complimentary Close)** Content – 4 marks Expression – 3 marks (grammatical accuracy, appropriate words, spellings, coherence & relevance of ideas and style) Suggested Value Points – • Placing and (sic) order to Apple Inc. • Order detail with approval of quotation • Mentioning the accessories needed • Detail about the quantity • Delivery date • Mode of payment • [Any other relevant point to be given credit]	**Objective: To use an appropriate style and format to write a formal / an informal letter.** **Note: No marks are to be awarded if only the format is given. Credit should be given for the candidate's creativity in presenting his/her own ideas** Format – 1 mark (sender's address, 2. Date, 3. Receiver's address, 4. Subject heading, 5. Salutation, 6. Closing (complimentary close, signature, making proper paragraphs), vii. Enclosures (optional). Content – 4 marks Expression – 3 marks (coherence and relevance of ideas and style – 1 ½ marks. Grammatical accuracy, appropriate words and spellings – 1 ½ marks) Value points – • Problem: stray dogs a menace, a nuisance. Chase vehicles, trouble strangers / bite the children • Solution: urge local authorities / local NGO to take appropriate actions. Control increasing dog population; send dog catchers; immunization against rabies (any other related point);

It can be seen that there is a good degree of similarity across the two mark schemes. Nevertheless, the more specific breakdown in the award of points for expression in the 2020 Set 1 paper may better support examiners in allocating the 3 marks. The inclusion of an overall objective in the 2020 Set 1 paper may also provide a better understanding of the question expectations, although it may be of value to specifically decide whether a formal or informal letter is expected- it may be that formal/ neutral is more appropriate here. As the addressee is a Municipal Commissioner informal style may be less appropriate.

Potential competencies (as indicated by CEFR descriptors) tested by this letter question are as below:

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Note that the analysis tables throughout are informed by CEFR descriptors in the 2018 companion volume.

Table 28: Scope in the task to assess different competencies- some examples[10]

	Task area	Expectations at B1/B2	
Overall written production	Formal written output (letter)	Can write straightforward connected texts on a range of familiar subjects	Can write clear, detailed texts on a variety of subjects
Sociolinguistic appropriateness	'relevance of ideas and style' forms part of mark scheme and 1 mark allocated to format areas such as 'salutation' and 'complimentary close'	Aware of politeness conventions	Can express him/herself appropriately
Orthographic control	A letter of 120 words would require some specific structuring with mark scheme indicating points for coherence (through paragraphing/ use of greetings) and spelling, although noting that 120 words would not require a large number of different paragraphs.	Spelling, punctuation, layout can be generally understood	Follows standard layout and paragraphing conventions Reasonable accurate spelling and punctuation
Grammatical accuracy	Mark scheme indicates some of expression marks go towards grammatical accuracy	Uses grammar in more predictable situations 'reasonably accurately'	Shows a relatively high degree of grammatical control
General linguistic range	Marks awarded for 'appropriate words'	Has sufficient vocabulary to express him/herself on topics such as family, hobbies and interests, work, travel and current events	Has a sufficient range of language to be able to give clear descriptions, express viewpoints and develop arguments using some complex sentence forms to do so
Vocabulary control		Uses a wide range of simple vocabulary appropriately when talking about familiar topics	Lexical accuracy is generally high
Coherence	Marks awarded for 'coherence' in expression	Can form longer sentences and link them together…can make simple, logical paragraph breaks	Can produce text that is generally well-organised and coherent…can structure longer texts in clear, logical paragraphs

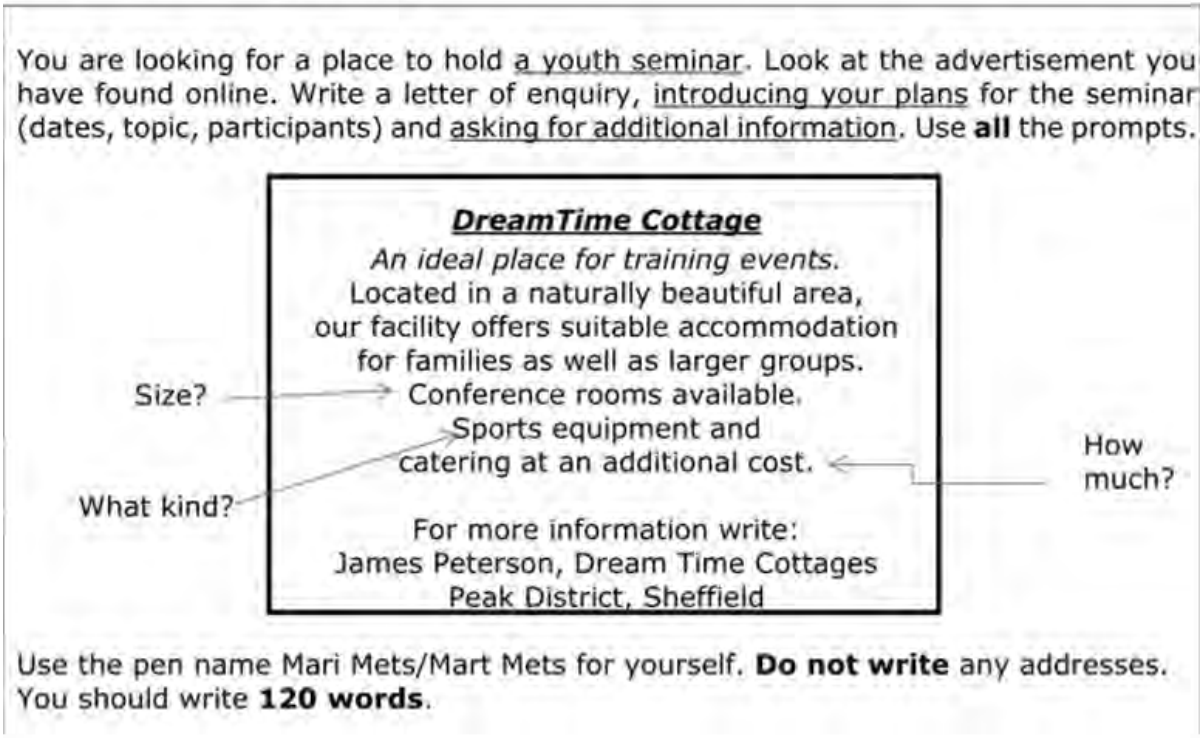
As can be seen from the table above, a number of competencies can potentially be covered by the task. The mark scheme construct for the CBSE question impacts, however, on the degree to which these competencies are rewarded. For example, there are only 4/8 marks allocated to non-content points in both the 2019 SQP and the 2020 Set 1 paper. Moreover, guidance for allocating these marks is unclear for examiners especially in the 2019 SQP mark scheme: with three marks available in total across grammatical accuracy, appropriate words, spellings, coherence & relevance of ideas and style, it is not clear on how those marks should be allocated or deducted; if, for example, the candidate is strong on grammatical accuracy, word choice, coherence, relevance of ideas and style but has poor spelling how many marks would be forfeited? This is clearer in the 2020 Set 1 paper.

Similarly, it may support students to provide more guidance in terms of content expectations. The mark scheme covers a range of potential content areas (delivery date, mode of payment, approval of quotation) and it may support task accessibility if some indication of potential content areas was provided, e.g. as bullet points. Care can be taken to ensure that these do not reduce the demand of the question but with content comprising such a high percentage of the marks it may increase the fairness of the question.

The following task is from the Estonian examination. Students need to write a letter of enquiry to a cottage owner based on the following rubric and details:

Figure 50: Example 3: Estonian state examination writing task exemplar- letter

Kirjutamisosa: kiri (*letter*)



The task requires a neutral-formal register ('a letter of enquiry'), with the audience and expected output clear ('letter of enquiry' to the cottage owner) and the input text acts as a stimulus: the text itself is not long, thus reducing the burden of reading. The output text has a recommended word count of 120 words. The task reflects authentic language use, and the input text itself reflects this authentic language in some of the reduced forms 'conference rooms available', a lexical set related to accommodation (facility; events; conference rooms; sports equipment; catering) including typical collocations ('additional cost'); ('suitable accommodation').

Content scaffolding is provided, telling students that they need to use 'all the prompts,' but also through the use of the input text which is short, and not placing a large receptive burden on the candidate in a productive task, it serves to provide a good level of context and some clear options in terms of areas to engage with. Likely successful candidate responses would reflect ability to structure the letter text type (e.g. a neutral-formal greeting; some introduction to the question, developing the questions, and a formal sign off). The rubric requiring candidates to introduce plans for the seminar indicates that they will need to use future forms for plans, as well as reference present tense in order to ask questions about the facilities. The 120-word limit indicates that candidates will need to develop and expand on their points. The task provides scope to test a range of specific language competences. The following table indicates some of these as an example:

Table 29: Scope in the task to assess different competencies- some examples

	Task area	Expectations at B1/B2	
Sociolinguistic appropriateness	Use of correct register for a letter of enquiry, awareness of audience	Aware of politeness conventions	Can express him/herself appropriately
Orthographic control	A letter of 120 words would require some specific structuring (e.g. greetings, paragraphing)	Spelling, punctuation, layout can be generally understood	Follows standard layout and paragraphing conventions Reasonable accurate spelling and punctuation
Coherence and Cohesion	Developing the letter from initial context (re: youth seminar), outlining the plans, and then to asking and extending the questions required in the prompt.	Can write in a connected series of points. Can write longer sentences and use cohesive devices	Produces generally well-organised and coherent text Uses a range of linking words and cohesive devices
Linguistic Range & Accuracy	The task allows for a range of structures (e.g. questions about present situations; explaining about future plans; fixed expressions such as 'Dear Sir', 'Yours sincerely'; the topic itself, although accessible, is relatively challenging (youth seminar) and would allow opportunity for successful candidates to produce some lexis related to conferences such as sessions/speakers/ delegates etc.	Can express him/herself on topics such as travel, interests. Has a good range of vocabulary for familiar topics/everyday situations. Communicates with reasonable accuracy.	Can give clear descriptions and develop arguments. Can use some complex sentence forms. Has a good range of vocabulary for most general topics. Can produce collocations in most contexts. Doesn't make mistakes which lead to misunderstandings.

The authentic nature of the task reflects real-life relevance of the assessment, as well as some potential minor links with interdisciplinary areas which may arise through the topic of youth engagement – likely to reflect some key contemporary issues which may manifest primarily through the use of vocabulary.

In contrast to the CBSE 2019 SQP question, the examination question from Estonia uses a mark scheme which more clearly indicates how marks should be allocated across different competencies: up to 6/9 marks are available on non-content areas and it should also be noted that 'task completion' includes not only content, but also the competences of organisation and coherence, indicating that competences are the main area assessed in this task beyond specific content points. Further support is provided to students regarding content, through rubric construct ('use all the prompts').

Figure 51: Example 4: Estonian state examination – mark scheme for letter writing task

Hindamisskaala: kiri

	Task Completion	Vocabulary	Grammar
3	All aspects of the task mentioned and expanded. Clear organisation (information grouped into paragraphs logically). Correct format.	Appropriate, task-specific vocabulary with a few slips. Appropriate tone and register. Correct spelling.	Grammatically correct, with a few slips. Complex sentences and structures correctly used. Punctuation mostly well managed.
2	All aspects of the task mentioned but only two or three aspects expanded. Organisation mostly logical. Mostly correct format (Salutation and/or sign-off inappropriate). Some irrelevant remarks.	Basic vocabulary well controlled but less common vocabulary faulty or lifted from the task. Tone and register mostly appropriate. Some spelling mistakes.	Basic grammar well controlled. Mistakes in complex sentences and structures. Several grammar and/or punctuation mistakes.
1	All aspects of the task mentioned but none expanded OR not all aspects mentioned. Organisation not logical. Faulty format (does not look like a letter; salutation and/or sign-off inappropriate). Significant amount of irrelevant information.	Vocabulary limited. Frequent incorrect use. Inappropriate tone and register. Vocabulary and spelling mistakes make comprehension problematic.	Limited range of grammar. Frequent incorrect use. Grammar and punctuation mistakes make comprehension problematic.
0	The task has been misunderstood. Fewer than 60 words.	Vocabulary and spelling mistakes make comprehension impossible.	Grammar and punctuation mistakes make comprehension impossible.
	Ignores the task. Plagiarised work.		

Although the questions are not so dissimilar – the word count output is similar, both require a formal letter, and both reflect real-life authentic situations –the mark scheme construct for the Estonian question provides a much clearer opportunity for students to be awarded for their linguistic competences through a greater apportion of marks on these areas in relation to content points and through the added scaffolding for the marker to understand how to allocate these marks. It is also noted that although in general terms the Estonian mark scheme covers only 'task completion'; 'vocabulary'; and 'grammar' when the descriptors are analysed, we can see that in fact, these are umbrella categories for many more competences (coherence, organisation, sociolinguistic features, vocabulary range control and accuracy, spelling, grammar range and accuracy and orthographic features).

A similar approach to competency-based recognition through mark scheme construct is used in the TOEFL iBT question overleaf (noting that this is the publically available version of the mark scheme).[11] In this question, candidates are expected to show a longer written output than either in the CBSE or the Estonian question (300 words), and the task itself requires a different output- a discursive essay.

11 TOEFL iBT Writing Practice Set 1. Published by: ETS TOEFL. Available at <https://www.ets.org/toefl/test-takers/ibt/prepare/tests/writing>.

Figure 52: Example 5: TOEFL iBT written production question

Writing Practice Set 2 (Independent): Question

Directions: Read the question below. Give yourself 30 minutes to plan, write, and revise your essay. Typically, an effective response will contain a minimum of 300 words.

Reading Time: 30 minutes

Question: Do you agree or disagree with the following statement?

> **Television advertising directed toward young children (aged two to five) should not be allowed.**

Use specific reasons and examples to support your answer.

Scaffolding is provided within the question – candidates are reminded to 'use specific reasons and examples' and are also given some guidance regarding their use of time. TOEFL provides information on what a good answer needs to include here; the blue annotations in the mark scheme below indicate some of the key competencies required for successful task completion:

- Task achievement
- Organisation
- Development
- Exemplification/supporting points
- Coherence
- Lexical and grammatical range including idiomaticity.

To support the marking of tasks that are open-ended such as this one, clearly articulated mark schemes are vital in order to ensure that marking is standardised and reliable across different sittings. This marking should also then be subject to a moderation process to ensure that a 'good' answer in one exam sitting is rewarded in the same way as a 'good' answer in another sitting. The accompanying marking rubric provides guidelines for how these competencies might look at different achievement levels. These have been annotated with a purple star:

Figure 53: Example 6: TOEFL mark scheme

SCORE	TASK DESCRIPTION
5	**An essay at this level largely accomplishes all of the following:** • Effectively addresses the topic and task • Is well organized and well developed, using clearly appropriate explanations, exemplifications and/or details ★ • Displays unity, progression and coherence • Displays consistent facility in the use of language, demonstrating syntactic variety, appropriate word choice and idiomaticity, though it may have minor lexical or grammatical errors
4	**An essay at this level largely accomplishes all of the following:** • Addresses the topic and task well, though some points may not be fully elaborated • Is generally well organized and well developed, using appropriate and sufficient explanations, exemplifications and/or details ★ • Displays unity, progression and coherence, though it may contain occasional redundancy, digression, or unclear connections • Displays facility in the use of language, demonstrating syntactic variety and range of vocabulary, though it will probably have occasional noticeable minor errors in structure, word form or use of idiomatic language that do not interfere with meaning
3	**An essay at this level is marked by one or more of the following:** • Addresses the topic and task using somewhat developed explanations, exemplifications and/or details ★ • Displays unity, progression and coherence, though connection of ideas may be occasionally obscured • May demonstrate inconsistent facility in sentence formation and word choice that may result in lack of clarity and occasionally obscure meaning • May display accurate but limited range of syntactic structures and vocabulary
2	**An essay at this level may reveal one or more of the following weaknesses:** • Limited development in response to the topic and task ★ • Inadequate organization or connection of ideas • Inappropriate or insufficient exemplifications, explanations or details to support or illustrate generalizations in response to the task • A noticeably inappropriate choice of words or word forms • An accumulation of errors in sentence structure and/or usage
1	**An essay at this level is seriously flawed by one or more of the following weaknesses:** ★ • Serious disorganization or underdevelopment • Little or no detail, or irrelevant specifics, or questionable responsiveness to the task • Serious and frequent errors in sentence structure or usage
0	**An essay at this level** merely copies words from the topic, rejects the topic, or is otherwise not connected to the topic, is written in a foreign language, consists of keystroke characters, or is blank.

So, for example, at the top-level band the candidate can write in a coherent way with clear progression between ideas. At the mid band, however, there is likely to be a less clear connection between some of the different ideas. At band 1, there is serious disorganisation. The scheme allows the candidates' abilities across these different competencies to be recognised and graded as 'to level' (e.g. 3 and above) or under level.

The descriptions in the mark scheme above link closely to CEFR descriptors on competencies such as those relating to thematic development, coherence and cohesion, linguistic range, vocabulary control, and grammatical control. As can be seen from the accompanying public domain mark scheme, candidate responses will be marked according to the different levels.

It can be seen from these two examples, then, that some best practice can be noted around rubric and mark schemes for written production tasks which may support improved testing of competences in the CBSE examination:

- Rubric can provide some support to students regarding content or approach and task expectations, without lowering question demand
- Apportioning more marks to competences over content indicates that these competencies are valued. This allows a greater emphasis to be placed on competency development which, in turn, is likely to have a positive washback effect in a classroom where teachers may then choose to focus more on developing students' linguistic competences
- A clearly articulated and standardised mark scheme (along with quality assurance mechanisms to support moderation) can support markers to assess more fairly and equitably; although this is clearer in the 2020 Set 1 paper, a more developed mark scheme across different achievement levels may support more consistent marking.

Reading

Reading skills are tested in Section A of the CBSE Standard X examination. In both the 2019 SQP and the 2020 Set 1 paper Question 2, for example, a text is provided and then students are expected to answer some comprehension questions followed by some questions about synonymy/antonymy.

Figure 54: Example 7: CBSE Standard X English Language and Literature reading question, 2019 SQP

Q2 Read the passage carefully-

The Road to Success

1. The Road to success is not straight; there is a curve called failure, a loop called confusion, speed bumps called friends, caution lights called family, and you will have flats called jobs. But, if you have a spare called determination, an engine called perseverance, insurance called faith, and a driver called God, you will make it to a place called success!

2. In spite of all our planning and preparation, unexpected challenges are certain to arise. The bumps in the road are unavoidable, but you'll never get to your destination if you aren't willing to drive over them. The difference between a disaster and triumph lies in whether or not you're prepared and willing to weather the storm. If you're ready, those bumps will become stepping-stones.

3. The key thing to realize is that working harder is same as working smarter. How do you work smarter? You just need to have the right skills. People want improved circumstances and better life without an improved self. They want victory without paying the price or making efforts. It really cannot happen without the other. Any improvements that have not been generated by improving yourself are superficial and short-lived. If you want to have a better future, you have to change yourself. Stop worrying about the various challenges that will come your way. Just believe in yourself and use them as stepping-stones.

Figure 54: Example 7: CBSE Standard X English Language and Literature reading question, 2019 SQP

4. "Success" is getting whatever you want out of life without violating the rights of others." It is not an accident. Success is the result of our attitude and our attitude is a choice. Hence success is a matter of choice and not chance. **5.** Today success represents a holistic and positive attitude to life. Attitude is everything. Success is not restricted within some kind of brick and mortar premises. It assumes the individuality of a complete act executed with perfection; material achievements do not define life. We don't remember sports stars for the products they endorse but the spirit of achievement they represent. In the abundance of positive attitude underline the grandeur of a truly rewarding rich life. **6**. Success can be measured from two standpoints—the external and the internal. Externally it is the measure of a job well done and recognition. Internally it the feeling of achievement and wholeness derived from the completion of a task or fulfillment of desire. 2.1 On the basis of your reading of the above extract, answer the following questions in 30-40 words each: (a) What qualities lead one to the place called success? (b) What is the difference between disaster and triumph? (c) How can one have a better future? (d) Describe two ways to measure success.	2x4=8

The text is quite abstract and complex and takes a metaphorical approach with the idea of success being a journey. This leads, at times, to some quite complex ideas as the metaphor is extended- for example 'if you have a spare called determination' is a complex concept taken out of context (and without the addition of the word 'tyre'. Some low-frequency lexis is included: 'insurance'; 'perseverance'; 'stepping stones'; 'triumph'; 'holistic'; 'abundance'; 'grandeur' making the text overall high demand. Complex structures serve to further increase demand,[12] such as extended conditional clauses 'the bumps in the road are unavoidable but you'll never get to your destination if you aren't willing to drive over them'; complex passive structures 'any improvements that have not been generated by improving yourself are superficial and short-lived,' and general complexity through abstractedness: 'success is not restricted within some kind of brick and mortar premises.' At first glance, then, this task appears to be high demand testing at an advanced level.

The 2020 Set 1 paper is of similar abstractedness and focuses on degrees of authority within families and argues for the value of listening to children's views and ideas. Linguistically the input text has less technical lexis than the 2019 SQP, but a number of low-frequency words occur: 'chaos'; 'grumbling'; 'promotes'; 'bonding'; 'preaching'; 'lull'; as well as expressions such as 'would do the trick'; 'order is restored'; 'to fall in line'. Structures are also high-level such as rhetorical questions: 'how then do we reach our children through all the conflicting views and make the voice of reason be heard?'; imperative structures with low-frequency verbs 'ensure that you keep some time aside for them, insist that they share their stories with you'; and the use of 'would' for past

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Note a typo in paragraph 6 which may impact on the student response 'internally it the feeling of achievement'.

tense to convey tradition or conventional behaviour in the past: 'twenty years ago, you would step out of home…'

Design in the questions, however, may lower demand unintentionally and reduce the validity; for example, in the 2019 SQP question candidates can use 'word spotting' to find the answers to Questions 2.1 a-d and then can copy directly from the text:

As can be seen from the mark scheme below, no

Figure 55: Example 8: CBSE Standard X English Language and Literature reading questions

2.1 On the basis of your reading of the above extract, answer the following questions in 30-40 words each:

(a) What qualities lead one to the place called success?
(b) What is the difference between disaster and triumph?
(c) How can one have a better future?
(d) Describe two ways to measure success.

3. The key thing to realize is that working harder is same as working smarter. How do you work smarter? You just need to have the right skills. People want improved circumstances and better life without an improved self. They want victory without paying the price or making efforts. It really cannot happen without the other. Any improvements that have not been generated by improving yourself are superficial and short-lived. If you want to have a better future, you have to change yourself. Stop worrying about the various challenges that will come your way. Just believe in yourself and use them as stepping-stones.

4. "Success" is getting whatever you want out of life without violating the rights of others." It is not an accident. Success is the result of our attitude and our attitude is a choice. Hence success is a matter of choice and not chance.

5. Today success represents a holistic and positive attitude to life. Attitude is everything. Success is not restricted within some kind of brick and mortar premises. It assumes the individuality of a complete act executed with

reformulation of the language is required, so this has become a 'copying' question and in this section, the student can gain up to 10% of the examination marks without really needing to understand the English in any depth, potentially giving a false representation of their proficiency level.

2.1	**Answer any four of the following questions in 30-40 words each.** **(a)** a spare called **determination**, an engine called **perseverance**, insurance called **faith,** and a driver called **God.** (b) The difference between a disaster and triumph lies in whether or not you're prepared and willing to weather the storm. If you're ready, those bumps will become stepping-stones. (c) If you want to have a better future, you have to change yourself. Stop worrying about the various challenges that will come your way. Just believe in yourself and use them as stepping-stones. (d) Success can be measured from two standpoints—the external and the internal. Externally it is the measure of a job well done and recognition. Internally it the feeling of achievement and wholeness derived from the completion of a task or fulfillment of desire	2X4=8

As can be seen from the mark scheme below, no reformulation of the language is required, so this has become a 'copying' question and in this section, the student can gain up to 10% of the examination marks without really needing to understand the English in any depth, potentially giving a false representation of their proficiency level.

In this question construct, reading competencies are not particularly well tested. The CEFR provides descriptors across the ability to comprehend an input text in general, reading for orientation, and reading for information and argument but the competencies within these are not tested, and students can bypass the competency and its associated language proficiency through exam technique.

The 2020 Set 1 papers reduce this opportunity to bypass complexity and is more demanding. Students would need to have a better understanding of the content to understand the question so the opportunity for word-spotting is reduced (e.g. they would need to understand that 'what then is the best path to take?' constitutes an introduction to advice-giving. Nevertheless, answers which include word-for-word copying still have the potential to receive full marks and do not require any reformulation by the students.

6. What then is the best path to take ? I would say the most important thing one can do is to listen. Listen to your children and their silences. Ensure that you keep some time aside for them, insist that they share their stories with you. Step into their world. It is not as complicated as it sounds; just a daily half an hour of quality time would do the trick.

(c) Which two pieces of advice does the writer give to the parents?

Ans. Listen to children and their silences / ensure that you keep some time aside for them / insist that they share their stories with you / step into their world / spend at least half an hour of quality time with children (any two).

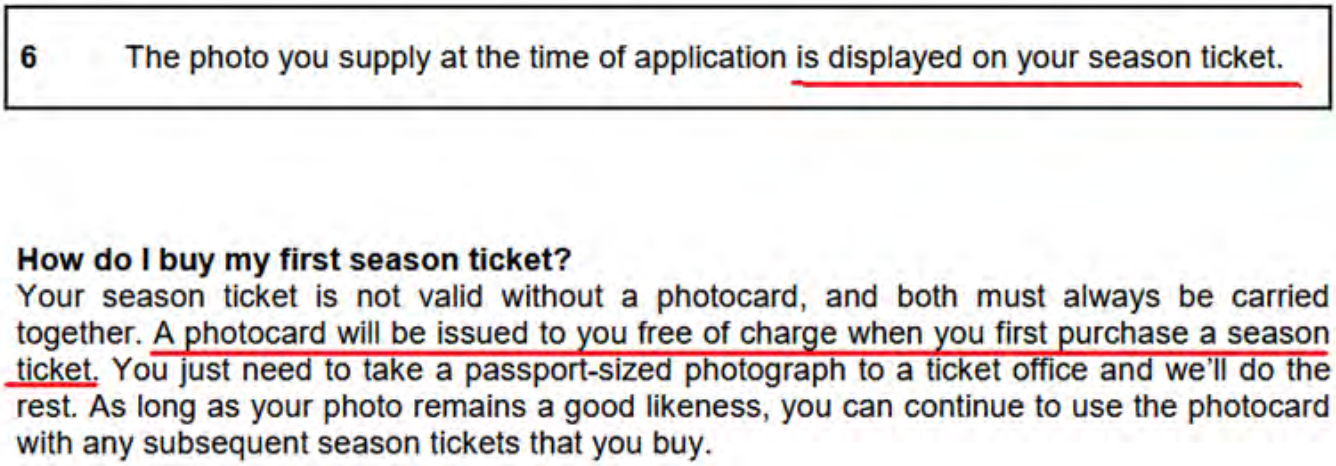
The addition of Question D in the 2020 Set 1 paper is also more demanding in comparison to that of the 2019 SQP, as it asks for students' opinions on the author's topic more explicitly; this provides more potential to identify students who have understood the overall meaning of the text. Given the value of this question type in testing true comprehension and engagement with the text, CBSE may wish to consider increasing the mark allocation for this question.

The question taken from the IELTS General Reading test, is constructed in a way which requires candidates to demonstrate their reading competences consistently, and may provide a useful reference point.[13] The extract input text 'How do I buy my first season ticket?' reflects real-life use; an information piece about rail season tickets, allowing for authentic English to be used. There are six True/False/Not Given statements based on the input text – Question 6 has been provided as an example ('the photo you supply at the time of application is displayed on your season ticket.')

13

Note that the annotations have been added by us in order to highlight the competency use, and would not appear annotated for candidates. See further IELTS Sample Test. Published by: IELTS. Available at <https://www.ielts.org/-/media/pdfs/pb-sample-test-materials/pb-sample-general-training-reading-tfng-task-and-key.ashx?la=en>..

Figure 56: Example 9: IELTS General Reading test- extract from exemplar question

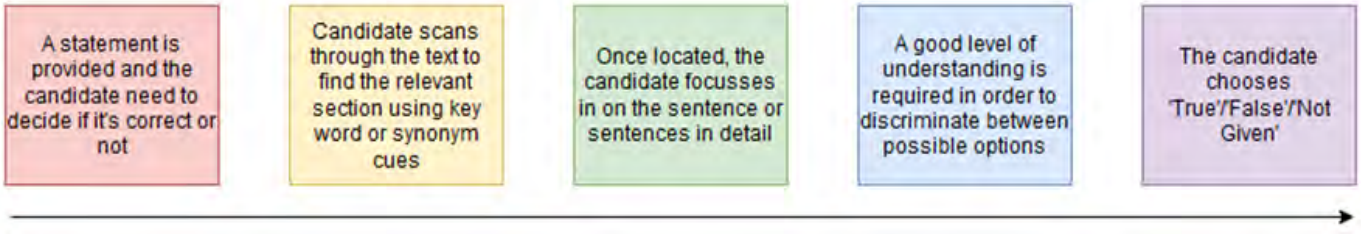


6 The photo you supply at the time of application is displayed on your season ticket.

How do I buy my first season ticket?

Your season ticket is not valid without a photocard, and both must always be carried together. A photocard will be issued to you free of charge when you first purchase a season ticket. You just need to take a passport-sized photograph to a ticket office and we'll do the rest. As long as your photo remains a good likeness, you can continue to use the photocard with any subsequent season tickets that you buy.

The candidates' abilities to read for detail are tested through the following cognitive processes:



A well-designed question testing the reading for detail competency requires candidates to engage at this close level; they should be unable to answer the question correctly without understanding the majority of the input. The question demand can vary for different proficiency levels according to the difficulty of input text, construct of the statements, whether reformulation (e.g. synonyms) are used, but in all cases, the aim is that the candidate needs to focus in detail on a specific part of the text. In Question 6 (which is false), for example, we can see the detail that the candidate will need to engage with (annotated above):

If a candidate does not follow the cognitive process correctly, either through a lack of proficiency or a lack of care, then he/she may note that a photo is included in the process and therefore take the sentence to be true. The correct answer requires more care to notice that the photo, although used and supplied at the time of application, is not on the season ticket, but on a separate card ('photocard'). Additionally, challenge is raised because the input text does not directly reflect the question statement- 'the photo is not displayed on your season ticket'. The more nuanced reference to a photocard means that candidates need to show some ability to infer here to understand that the photocard is an object which contains the photo submitted at time of application and is separate from the season ticket.

This question thus tests reading competences in a more valid way than the CBSE questions where students are able to find the right answer through word-spotting. Validity is increased further by the 'not given' option – so students or candidates of the IELTS question would need to choose between three possible options – true, false, or not given.

Multiple-choice questions

The CBSE paper also uses multiple-choice questions: it is common practice to use multiple-choice questions to test receptive skills, primarily to ensure that candidates have time to reflect their understanding of input texts which, at least in the case of listening, can pass by very quickly, and also to avoid testing the wrong skill (e.g. asking students to produce lengthy written answers when the aim is to test reading skills). For reading questions, multiple-choice questions allow candidates and students to demonstrate their skills in reading for detail or inferring meaning. Nevertheless, testing of these skills through the multiple-choice question type needs precise and careful question design- and the use of distractors, in particular - can make a significant impact on whether these subskills and competences are reliably and effectively tested.

In some of the CBSE questions reviewed, distractors are very easily disregarded. In Section A Question A, for example, students need to choose between four possible options:

Figure 57 Example 10: CBSE Standard X multiple-choice question, SQP 2019

On the basis of your reading of the passage given above, answer the following questions-

a. How many soldiers fought in the battle of Solferino on June 24?

i. 270,000 ii. 40,000 iii. 230,000 iv. 23,000

Two distractors (iii and iv), however, are easily eliminated, as the numbers do not appear anywhere in the text, reducing the validity of the question considerably. If these numbers cannot easily be integrated into the text, then a different question may be more appropriate. In Question C, too, it is relatively easy to eliminate option iv 'International Red Cross', as the question refers to a writer. Similarly, Question D Option iv can reasonably be eliminated from real-world knowledge not derived from the text itself.

In the 2020 Set 1 paper a similar situation occurs. In Question 1.1 of the 2020 Set 1 Paper only one option (Mohenjo-Daro) occurs in the text, making it easy to eliminate the other three.

Similarly, multiple-choice questions can become less valid when containing errors as in a more grammar-based question in the CBSE paper. For example, in Section B Question 5, one sentence appears to be unfinished (annotated overleaf in blue):

14

Pearson PTE Examination overview. Published by: Pearson. Available at <https://pearsonpte.com/>.

15

Pearson PTE Listening question. Published by: Pearson. Available at <https://www.examenglish.com/PTE/pte_academic_listening_1.htm>.

Figure 58: Example 11: CBSE English Language and Literature Section B Question 5

Q5) Complete the paragraph given below by filling in the blanks choosing the correct option from those that follow- 1x4=4

Elephants (a) _____ the largest land mammals. Three species of elephants (b) _____ living today. Elephants (c) _____other Elephantidae were once classified with other thick skinned . The elephant's gestation period is 22 months. (d) _____ longest for any land animal.

(a) (i) is (ii) are (iii) was (iv) were

(b) (i) are living (ii) have been living (iii) had been living (iv) will be living

(c) (i) with (ii) also (iii) and (iv) but

(d) (i) a (ii) an (iii) which (iv) the

Moreover, options provided in (b) are all technically wrong, as the word 'living' already appears in the text. It is recommended that papers are quality checked and carefully proofed to ensure that they provide a good quality model of English language to candidates and reduce the risk of misleading or reducing the fairness of the test.

It may be useful to consider a multiple-choice question from PTE Academic, the Pearson English Language Test, as a focus on valid distractor creation. PTE Academic is an international computer-delivered test which assesses reading, writing, listening and speaking.[14] The following task, taken from PTE Academic practice materials,[15] is a relatively short listening question, but tests a range of listening

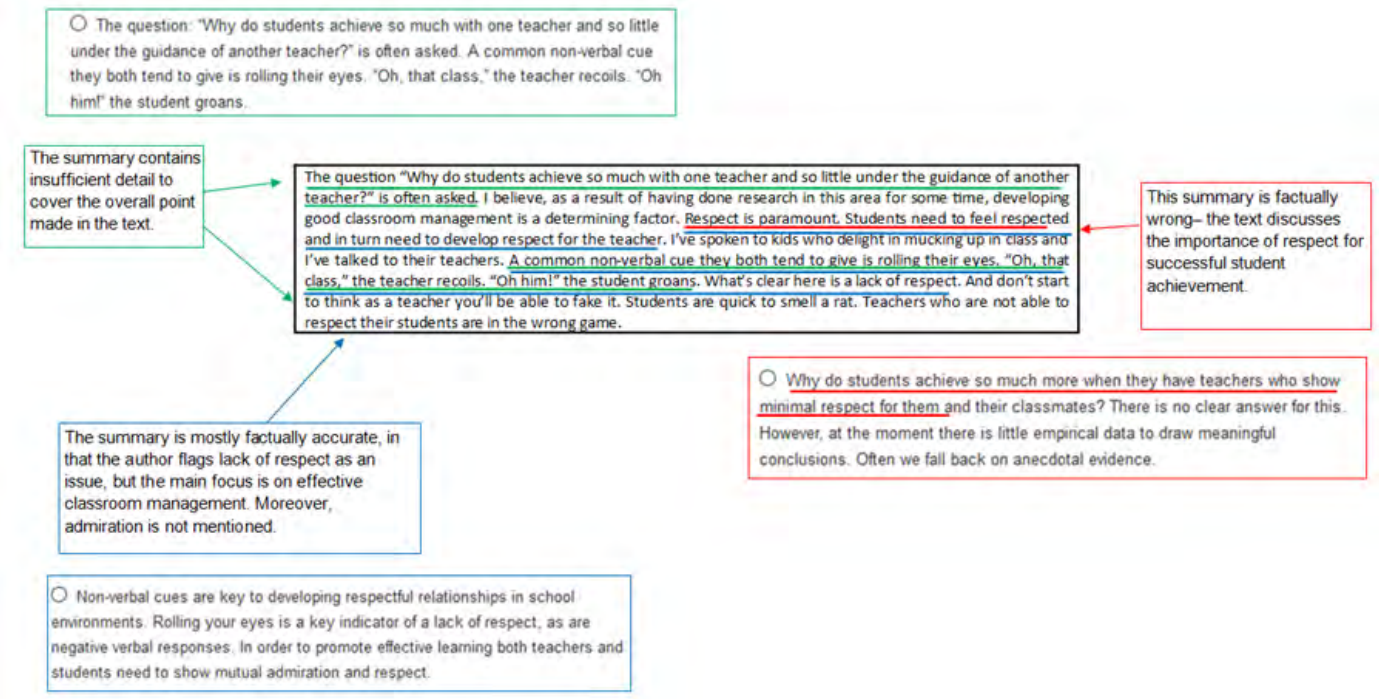
competences; candidates need to listen to the input text and then choose the correct summary of the text in a multiple-choice question:

Figure 59: Example 12: PTE Academic listening task. Listening transcript.

The question "Why do students achieve so much with one teacher and so little under the guidance of another teacher?" is often asked. I believe, as a result of having done research in this area for some time, developing good classroom management is a determining factor. Respect is paramount. Students need to feel respected and in turn need to develop respect for the teacher. I've spoken to kids who delight in mucking up in class and I've talked to their teachers. A common non-verbal cue they both tend to give is rolling their eyes. "Oh, that class," the teacher recoils. "Oh him!" the student groans. What's clear here is a lack of respect. And don't start to think as a teacher you'll be able to fake it. Students are quick to smell a rat. Teachers who are not able to respect their students are in the wrong game.

Three distractors are provided which are constructed in such a way to test candidates' abilities to listen for detail when deciding which option provides the best summary:

Figure 60: Example 13: PTE Academic: annotation of effective distractors for a listening text



So, the option in green above is incorrect because there is insufficient detail in it to cover the overall key points made by the text. The option in blue, although factually accurate, misses that the main focus in the text is on effective classroom management rather than on respect *per se* and admiration is not mentioned. The red option is factually incorrect.

The correct answer is this summary:

Figure 61: Example 14: PTE Academic listening task correct response

◉ Research indicates that students do better with one teacher than another as a result of good classroom management. A key feature of this is respect. Students quickly ascertain if a teacher lacks real respect.

As indicated in the comments within the annotations above, the options are similar and all have some basis in the text, raising demand, and reflecting the best practice idea that all distractors should be rooted in input texts. The correct answer, however, requires candidates to understand the main argument of the input text in full, testing not only competences to listen for detail but also competences in listening for information or argument and being able to understand how this can be reformulated in a summary.

Grammar or error correction-based questions

A number of examinations use grammar-based or error correction questions in order to ascertain candidate or student skills in accuracy of language use. One such question in the CBSE examination can be seen overleaf:

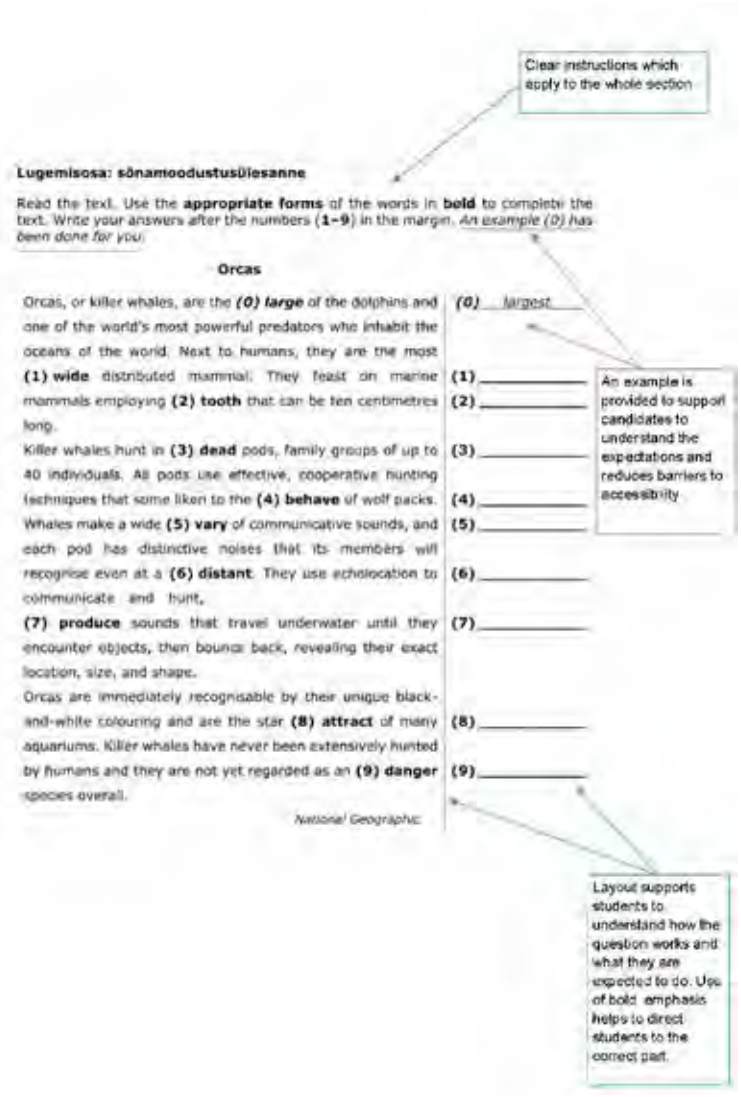
Figure 62: Example 15: CBSE English Language and Literature, Section B Question 6 error correction question

Q6)	The following paragraph has not been edited. There is one error in each line. Write the incorrect word and the correction in your answer sheet against the correct blank number. **Error Correction** Tsunami is a series in waves (a) _____ _____ generated in a body from water (b) _____ _____ through an impulsive disturbance (c) _____ _____ causing damage to property or loss of life. (d) _____ _____	1x4=4

The challenge with this question, however, is that there are some flaws in the construct, potentially reducing the overall validity. A few issues arise: the lack of cohesion across the paragraph makes it difficult to understand the overall meaning; as a result of this lack of contextualisation, it is challenging to identify where the errors may be – e.g. it is complex to recognise where the error might be in the fourth sentence, which as it stands is structurally correct. The mark scheme indicates that 'or' should be 'and', but this is not necessarily clear from the context (tsunamis may, in fact, cause damage to property and/or loss of life). In the first sentence, there is also scope to identify more than one error ('tsunami**s are**') which nonetheless does not resolve the subsequent 'a series in waves' which is identified in the mark scheme as being the error (a series of waves). Although it is easier in the 2020 Set 1 paper to identify the errors and correct them, the overall lack of contextualisation of the question makes it less valid. Furthermore, in line 1 again two errors can be identified – 'the girls' should omit the definite article as it refers to girls in general, and 'broke' should be the past participle form ('broken').

In contrast, the annotated 'error identification' question overleaf from the Estonian state examination may provide a useful model of how to ensure that appropriate scaffolding is provided to students to improve validity and accessibility to the question without reducing demand. It is worth noting that the text is longer, resulting in more errors to be corrected and increased cognitive demand, although this is tempered to some degree as the incorrect words are highlighted).

Figure 63: Example 16: Estonian state examination – error correction activity



Both the CBSE and the Estonia state examination questions test similar competences around grammatical accuracy and vocabulary control, as well as some reading competences, but the Estonian question is more accessible and with greater validity due to question design, construct, layout and scaffolding.

Speaking and listening

Speaking and listening form part of the internal assessment for the CBSE Standard X and falls to individual schools to decide how to test. Findings from stakeholder engagement indicate that the two skills are valued and that teachers include classroom activities to develop and assess these (such as using audio tapes, collaborative speaking activities) as well as forming part of extra-curricular activities. The Estonian state examination, the IGCSE, and the international English language examinations all test speaking and listening in external assessment. The GCSE English Literature does not include speaking or listening skills. The examples have been provided below in order to highlight how questions testing speaking and listening can also be competency-based.

Listening

The question below from the IGCSE[16] is a typical matching question, where candidates need to listen to different speakers' opinions and choose the matching option. The question includes a distractor (an additional letter which is not needed).

16

Cambridge International IGCSE. Published by: Cambridge International Examinations. June 2018, Question Paper 31. Available at <https://www.cambridgeinternational.org/Images/569411-june-2018-question-paper-31.pdf>.

Figure 64: Example 17: IGCSE Listening task exemplar- matching

Question 6

You will hear six people talking about what they think schools should teach young people about money. For each of speakers 1 to 6, choose from the list, **A** to **G**, which opinion each speaker expresses. Write the letter in the appropriate box. Use each letter only once. There is one extra letter which you do not need to use.

You will hear the recordings twice.

Speaker 1 ☐

Speaker 2 ☐

Speaker 3 ☐

Speaker 4 ☐

Speaker 5 ☐

Speaker 6 ☐

A It's essential for young people to understand the pros and cons of borrowing money.

B Young people find it hard to plan for the future – they should learn about that.

C Young people should be taught that you don't need to be rich to be happy.

D Young people need to be encouraged to save money.

E I think young people should learn what happens when you run out of money.

F Schools should teach young people to understand financial words and phrases.

G Young people should know what they need to earn in order to have a good standard of living.

[Total: 6]

Candidates need to listen to the input text and choose which speaker reflects the statement. One example is given below (this is the transcript of the audio text). The answer here is that Speaker 1 reflects the idea in statement F: 'schools should teach young people to understand financial words and phrases.'

Figure 65: Example 18: IGCSE listening task transcript

R1 **Speaker 1**

F, 30s

* When I was younger, I'd hear people talking about things like inflation, and the cost of living, and I just couldn't work out what they really meant. I think these economic terms could be explained in a really simple way, and that children would be much better prepared for the real world if they learned these things at school. That's so much more important than spending time discussing what you'd do if you had a million pounds, or the disadvantages of being rich, for example.

PAUSE 00'10"

The task tests candidates' ability to listen for detail and identify which speaker has which opinion. The inclusion of a distractor reduces the chance of a guess being correct. Listening competences are tested through question design: candidates scanning the statement 'financial words and phrases' will not be able to hear the equivalent in the input text; they will need to have a sufficient vocabulary range to understand that 'economic terms' or 'inflation' or 'cost of living' represent financial words and phrases. Moreover, in other parts of the transcript, other financial terms appear (e.g. 'debt' in Speaker 2; 'salary' by Speaker 5) so candidates will need to have a sufficient understanding of the wider context of Speaker 1's statements to recognise that the statement refers to the learning of these phrases in school. The table below provides some indication of some of the competencies that this task thus tests:

Table 30: Scope in the task to assess different competencies- some examples

	Task area	Expectations at B1/B2
Overall listening comprehension	**Candidates listen to six different speakers using different accents and providing different opinions**	Can follow extended speech and complex lines of argument provided the topic is reasonably familiar, and the direction of eh talk is sign-posted by explicit markers
Listen to audio media and recordings		Can understand most audio material delivered in the standard form of the language and can identify the speaker's mood, tone etc.
Identifying cues and inferring	**Eliminate options by listening carefully for detail**	Can use a variety of strategies to achieve comprehension, including listening for main points; checking comprehension using contextual cues.

Speaking

All students undergo a speaking assessment in the Estonian state examination. The task reproduced below reflects a typical 'monologue' question from the examination and the competences that it aims to test:

Figure 66: Example 19: Estonian state examination speaking task exemplar- monologue

Suuline osa: monoloogikaart

MONOLOGUE

Read the topic below and prepare to speak about it. Use the questions given to help to plan your monologue.

Some people say that more technology at home does not mean more free time.

Why do you think they say that? Do you agree? Give reasons.

The topic provides scope to test that students can engage with a specific area, use relevant lexis related to technology, leisure activities, and also give their opinions and justify their thoughts, providing an opportunity to demonstrate their ability to develop and signpost arguments and examples.

The accompanying mark scheme is articulated across five bands. The top band is reproduced below, and specific competencies are outlined across task completion, vocabulary, grammar, fluency and pronunciation, providing clear expectations of what students operating at different ability levels should be able to produce across the different competencies associated with a spoken production task:

Figure 67: Example 20: Estonian speaking mark scheme for the monologue task

Hindamisskaala: suuline osa

	Task completion	Vocabulary	Grammar	Fluency & pronunciation
5	Deals with the tasks effectively. Responds to all aspects of the tasks. Expresses his/her ideas and opinions with precision. Presents complex lines of argument convincingly.	Wide vocabulary. Has a good command of a broad range of vocabulary and can express him/herself clearly in an appropriate register without having to restrict what he/ she wants to say.	Excellent control of grammar. Maintains a high degree of grammatical accuracy. Errors are rare and occur in complex structures only.	Very fluent. Can express him/herself fluently and spontaneously, almost effortlessly. Appropriate pronunciation and intonation and only natural pauses.

The table below provides some examples of competencies likely to be tested within this question type based on the question design and mark scheme construct:

Table 31: Scope in the task to assess different competencies- some examples

	Task area	Expectations at B1/B2	
Spoken production	**The monologue will require students to speak for some time alone without the support of a second person**	Can reasonably fluently sustain a straightforward description, presenting it as a linear sequence of points	Can give clear, detailed descriptions, expanding and supporting ideas with subsidiary points and relevant examples
General linguistic range	**Students will need to speak at length within the topic of technology and leisure**	Sufficient vocabulary to express him/herself on topics such as hobbies, interests, current events	Has a sufficient range of language to express viewpoints and develop arguments using some complex sentence forms to do so
Thematic development	**Students need to state their argument ('do you agree?') and develop it ('give reasons)- the mark scheme indicates students will be rewarded for presenting 'complex lines of arguments convincingly'**	Can develop an argument well enough to be followed without difficulty most of the time (B1+)	Can develop a clear argument. Can evaluate the advantages and disadvantages of various options
Coherence	**Students need to present a clear argument and make sure that the listener can follow it by using cohesive devices ('expresses his/her opinions and ideas with precision')**	Can form longer sentences and link them together using a limited number of cohesive devices	Can provide text that is generally well-organised and coherent, using a range of linking words and cohesive devices
Propositional precision	**Students need to make their own opinion clear**	Can express the main point he/she wants to make	Can communicate the essential points even in more demanding situations

Students will have scope in this question to demonstrate their understanding not only of the language aspects of this topic (e.g. technology lexis / free time lexis) but the washback from tasks like these may also result in students developing skills in making a point and sustaining their arguments; skills that apply beyond the foreign language context.

The following task is an example of a typical spoken interaction task in the 'count-in' speaking of the IGCSE. The candidates are given an unseen topic and some prompts to support the discussion which they will have with the examiner. The prompts indicate a wide variety of linguistic options in terms of tense, lexis and structures.

Figure 68: Example 21: IGCSE Speaking task exemplar- conversation

B Learning from mistakes

We all make mistakes in our lives and can learn from them.

Discuss this topic with the examiner.

Use the following prompts, in the order given below, to develop the conversation:

- what you have learned from making mistakes
- how you would help someone else to learn from a mistake
- whether students should judge their own work, rather than teachers correcting everything
- jobs or situations where it is very important not to make mistakes, and why
- the view that progress is only possible if people are free to experiment and make mistakes.

You may introduce **related** ideas of your own to expand on these prompts.

Remember, you are not allowed to make any written notes.

The mark scheme covers a range of competencies within structure, vocabulary, development and fluency areas, and is detailed across 10 bands.[17]

17 Cambridge IGCSE Teachers' Notes. Published by: Cambridge International Examinations. Available at: <https://www.cambridgeinternational.org/Images/569419-june-2018-teachers-notes-51.pdf>.

Figure 69: Example 22: IGCSE mark scheme for speaking task

Give a mark out of 10 for each category (structure, vocabulary, development and fluency), and then add these marks to give an overall total out of 30.

Mark	Structure	Vocabulary	Development and Fluency
9–10	The candidate uses a range of structures accurately and consistently, and is confidently in control of the structures used.	The candidate uses a sufficient range of vocabulary to respond with precision. Shades of meaning are achieved and some sophisticated ideas are communicated.	The candidate shows sustained ability to maintain a conversation (and contribute) at some length. The candidate responds to a change of direction in the conversation, demonstrating the ability to expand and develop the topic and contribute original ideas. Pronunciation and intonation are clear.
7–8	The candidate uses a range of structures that are generally accurate (and used) with some confidence. Errors will occur when attempting to use more complex sentences.	The candidate uses a sufficient range of vocabulary to convey information and ideas with competence and some confidence.	The candidate maintains a competent conversation, responding relevantly and at length, using some original ideas. Frequent prompting is unnecessary. Pronunciation and intonation are generally clear.
5–6	The candidate uses simple structures securely, but has difficulty venturing beyond them.	The candidate uses a sufficient range of vocabulary to convey simple ideas and information clearly, but not entirely successfully.	The candidate makes an attempt to respond to questions and prompts. Effort is needed to develop the conversation which will not be entirely successful. Pronunciation and intonation are not always clear, but the candidate can be understood.
3–4	The candidate uses very simple, limited structures with errors which restrict communication.	The candidate uses a restricted range of vocabulary and has difficulty in conveying simple ideas. There is likely to be hesitation, repetition and searching for words.	The candidate has to be encouraged to go beyond responses which are brief and widely spaced. The candidate struggles to develop a conversation. Pronunciation and intonation cause some communication difficulty.
1–2	The candidate attempts a response, but rarely achieves communication.	The candidate has insufficient vocabulary to convey even simple ideas.	The candidate's responses are so brief that little is communicated. Pronunciation and intonation patterns cause difficulty for even the most sympathetic listener.
0	No response.	No response.	No response.

Based on the task and the mark scheme, we can see that the task provides an opportunity to test across a number of different competencies related to spoken interaction.

Table 32: Scope in the task to assess different competencies- some examples

	Task area	Expectations at B1/B2
General linguistic range	Candidates will need to outline their own stances (e.g. content point to discuss the view that progress is only possible if people are free to experiment) and to engage with different ideas	Can give clear descriptions, express viewpoints, develop arguments
Grammatical accuracy	Accuracy forms part of the mark scheme and at this level it would not be expected for errors to impede understanding	Shows a relatively high degree of grammatical control. Does not make mistakes which lead to misunderstanding
Flexibility	The conversational/discussion nature of the task means that the interaction is organic and will require the candidate to demonstrate responsiveness and flexibility	Can adjust to the changes of direction, style and emphasis normally found in conversation. Can reformulate an idea to emphasise or explain a point.
Thematic development	Candidates will need to expand their views and provide examples	Can evaluate the advantages and disadvantages of various options.
Phonological Control	Candidates will need to be able to use a range of phonology e.g. intonation, sound articulation, stress, in order to be understood by the examiner	Can generally use appropriate intonation, place stress correctly and articulate individual sounds clearly

The task provides clear scope to test a range of speaking competences and the construct prevents predictability: candidates may be able to prepare for the task type, but the unknown topics and the interaction patterns mean that candidates will need to respond to unexpected turns in the conversation and to be able to express themselves on a topic that they have not explicitly prepared for.

Literature

A number of literature-based questions appear in the CBSE examination, particularly in Section C. The below is one such question:

Figure 70: Example 23: Exemplar CBSE literature question

	Section C - Literature	30 Marks
Q8	Read the extract given below and answer the questions that follow. "He should be lurking in shadow, Sliding through long grass Near the water hole Where plump deer pass." a. The poem, "A Tiger in the Zoo" is written by (i) Leslie Norris (ii) William Blake (iii) Peter Niblett(iv) Robert Frost b. The tiger should be lurking in the shadow (i) for his prey (ii) for taking rest (iii) for leisure (iv) for scaring others c. The deer frequents the water hole to _____ d. The phrase 'lurking in the shadow' here means _____	1x4=4

The question includes optionality (e.g. Q8 has two different extracts and questions; students can choose which one to answer). The question is worth 4 marks and focusses on a text that students are familiar with and have read in class. The question is formed of an extract from the text (in this case a poem) and a number of objective questions: two multiple-choice questions, and two short answer questions.

For the first question, candidates need to demonstrate recall and remember the poet's name. This is the same in the 2020 Set 1 paper, for Question 8c. The other questions require some engagement with the poem. Question 8b in the 2019 SQP, for example, requires the student to understand that the tiger's position and his lurking in the grass is likely to indicate that he is hunting. Question 8d requires students to understand that 'lurking in the shadow' means that the tiger is hidden, and students would need some understanding of the low-frequency verb 'lurking' for this. It should be noted that the answer for Question 8c given in the mark scheme does not fit structurally – the Question option 'the deer frequents the water hole to….' should be completed with an infinitive (e.g. 'drink water') rather than the mark scheme answer 'for drinking water.' In this question, some basic engagement with imagery and poetic language is tested. In the 2020 Set 1 paper some of the questions also require some understanding of poetic language, with the lady's hair being compared to ramparts (Question 8a).

Both the 2019 SQP and the 2020 Set 1 papers include some longer answer questions, requiring open responses of 100-150 words. Again, optionality is included, and the questions relate to set texts.

Figure 71: Example 24: CBSE Standard X English language and literature mark scheme

	SECTION C (Literature)	**30**
	General Instructions: This section is meant to test the student's familiarity with and appreciation of the recommended texts. However, if the faulty expression prevents clear communication ½ mark may be deducted.	
8	**Read the extract given below and answer the questions that follow –** a) (i) Leslie Norris b) (i) for his prey c) for drinking water d) stay hidden, not coming to the forefront	1x4=4

Figure 72: Example 25: CBSE Standard X English language and literature : questions on set texts, 2019 SQP

Q10	Lencho had faith in God but lacked faith in humanity. Elaborate with reference to 'A Letter to God'.(100-150 words) OR Life is full of trials and tribulations which can be overcome by a human being through his own efforts. Explain with reference to Kisa Gotami's life.(100-150 words)	8
Q11	Ostentation and vanity often land people in trouble. Matilda is an apt example of this. Justify.(100-150 words) OR Valli shows extraordinary courage in taking a bus journey all alone. Explain how ability and courage are essential to fulfill one's dream. (100-150 words)	8

The mark scheme indicates that the answers are content (4 marks) and expression (4 marks). Some key value points are provided to support the 'content' marks, although there is little indication of how to apportion expression marks. Examiners are reminded that there may be more than one correct answer, as long as textual evidence is provided.

Figure 73: Example 26: CBSE Standard X English language and literature: mark scheme, SQP 2019.

10	**These questions have been set to test the student's understanding of the text and their ability to interpret evaluate and respond to the themes/issues raised. Therefore, there can't be just one correct answer. All presentations logically supported by textual evidence must be considered correct.** **Content** = 4 **Expression** = 4 **Suggested Value Points:** Lencho- a simple person Started correspondence with God, immense faith, asked for money Received a lesser amount, blamed the post office employees Didn't realize the irony- they were the real helpers, who had contributed parts of their salary. Didn't act practically OR Kisa went from home to home , asked for mustard seeds- where no one had died, unsuccessful in getting any, distraught on the loss of her only son loses her senses, doesn't accept reality, ignorant of the fact that death is inevitable Lesson- humans are mortal, face pain and suffering, no use grieving	1x8=8

Review of some of the question construct here would support validity: for example, all options within Questions 9 and 10 all seem to focus on set texts. In both options for Question 10, it is clear that candidates are expected to refer to the set text ('elaborate/explain with reference to…'). In Question 11 the first question seems to imply reference to the text, with Matilda being highlighted as an example, so it seems that the candidates are expected to use the example of Matilda to demonstrate how ostentation and vanity may land people in trouble. This could be made clearer, however, with the addition of 'with reference to the text' as in Question 10. For the second option, however, this expectation is even less clear- 'explain how ability and courage are essential to fulfil one's dream' could plausibly be interpreted without any reference to the text.

Given the focus on content points and the limited explanation on how to mark for expression, it is less easy to understand which competencies are tested in Question 10. This is clearer in the 2020 Set 1 paper, where the mark scheme stipulates 4 marks for content, 2 marks for fluency, and 2 marks for grammatical accuracy.

Nevertheless, despite the increased clarity in the 2020 paper mark scheme, overall it may support candidates more if the expectations are more explicit here: for example, in the question below taken from the GCSE English literature sample assessment, the

green annotations that we have added highlight where it is made clear that the question is focussed on a set text,[18] whilst the purple annotations provide students with some indication of how marks are apportioned across different competences:

18 Edexcel GCSE (9-1) English Literature. Sample Assessment Materials. Published by: Pearson. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/English%20Literature/2015/specification-and-sample-assesment/English-A-SAM-Literature-Collation-WEB-ISBN9781446914380.pdf>.

Figure 74: Example 27: GCSE English literature question on set texts

SECTION B – Post-1914 Literature – British Play OR British Novel

Answer ONE question from this section, on EITHER a British Play OR a British Novel.

You should spend about 50 minutes on this section.

BRITISH PLAY

***An Inspector Calls:* J B Priestley**

Your response will be marked for the range of appropriate vocabulary and sentence structures, and accurate use of spelling and punctuation.

EITHER

7 **Sybil Birling:** *I must say, we **are** learning something tonight.*

Explore how learning from experience is important in the play.

You **must** refer to the context of the play in your answer.

(Total for Question 7 = 40 marks (includes 8 marks for the range of appropriate vocabulary and sentence structures, and accurate use of spelling and punctuation))

OR

8 **Sheila Birling:** *But these girls aren't cheap labour – they're **people**.*

In what ways is Eva Smith exploited in the play?

You **must** refer to the context of the play in your answer.

(Total for Question 8 = 40 marks (includes 8 marks for the range of appropriate vocabulary and sentence structures, and accurate use of spelling and punctuation))

A major difference in the GCSE is the weighting of marks: over 40 marks are apportioned to this example question, half of the total marks available for Paper 1. The specification indicates how the Assessment Objectives are covered across the paper – AO1, AO3 and AO4 are assessed in the question.

Figure 75: Example 28: GCSE English literature allocation of raw marks across assessment objectives

Paper 1 Mark scheme

The table below shows the number of raw marks allocated for each question in this mark scheme.

Component	Assessment Objectives				Total marks
	AO1	AO2	AO3	AO4	
Component 1: Shakespeare and Post-1914 Literature					
Questions 1a to 6a		20			20
Questions 1b to 6b	15		5		20
Question 7	16		16	8	40

Mark schemes provide further detail on mark allocation, and are designed on a per-question basis:

Figure 76: Example 29: GCSE English literature mark scheme

Question Number	Indicative content
7. An Inspector Calls	The indicative content is not prescriptive. Reward responses that consider how learning from experience is important in the play. Responses may include: Interpretation of text (AO1): • even when the Inspector's visit was thought to be a hoax, Sheila and Eric have learned from experience, e.g. '...That's what's important – and not whether a man is a police inspector or not.' • Gerald and Mr and Mrs Birling dismiss how they felt and so have not learned from the experience, e.g. 'But the whole thing's different now. Come, come, you can see that, can't you?' • Mrs Birling is relieved that nothing will go public, 'But I'd a special reason for not wanting a scandal just now.' • Sheila and Eric continue to learn. Sheila: 'You began to learn something. And now you've stopped.' • the play has a strong contrast between young and old when it comes to learning from experience, e.g. 'Everything we said had happened really had happened.' The young are thought by the older characters to be 'more impressionable' • the older characters revert to type and are concerned only that they are no longer facing Inspector Goole, rather than how a girl outside their class may or not have suffered.
	Relationship between text and context (AO3): • the play reflects a period when social mobility was very limited and this often led to ingrained attitudes, which could affect characters' ability to learn from experience • the play suggests that the rich are self-seeking and complacent; they feel no responsibility for the 'body' of society • the young learn from experience and finally understand the plight of Eva Smith, and those like her, hold the hopes for the future. Reward all valid points. Candidates will be rewarded if they make relevant textual references or use short quotations from the text. This includes relevant paraphrasing.

Figure 76: Example 29: GCSE English literature mark scheme

In responses to the following question for AO1, examiners should be aware of the different ways candidates may structure their responses. There should be sufficient evidence of a personal response and a critical style to meet the criteria for each level.

Level	Mark (32 marks)	Descriptor – Bullets 1 and 2– AO1 (16 marks), Bullets 3 and 4 – AO3 (16 marks)
	0	No rewardable material.
Level 1	1–6	• The response is simple with little personal response and little relevant supporting reference to the text. • There is little evidence of a critical style and little relevant supporting reference to the text. • Little awareness of relevant contexts is shown. • There is little comment on the relationship between text and context.
Level 2	7–12	• The response may be largely narrative but has some elements of personal response, there is some reference to the text without consistent or secure focus. • There is some evidence of a critical style there is some reference to the text without consistent or secure focus. • Some awareness of relevant contexts is shown. • There is some comment on the relationship between text and context.
Level 3	13–19	• The response shows a relevant personal response, soundly related to the text with focused supporting textual references. • There is an appropriate critical style, with comments showing a sound interpretation with focused supporting textual references. • Sound comment is offered on relevant contexts. • There is relevant comment on the relationship between text and context.
Level 4	20–26	• The response has a developed personal response and thorough engagement, fully related to the text with well-chosen references to the text. • The critical style is sustained and there is well-developed interpretation with well-chosen references to the text. • Sustained comment is offered on relevant contexts. • There is detailed awareness of the relationship between text and context.
Level 5	27–32	• There is an assured personal response, showing a high level of engagement with the text and discerning choice of references to the text. • A critical style is developed with maturity, perceptive understanding and interpretation with discerning choice of references to the text. • The understanding of relevant contexts is excellent. • Understanding of the relationship between text and context is integrated convincingly into the response.

With AO4 having a more general mark scheme applicable across all questions.

Figure 77: Example 30: GCSE English Literature overall mark scheme for AO4

AO4 Mark Scheme		
Use for ALL Questions in Paper 1 – Section B (British Play OR British Novel)		
Level	Mark	
	0	No rewardable material.
Level 1	1–2	**threshold performance**-in the context of the Level of Demand of the question, Learners spell and punctuate with reasonable accuracy, and use a reasonable range of vocabulary and sentence structures; any errors do not hinder meaning in the response;
Level 2	3–5	**intermediate performance**-in the context of the Level of Demand of the question, Learners spell and punctuate with considerable accuracy, and use a considerable range of vocabulary and sentence structures to achieve general control of meaning;
Level 3	6-8	**high performance**-in the context of the Level of Demand of the question, Learners spell and punctuate with consistent accuracy, and consistently use vocabulary and sentence structures to achieve effective control of meaning.

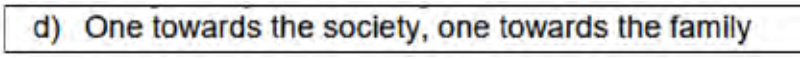
It may also useful to look at the use of command words in some of the literature questions. Command words in questions are critical in terms of conveying what expectations are and what candidates need to do to respond successfully. At times in the reviewed CBSE paper, particularly in the literature section (Section C), these command words may benefit from revision to ensure that they correspond with the intended outcome. The table below provides an overview of the various command words used throughout the reviewed paper:

Table 34: Sample command words in CBSE English Language and Literature paper SQP 2019 and 2020 Set 1 paper

Paper reviewed	Explain	Elucidate	Elaborate	Justify
SQP 2019	Q9b 'Bholi was a neglected child. Explain.' Q11 'Valli shows extraordinary courage in taking a bus journey all alone. Explain how ability and courage are essential to fulfil one's dream.'	Q9d 'Nelson Mandela speaks of 'Twin Obligations'. Elucidate	Q10 'Lencho had faith in God but lacked faith in humanity. Elaborate with reference to 'A Letter to God.'	Q11 'Ostentation and vanity often land people in trouble. Matilda is an apt example of this. Justify.'
2020 Set 1 paper	Q11 'Discoveries of science can be used for the welfare of mankind as well as for its destruction. How is this applicable to Griffin's scientific discovery? Explain giving examples from the text.'		Q11 'Mme Forestier proved to be a true friend of the Loisels. Elaborate.'	Q10 'Valli was a mature girl and ahead of her age.' Justify the statement with instances from the text.'

For example, in the 2019 SQP, Question 9b and Question 11, the same command word ('explain') is used, but in Question 9 the expected outcome is less clear: is the student required to explain why Bholi was neglected, or why the statement has been made? 'Explain' in Question 11 attracts 8 marks, so presumably, some development of points is needed beyond the 'explain' in Question 9b worth 2 marks. In the 2020 Set 1 paper, the question could be improved by making it clear that students need to refer to the set text, as in the question about Valli and scientific discoveries. Further, in 2019 SQP Question 9d it is not immediately clear what needs 'elucidating' – is it the 'twin obligations', or why the candidate thinks Mandela speaks about them, or more detail about what these entail? On reference to the mark scheme, it seems that candidates are required just to note what these are.

Figure 78: Example 32: CBSE Standard X English language and literature mark scheme


d) One towards the society, one towards the family

Cambridge Assessment International Education provides an overview to support students in understanding what the different command words mean in their assessments, and what the expectations are within those. The following table replicates some of these, with the full list available on their website.[19]

Table 35: Definitions of command words, Cambridge Assessment International Education

Analyse	Examine in detail to show meaning, and identify elements and the relationship between them.
Explain	Set out purposes of reasons / make the relationships between things clear / say why and/or how and support with relevant evidence.
Justify	Support a case with evidence/argument.
Summarise	Choose and present the main points, without detail

It may be useful for CBSE to also do this at an overarching level to ensure that expectations on output across questions align, and also to make this information publically available to support teachers, students, and other stakeholders.

6.1.4.5 General points of comparison: consistency and accessibility of layout and appearance

Some more general observations may be valuable across the qualifications regarding the appearance of the examination paper, the clarity of the layout, and overall consistency. Review of the CBSE Standard X English Language and Literature assessment found a number

19 Cambridge Assessment International Education 'Understanding Command Words.' Published by: Cambridge Assessment International Education. Available at: <https://www.cambridgeinternational.org/exam-administration/what-to-expect-on-exams-day/command-words/ >.

of minor changes could be made to support overall accessibility through scaffolding which improves fairness (without reducing demand) through increased clarification of expectations and visual accessibility. Some of these are minor in isolation, but the accumulated effect of them may have a stronger impact on the overall fairness of the paper.

Consistency and clarity of question numbering

In the 2019 SQP it was noted that numbering conventions could be improved to help with accessibility:

Figure 79: Example 34: CBSE Standard X English Language and Literature Reading Question- multiple-choice, 2019 SQP

f. The aid provided by Dunant's volunteers during the battle of Solferino was:

I. to help bring water and food to the injured
II. to assist with medical treatment
III. to write a book
IV. to give relief in epidemic

(i) I and III (ii) III and IV (iii) I and II (iv) II and III

The use of roman numerals both as the answer and the options may cause some confusion or make the paper less user-friendly under pressured conditions. The options could be presented as letters instead (e.g. a) I and III b) III and IV.

A clearer numbering system may also be useful to support navigation- for example in the 2019 SQP Section A Reading, it may be preferable to renumber 2.1 and 2.2 to 2 and 3. This potential challenge may be compounded further by the inclusion of numbers within the input text itself, as candidates may think that the answers will be found within those numbered paragraphs:

Figure 80: Example 35: CBSE Standard X English Language and Literature Questions 2.1 and 2.2, 2019 SQP

	2.1 On the basis of your reading of the above extract, answer the following questions in 30-40 words each: (a) What qualities lead one to the place called success? (b) What is the difference between disaster and triumph? (c) How can one have a better future? (d) Describe two ways to measure success.	2x4=8
	2.2 On the basis of your reading of the above extract, answer the following: (a) The synonym of 'victory' as given in paragraph 2 is _____ (i) Planning (ii) Preparation (iii) Triumph (iv) Challenges (b) The synonym of 'surplus' as given in paragraph 5 is _____ (c) The antonym of 'Defeat' as given in paragraph 6 is _____ (i) Recognition (ii) Achievement (iii) Completion (iv) Success	1x4=4

Consistency of font

At points in the 2019 SQP paper different fonts are used: although this can support readability in a positive way, its use is inconsistent- thus, for example, the change of font is only seen in the multiple-choice options for Question 5 in Section B for the Writing and Grammar, but is not used in other multiple-choice options:

Figure 81: Example 36: CBSE Standard X English Language and Literature Question, 2019 SQP 5

Q5)	Complete the paragraph given below by filling in the blanks choosing the correct option from those that follow- Elephants (a) _____ the largest land mammals. Three species of elephants (b) _____ living today. Elephants (c) _____other Elephantidae were once classified with other thick skinned . The elephant's gestation period is 22 months, (d) _____ longest for any land animal. (a) (i) is (ii) are (iii) was (iv) were (b) (i) are living (ii) have been living (iii) had been living (iv) will be living	1x4=4

This was not found to be an issue in the 2020 Set 1 paper, however.

Clarity of expectations

At times, layout may impede understanding of task requirements. For example, the instructions in bold given at the top of Question 9 in the 2019 SQP may confuse students who may not recognise that they do not apply to Question 10 and Question 11.

Figure 82: Example 37: CBSE Standard X English Language and Literature Question 9, 2019 SQP

Q 9	**Answer any five of the following questions in 30 to 40 words each.** a. Why did Hari Singh think that Anil's job was queer? b. Bholi was a neglected child. Explain. c. Why did Mr.Keesing call Anne 'an incorrigible chatterbox'? d. Nelson Mandela speaks of 'Twin Obligations'. Elucidate e. Why did Belinda tickle the dragon? f. How is bread an important part of life in Goa?	2x5=10
Q10	Lencho had faith in God but lacked faith in humanity. Elaborate with reference to 'A Letter to God'.(100-150 words) OR Life is full of trials and tribulations which can be overcome by a human being through his own efforts. Explain with reference to Kisa Gotami's life.(100-150 words)	8
Q11	Ostentation and vanity often land people in trouble. Matilda is an apt example of this. Justify.(100-150 words) OR Valli shows extraordinary courage in taking a bus journey all alone. Explain how ability and courage are essential to fulfill one's dream. (100-150 words)	8

This was also mentioned by a student in a 1-2-1 interview who had, at times, been uncertain regarding what was required in a task, even though overall he/she was a high performer. This is improved in the 2020 Set 1 paper, however, where there is no overall bolding used. In general, though, across both papers reviewed it would better support student understanding of question expectations if the rubric is developed for each question, particularly where optionality is required. So, for example, at the top of Question 10, it may be useful to add a bold rubric stating that candidates need to answer either the question on Lencho or the question on trials and tribulations.

For Questions 9-11 in the CBS paper, it may be better to clearly demonstrate that these are separate questions by separating them and providing instructions at the top of each making the optionality clear. This is done more clearly in Question 4 of the 2019 SQP paper.

Use of images- 2019 SQP paper only

The visual acts as a stimulus for the task and so may be useful to ensure that the visual does not become distorted (e.g. in the case below, the visual needs a better horizontal:vertical ratio. It may also be useful to improve the resolution or overall clarity of the image chosen- for example, in the stimulus below it may not be immediately clear whether the image includes two men or a man and a woman.

Figure 83: Example 38: CBSE Standard X English Language and Literature Question 4 Story Writing

Taking cue from the picture given above, write a story in 150-200 words

This is particularly important as the mark scheme indicates that the picture is integral to the textual output:

Figure 84: Example 39: CBSE Standard X English Language and Literature mark scheme for Question 4

	OR **Word limit** : 150-200 words **Format** – 1 mark (Title) **Content** – 4 marks • The picture provided is an important part of the story. The students must	
	make sure that either the story revolves around the picture or the picture forms an intrinsic part of the story. • There must be clarity of plot, logical sequence of events, well defined characters and apt conclusion. **Expression** – 5 marks (creativity, grammatical accuracy, appropriate words, spellings, coherence & relevance, originality of ideas and style)	

Indicative timings

Given that the exam paper duration is quite long, (3 hours), and that students may struggle to keep to the timeframe, it may be helpful to provide indicative timings so that students spend long enough on the questions which will attract higher marks, and to recognise that their time needs to be split appropriately across the three sections of the examination paper. One student in a 1-2-1 interview commented that this had been particularly challenging, feeling that there was insufficient time allocated to such a range of questions.

Mark allocation

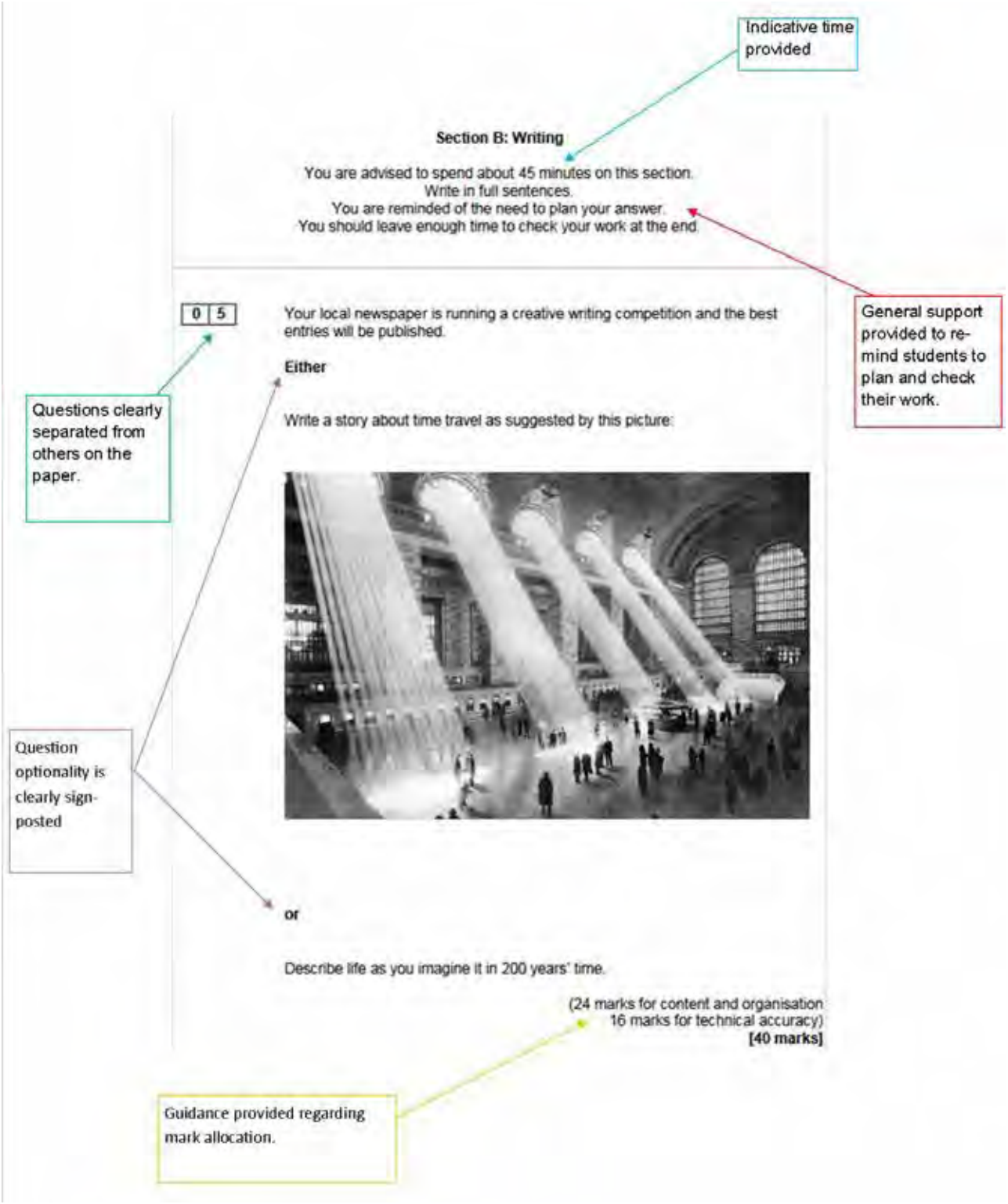
The CBSE paper includes top level mark allocation (e.g. so that Section C is worth 30 marks, and that Question 10 within that, for example, is worth 8 marks). This could be improved further by providing some indication of how the marks are split between different competences.

The following annotated example, taken from the AQA GCSE English Language (8700) November 2018 paper,[20] may be useful as a reference point to address some of the points noted above.

20

AQA GCSE English Language Paper 1 Explorations in creative reading and writing. Published by: AQA. Available at <https://filestore.aqa.org.uk/sample-papers-and-mark-schemes/2018/november/AQA-87001-QP-NOV18.PDF>.

Figure 85: Example 40: AQA GCSE English Language (8700) November 2018



6.2 Key findings and recommendations

Competences are included in the CBSE Standard X English language and literature curriculum and assessment shows some influence from communicative methodologies. This inclusion of competences is, however, not currently operating at maximum potential due to a lack of top-level cohesion regarding which competencies should be included and the manner in which they should be assessed. To strengthen this, it will be important for CBSE to ensure that overarching course and assessment aims and objectives inform question design and that questions reflect the specific competencies that are being targeted.

In terms of syllabus design and clearly **defining the aims and objectives**, it would be useful to consider, through consultation with key stakeholders and field experts, whether the competency-based model of language proficiency as developed by the CEFR may have relevance and application to the Standard X context. It will be important to articulate the key competencies to be tested in top level or overarching aims and objectives, to ensure that the most valued competencies can be included in the formal assessment and be integrated in the classroom delivery context. This extends to the **review and development of learning outcomes** that are measurable and linked to CEFR defined competences. Reference can be made to the integration of CEFR into the *Riigieksamid* in Estonia, as explained in the following case study:

Figure 86: Case Study: Estonia – Integration of CEFR into the Riigieksamid

The CEFR informs the Estonian national curriculum for both home languages (Estonian, Russian) and foreign languages.[21] All learning outcomes are specified in relation to the CEFR. The national curriculum states that 'as a foreign language is primarily a means to obtain information and to transfer it in communication, the learning of languages focuses on content areas that facilitate development of communicative competence,' informing learning outcomes across the four skills of reading, writing, listening, and speaking.[22]

Competency-based objectives can thus be seen as integral to the qualification at the top level. The overarching aims below (applicable to any foreign language subject) indicate that expectations go beyond language proficiency to include cultural awareness and skills for lifelong learning:

It is expected that, through foreign language education, upper secondary school graduates will:

- Communicate purposefully, both orally and in writing, by following relevant cultural practices;
- Understand and interpret the content presented in foreign languages;
- Have acquired knowledge of different cultures, understand the similarities and differences between cultures and value them; and
- Have acquired the motivation and skills required for lifelong learning.'[23]

21 Estonian Upper Secondary National Curriculum. Published by: Republic of Estonia Ministry of Education and Research/ Available at: <https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf> Page 2

22 Estonian Upper Secondary National Curriculum. Published by: Republic of Estonia Ministry of Education and Research/ Available at: <https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf> Page 2-3

23 Estonian Upper Secondary National Curriculum. Published by: Republic of Estonia Ministry of Education and Research/ Available at: <https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf>. Note that in addition, similar learning objectives are outlined in 2.2.1 with the addition of the expectation that students will be able to take part in varied international projects. See further p.12.

Learning outcomes are divided into two CEFR levels, one at B1 and one at B2 for a foreign language (e.g. English or Estonian as a foreign language). The following table reproduces both with areas of similarity highlighted:

Learning outcomes at B1 and B2 for the Estonian State Examination Certificate

Graduates of upper secondary school:

B1

1. Understand everything that is important to them on familiar or interesting themes;
2. Can generally manage in everyday communication with people speaking the language they are learning;
3. Describe their experiences, events, dreams and goals, and explain and elaborate on their positions and plans in brief;
4. Compile simple texts on familiar themes;
5. Take into account the cultural norms of the country of the language they are learning;
6. Are interested in the cultural life of the countries whose languages they are learning, read literature in foreign languages, watch films, TV programmes and theatre performances and listen to the radio;
7. Use reference sources in foreign languages (e.g. translation dictionaries and the Internet) to seek necessary information in other areas as well;\
8. Set learning goals and assess their achievement and are able to select and change their learning strategies if necessary; and
9. Integrate the knowledge they have acquired with their knowledge in foreign languages and other areas.

B2

1. Understand the essence of complex texts or discussions on abstract or concrete themes;
2. Communicate with native [...] speakers spontaneously and fluently;
3. Create coherent and logical texts on different these;
4. Explain their viewpoints, assess their weaknesses and strengths and are able to generalise and summarise;
5. Take into account [...] cultural norms and practices;
6. Are interested in [...] social and cultural life, read literature and printed media in Estonian, watch films, TV programmes and theatre performances an listen to the radio;
7. Use reference sources (e.g. dictionaries and the internet) [...] to find necessary information on different topics;
8. Have acquired a command of the language that enables them to make public presentations;
9. Set learning goals and assess their achievement and are able to select and change their learning strategies if necessary; and
10. Integrate the knowledge they have acquired with their knowledge in foreign languages and other spheres of life.

It is worth considering, however, some of the inherent challenges in the direct application of the CEFR to a specific context which need to be kept in mind if it is considered a useful tool to inform the Indian Standard X context. These challenges can be outlined as below:

- The CEFR is (intentionally) language-neutral and therefore must be interpreted for a specific linguistic context
- The CEFR is intended to be 'descriptive' and not 'prescriptive': this is beneficial in terms of flexibility, but more problematic in terms of standardisation and quality monitoring
- The framework covers all aspects of language knowledge: not all of these are appropriate to the specific school language education context (e.g. a descriptor refers to formal interpretation or translation, which may be outside the scope of secondary education). This places the burden on the test or course developer to reflect on which areas to include and which to exclude in terms of desired outcomes.
- The construct of the CEFR itself is complex and challenging for those who are not linguistic experts and may need breaking down to support successful integration amongst stakeholders
- Some aspects of the CEFR may be seen as Euro-centric due to its genesis as part of the Council of Europe
- There has been criticism levied at the 'jump' between different levels: for example, the progression between CEFR B1 and CEFR B2 is often cited as being challenging for learners. It may thus be appropriate for the plus or intermediary levels to be developed noting, however, that these may be less well recognised internationally.

Ensuring that the most valued competencies are included in the formal assessment in order to ensure practical development of skills in the classroom delivery context is important. This may involve consultation with subject experts and a wide range of stakeholders to ensure the **relevance** and value of the competences, which as a skills-based programme, also inform the **content**.

As noted in the comparative analysis, a number of observations were made relating to the **accessibility** of the English papers. When taken as a whole, the issues encountered may impact negatively on student performance and unfairly penalise them. CBSE can reduce the risk of invalid questions, maximise the opportunity for student engagement with questions, and increase the transparency of expectations. Example 16 provides an example of a reading comprehension and morphology question from the Estonian State Examination and highlights the key features of layout and presentation that promote accessibility and engagement, enabling focus on practical grammar usage and reading skills assessment.

The design of CBSE multiple-choice questions could also be reviewed, to ensure that distractors assess appropriate comprehension of the texts and are well-constructed to test the appropriate competences. Reference can be made to case study Examples 12-14 from PTE Academic when considering the design of multiple-choice test items:

A further important feature would be to ensure that scaffolding is present, e.g. providing an example, emphasising key points in instructions, providing content points and giving an indication of mark allocation, thereby enhancing **accessibility**. This practice of employing scaffolding can be observed in an exemplar letter writing task from the Estonian state examination (Example 3) whereby underlining is used to emphasis key parts of the rubric, and the input text provides some indication of content to be covered.

Addressing some of these issues around **accessibility**, it is suggested that proofreading, item writer training and piloting be conducted, enabling feedback to be sought and acted upon to ensure that problematic questions can be removed or redesigned to ensure transparency.

In regard to **practical, real-world skills coverage in the assessment**, a number of questions were found to focus more on recall or basic understanding of the texts. It may be beneficial to review the weighting of questions or question types to provide more opportunity for students to demonstrate detailed understanding of the texts in question (e.g. reducing the number of recall questions; increasing the points available on an extended question). There could be scope to ensure further review of item wording and design to ensure that that the questions are focused on assessing reading comprehension and do not involve word spotting and extracting phrases word-for-word. An example of how this is achieved in the IELTS General Reading Test can be seen in Example 9 where the question design ensures that candidates have to engage with the text in detail and use their reading competences.

Higher order thinking skills assessment could be developed further in the CBSE Standard X in Section C of the examination which focuses on literature. This could be achieved, for example, by allocating more marks to the literary analysis questions, and supporting with a clear mark scheme to draw out the specific competencies. It could also be managed by including an unseen poem, as in the GCSE English Literature paper, to reduce predictability or the potential for students to memorise key linguistic features that they have studied in poems seen in class, and therefore to ensure that students' understanding of literary features, effects and intentions can be better understood. Similarly, in writing tasks, an essay style question could be used in Section B Writing & Grammar either to replace or in addition to the formal letter or the creative writing output. This essay style question could encourage students to present their ideas and the advantages and disadvantages of a specific situation (and could additionally be linked to a key 21st-century topic area, such as environmental concerns, human rights, technology). Where, for example, currently the question requires candidates to describe measures, it could instead ask them to evaluate different environmental options.

Figure 87: CBSE Standard X English Language and Literature Question 3 – article, 2019 SQP

OR

The government has urged the people of India to realize the dream of 'Clean India'. Write an article describing the measures that people can take for a cleaner and greener India. You are Anju/Amit Kumar (100-150 words)

In terms of ensuring the **validity of assessment**, consideration should be given to how different competences in the CBSE Standard X will be tested, how they will be weighted across the whole paper, and which questions will test which competences to maintain reliability across sittings. For example, weightings are applied in the GCSE specifications which clearly indicate how skills are to be assessed and linked to questions:

Figure 88: Case Study: GCSE English Literature Assessment Objectives

Skill & relative weighting in qualification (%)	Assessment objective(s)
AO1 Reading **30%**	R1 Identify and select relevant information R2 Understand ideas, opinions, and attitudes R3 Show understanding of the connections between ideas, opinions and attitudes R4 Understand what is implied but not directly stated, e.g. gist, writer's purpose, intention and feelings
AO2 Writing **30%**	W1 Communicate information/ideas/opinions clearly, accurately and effectively W2 Organise ideas into coherent paragraphs using a range of appropriate linking devices W3 Use a range of grammatical structures and vocabulary accurately and effectively W4 Show control of punctuation and spelling W5 Use appropriate register and style/format for the given purpose and audience

AO3 Listening **20%**	L1 Identify and select relevant information L2 Understand ideas, opinions and attitudes L3 Show understanding of the connections between ideas, opinions and attitudes L4 Understand what is implied but not directly stated, e.g. gist, speaker's purpose, intention and feelings
AO4 Speaking **20%**	S1 Communicate ideas/opinions clearly, accurately and effectively S2 Develop responses and link ideas using a range of appropriate linking devices S3 Use a range of grammatical structures and vocabulary accurately and effectively S4 Show control of pronunciation and intonation patterns S5 Engage in a conversation and contribute effectively to help move the conversation forward

GCSE English literature allocation of raw marks across assessment objectives

Paper 1 Mark scheme

The table below shows the number of raw marks allocated for each question in this mark scheme.

Component	Assessment Objectives				Total marks
	AO1	AO2	AO3	AO4	
Component 1: Shakespeare and Post-1914 Literature					
Questions 1a to 6a		20			20
Questions 1b to 6b	15		5		20
Question 7	16		16	8	40

In parallel to ensuring the **validity of specification design**, it would be important to develop detailed guidelines to support item writers to understand which competencies are and are not to be covered in their submissions. The development process should ensure that the question construct reflects the competencies that are intended to be tested.

In terms of **assessment validity,** it is recommended that mark schemes are reviewed to ensure they allow sufficient reward for competences, particularly in comparison to content points would be important. Developing analytical mark schemes to ensure a balance of rewarding key target competencies across a task, train markers to use these, and develop a clear standardisation process to support marking of open-response items would also be important to ensuring **assessment reliability**. The Estonian system, for example, highlights the use of analytical mark schemes, whereby level descriptors and assessment criteria are used (e.g. across task composition, vocabulary and grammar) in assessing writing tasks – this can be seen in Example 4.

7. Overarching findings on the CBSE Standard X

7.1 Overarching observations on teaching and learning by CBE principle

This section, focusing on delivery, draws primarily on the findings of the site visit lesson observations and initial stakeholder engagement. This section has been supplemented by the findings from further stakeholder engagement including surveys and interviews with teachers, principals and students conducted in October 2020.

CBE delivery principle: learning outcomes-focused delivery

A key aspect of the Aurora Institute definition of competency-based learning and delivery focuses on the implementation of measurable and explicit learning outcomes to empower students, placing them at the centre of the learning process.

Variations were reported from the management perspective in how well / widely understood and used competency-based approaches are in lesson planning and delivery in classrooms. A number of principals agreed with the observation from one principal that "learning outcomes" and "competency-based education" are referred to as buzz words, without widespread understanding of how they are used in practice to deliver and develop teaching and learning in classrooms. It was noted that as NCERT learning outcomes have only recently been introduced, time was required for new approaches, in particular, lesson planning at classroom level, to reflect changes to curriculum design.

A general observation in terms of delivery and lesson planning across all schools and subjects is that teachers follow the CBSE/NCERT curriculum very closely. The surveys and interviews indicated that the majority of respondents (teachers) are using NCERT learning outcomes to develop lesson plans and ultimately in their delivery of lessons across maths, science and reading.

Learning outcomes provides direction to my teaching process and provide insight into assessment process too.it really helps to cover all the aspects of a topic [Science].[1]

The NCERT learning outcomes are very clearly specified [science].

Help to know the progress of the students [Maths].

NCERT Learning outcomes have variety of topics that make students confident & builds critical & creative thinking [English].

1 CBSE Curriculum English Language and Literature, Standard IX and X. Published by: CBSE. Available at <http://cbseacademic.nic.in/web_material/CurriculumMain21/Language-Secondary/English_Sec_2020-21.pdf>..

While NCERT provides a useful foundation and prescribed learning outcomes for each topic area, teachers in the focus groups reported limited scope (in terms of resources and time) to include material outside of the set curriculum. For both Hindi and English, teachers commented that the quantity of set texts took up quite a lot of time. Preparation for board exams is a priority in Standard X with significant focus and class time spent on revision and completion of past papers. It can nevertheless be noted that teacher interviews and follow-up surveys reported greater scope to include further material outside of the curriculum, although the majority in the follow-up exercise were from private schools as opposed to state schools.

In practical terms, there is still some doubt however as to whether the learning outcomes are truly student-centred or more intended for the use of teachers in current school practice; ideally, they should be of benefit for both in a CBE-oriented system. The classes observed during the in-country review exercise did not involve sharing the learning outcomes with students, therefore students were not made aware of the key skills that they were expected to develop. Furthermore, the feedback from the teacher through the surveys expressed some doubts regarding the usefulness of learning outcomes across the different subjects:

We couldn't use all learning outcomes. [English].

Learning outcomes are different for every student so already given learning outcomes are not always that appropriate. [English].

They work well as a guideline, but are too basic for students with a reasonable existing command over the language. [English].

The extra knowledge required is given as per average standard of the students [Maths].

For some extend it is useful but need to add or refers extra resources also [Maths].

Outcomes of NCERT are very useful for an above average students For extra ordinary students we have to go beside it. otherwise the learning outcomes are catering overall development of a student [Science].

CBE delivery principle: interactive teaching

Interactive and activity-based delivery is a key feature of competency-based learning. This can involve both interaction between teacher and student and between students. Based on general observations from the teacher focus groups conducted during the site visits to CBSE schools, teachers encourage interaction through question and answer sessions, asking students to talk through their answers to pre-defined questions, while correcting misunderstandings. The delivery of interactive lessons was also reported through the teacher survey and interviews in the follow-up engagement, with the majority of teachers indicating the use of teacher-led question and answer approaches across subjects. Moreover, the teacher interviews and surveys indicated that group work and collaborative tasks are often included in the lesson planning and delivery of mathematics and science and English. Students reported that they particularly enjoy and feel engaged when participating in group and collaborative work.

Major barriers to class interaction were identified to be class size and the time allocated to each lesson. Limited interaction was observed to occur in the class observations for Classes 7-9, with most lessons dominated by teacher-led instruction "chalk and talk", with students being given limited opportunity to contribute on an individual basis. Although surveys and interviews suggest differently as discussed, group work and collaborative tasks were not used in maths and science classes observed during the site visits. Group work was observed in English classes, but the language of interaction in these groups was not English and teachers did not provide process language to support peer communication. Some student-led activity was observed in a literature-based class, where students were asked to comment on some literary effects, but this interaction was typically limited to just one or two students whilst others did not participate.

CBE delivery principle: self-paced, individualised learning

CBE encompasses an approach to learning which takes into account individual abilities and tailors the teaching and learning experience accordingly. It similarly acknowledges the differing pace that students may work at and the time needed to reach mastery in specific skills and fulfil specified learning outcomes. In the Indian Standard X provision, however, engagement with teachers and principals highlighted differentiation as a particular challenge. The class sizes coupled with the broad spectrum of

student background and abilities, are considered to impact the teachers' ability to differentiate students based on ability and learning style. Class observations also reflected the teacher and principal views, with limited evidence of differentiation being used throughout the lessons. This may also have significance for progression in languages, where Hindi or English may be a third or even fourth language for some students. In some cases, teachers commented that students who spoke English in their home context found the course much easier.

Some of these concerns regarding class sizes and limited differentiation were also reported in the follow-up interviews and surveys, with inclusion and catering for those with diverse learning needs highlighted as key issues. The following quotes were extracted from the survey responses:

The main challenge in delivering the curriculum is trying to balance diverse learning needs virtually.

Since the students are diversified in different aspects. Individually we must analysis each student and we have to fulfil as per their needs.

Since it is online class we don't have physical interaction and unable to assess them properly. Another drawback is that we are not able to concentrate and help the slow learners. Regarding the internal assessment we are not satisfied.

The main challenge is Balancing Diverse Learning Needs.

School management teams were asked in follow-up surveys about the measures in place to support learning. The management teams stated that these typically included parental involvement, the use of remedial classes, adaptation of classroom resources, activities, use of technology, 1-2-1 support in the classroom, or in the form of counselling or mentoring and financial support. These measures would help to support CBE integration by ensuring that all students have equitable access, and that support and stretch are appropriately used.

Furthermore, in view of the teachers' concerns regarding class sizes, it is thought that some practical measures could be introduced and used on a wider scale to implement differentiated learning more effectively. Commonly used methods to facilitate differentiation can be summarised as follows:

Figure 89: Case Study: practical approaches to differentiation[2]

1. Collaborative learning

Collaborative learning and mixed ability group work can enable higher performing students to assist lower achievers, allowing both to learn through the experience.

2. Progressive tasks

Teachers can set different tasks for students of varying ability levels, whilst recognising the challenges in administration this can pose it can enable students of varying abilities in large classes to develop relevant knowledge and skills.

2

Prometheanworld, 2020. Methods of Differentiation. [online] Available at: <https://resourced.prometheanworld.com/differentiation-classroom-7-methods-differentiation/>.

3. Digital Tools

The use of digital tools and applications can allow classes to approach the subject from different perspectives, they can also engage students of varying abilities to bring about the same learning outcome and provide confidence in building digital skills.

4. Verbal support

Teachers can adapt explanations and language accordingly, taking into account the varying learning profiles of students.

5. Variable outcomes

Allowing for flexibility in the way different students approach problems, enabling an open environment in which all students can express themselves.

CBE delivery principle: activity-based learning

The NCERT textbooks include examples of activities which can be used in classrooms. Focus groups with teachers indicated a clear intention to integrate activity-based learning within their lesson plans, albeit acknowledging the constraints of time, resources and class size. The surveys and interviews similarly reflected the benefits of the curriculum and supporting textbooks in providing a range of activity-based learning tasks across subjects with teachers reporting increased emphasis on practicals in science and problem-solving activities in maths.

Nevertheless, the focus groups and site visits conducted revealed that scope for practical work in science varies by school, with some lacking the resources to allow for practical-based provision, instead using teacher-led demonstrations of practicals. The science lessons observed during the site visits to schools did not involve practicals, although some questions were posed, with reference to practical work undertaken in previous lessons. In mathematics, teacher focus groups reported that an inquiry approach is sometimes employed, although the classes observed in mathematics did not include investigative, student-led tasks. This was also supported to some extent by the feedback given by maths teachers in the interviews and the survey; in which they reported less overall emphasis on investigative mathematical tasks in lesson delivery relative to other delivery methods.

Activity-based learning was observed in English, in particular in a grammar-based lesson observed, where students created their own examples of the structures and other students were expected to classify these; no communicative skills-based work was observed, however, although findings from surveys indicated that teachers use collaborative methods as a way to encourage student speaking – particularly to reduce shyness in students who might be less inclined to speak within a whole-class context.

CBE delivery principle: higher order thinking skills development

Higher order thinking skills are developed through problem solving in mathematics, teachers interviewed in the focus groups revealed the use of collaborative problem-solving approaches and exploration of alternative strategies. Opinions of teachers were divided on whether the use of calculators would be beneficial for developing higher order problem solving skills, although a number of teachers recognised the potential value for setting more complex calculation problems, particularly those involving very high or low numbers or data analysis involving large datasets. In general, teachers reported lower levels of confidence among students using calculators and other technology in problem solving, reflecting lower levels of use in the classroom. Moreover, in response to the survey a significant number of students highlighted a need for higher order thinking problem solving tasks during lessons.

In sciences, the teacher focus groups acknowledged the potential for higher order thinking skills to be developed through practical work. However, currently they reported less of an emphasis on data analysis, interpretation and evaluation in practical work, and more of a focus on understanding the practical observations and procedures, reflecting the scope of the NCERT textbooks. A number of science teachers thought that there should be a greater emphasis on analysing trends in the measurements

observed, the implications of anomalous results and suggesting improvements that could be made to experimental design, although such themes are not explicit in the NCERT materials and not required to be developed in the CBSE syllabus. These observations from the focus groups were also to some extent reflected in the survey responses, which highlighted that relative to other skill areas such as naming and explaining a scientific process or phenomena, students are somewhat less well prepared to plan, analyse and suggest modifications to scientific experiments.

Moreover, while in a number of lessons the teacher included application questions, the lessons observed in science during the site visit did not include any "stretch" questions focusing on higher order thinking, although it is acknowledged that the classes were Grade 9 and therefore possibly not representative of lessons taught at Standard X. However, these observations reflect some of the responses from the teacher surveys and interviews which highlighted a need for more emphasis on real-world application and extended experimental tasks in delivery of Standard X.

The main focus of higher order thinking skill development in science and mathematics currently is on preparing students for the CBSE HOTS questions, including preparatory data analysis tasks and case study type questions, although teachers opinion varied on whether these questions provide a thorough assessment of higher order thinking in the subject. Some teachers in the focus groups were of the opinion that a number of the HOTS questions, particularly those presented as case studies, rely heavily on reading comprehension as a skill and as such focus less on assessing subject-specific skills and knowledge. In relation to HOTs, a number of the science teachers responding to the surveys flagged the need for greater emphasis on the cognitive processes associated with the development of higher order thinking skills, one teacher in particular articulated the need to focus on a number of areas as follows:

"Interpretation of scientific data and developing experimental procedures and making predictions. If we reach greater depth of a concept students will learn the fundamentals behind design of an experiment and then only they will be able to predict the outcome of an experiment."

In some of the observed reading lessons, a focus on literary technique provided scope for HOTS to emerge within reading and, in some cases, some students were able to engage at this cognitive level (e.g. reflecting on their own personal experience, discussing the impact of a literary device). This opportunity was not maximised, however: very few students actively participated, and teacher management of the class did not allow for this to be developed or exploited – it may have been more beneficial, for example, to place some key discussion questions around the topic on the board and have students discuss these in pairs to widen participation and to allow for differentiation through the use of questions pitched to cover different cognitive levels. A further emphasis on creative writing was raised by some teachers in the surveys, which may provide more opportunity for HOTS to be developed and assessed, noting that these question types may require a more flexible mark scheme.

CBE delivery principle: appropriate formative assessment methods and feedback

Continuous assessment is encouraged and forms part of the internal assessment component of the CBSE Standard X across subjects. Regular teacher-led assessment allows the teacher to provide constructive feedback to students on an individualised level, although this does not appear to extend to self-assessment where the student is encouraged to reflect critically on his / her own performance.

The internal assessment, including the portfolio, project work and practicals, was generally agreed to be of continued benefit by teachers and principals participating in the focus groups and interviews, allowing students to be assessed on wider transferrable skills in addition to subject knowledge. Teachers interviewed highlighted the scope for practical-based assessment in science, project and portfolio assessment, assessment at the end of every lesson or chapter, and pre-midterm, mid-term and post-midterm assessment within the school-based component.

However, the need for further guidance on assessing students' practical ability in science was identified by teachers participating in the focus groups. There was some debate over whether further standardisation / moderation would be beneficial, with some teachers citing the increase in workload and practical

resources required for internal and external moderation as a potential barrier. The surveys show that to some extent, moderation practices and approach to internal monitoring may be employed in some schools, although the results showed variations between schools given their autonomy, again underlining the need for clear overarching as well as subject-specific guidelines.

It may be useful in English, if the CEFR is used as a reference point, to consider whether the European Language Portfolio (ELP) may provide relevant support here:[3] the ELP is intended to support learner autonomy, allowing for self-assessment and reflection on progress. It provides scaffolding for learners to consider their action points, and how they want to improve.

7.2 Coverage of core 21st-century skills and interdisciplinary assessment

7.2.1 CBE curriculum design principle: inclusion of transferable and other general skills across academic subjects

The CBSE has developed a set of core competencies and outcomes in learners in order to achieve the curriculum goals, although these are defined at an overall level to apply to all learners, not specifically those in Standard X.

Furthermore, there have been national-level initiatives undertaken by NCERT intended to integrate 21st-century skills into the curriculum for Classes 1-8 and now 9 and 10 and initiatives to build the capacity of teachers focusing on student-centred learning. Close consultation between NCERT and CBSE would be important to ensure that any integration of 21st-century skills could also be reflected in the syllabus design of CBSE at Standard X to ensure a coordinated and harmonised approach to curriculum development for Standard X across different subjects. Furthermore, the integration of 21st-century skills within the NCERT curricula at Standard X is still in progress and may benefit from review of approaches taken by other exam bodies internationally to inform future alignment of skills. CBSE may want to consider mapping the provision at Standard X to an international skills framework, as a process that has been carried out by a number of international exam boards like Pearson for example:

Figure 90: Case Study: Facilitating the integration of transferable skills across academic subjects

Embedded within the GCSE and International GCSE programmes and introduced as part the 2015-2016 GCSE reforms, are transferable skills, "providing students with the opportunity to gain a wider set of skills through the academic curriculum"[4]. These skills were determined by the Pearson Research Team, based on the National Research Council's (NRC) framework, and adapted to include Program for International Student Assessment (PISA) ICT Literacy and Collaborative Problem Solving (CPS) Skills.[5]

3
European Language Portfolio (ELP). Published by: the Council of Europe. Available at <https://www.coe.int/en/web/portfolio>.

4
Pearson Edexcel, 2019.Transferable Skills. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/International-GCSEs-from-2016-and-2017/transferable-skills.html>.

5
Pearson Edexcel, 2019. Transferable Skills. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/International-GCSEs-from-2016-and-2017/transferable-skills.html>.

The key transferable skills relate to cognitive, interpersonal and intrapersonal skills. Cognitive skills include critical thinking, problem solving, creativity and innovation. Interpersonal skills involve communication, relationship building and collaboration skills whilst intrapersonal skills encompass self-management, self-development and flexibility. These generic transferable skills are intended to be embedded into each subject's programme of study to facilitate alignment with 21st century skill frameworks. In addition, they are intended to enable students to be better equipped to face the demands of further and higher education as well as the demands of the workplace, so facilitating the range of progression opportunities available to students on completion.

Figure 3: summary of transferable skills

Reviewing individual subjects, as with the GCSEs, the International GCSEs in Sciences and Mathematics reflect cognitive skills, particularly on problem solving and critical thinking, demonstrating factual knowledge and ICT.

7.2.2 Synoptic and interdisciplinary assessment

A further feature indicative of competency-based secondary education – and a priority at the qualification design level – is a focus on assessing the student's ability to link together and integrate knowledge from different areas of the curriculum is. The approach to synoptic assessment can vary depending on the subject. It was noted that this did occur to some extent in the English curriculum and, for example, in an assessment question focused on environmental matters, but the qualification may benefit from a more targeted integration of these skills.

Synoptic assessment can be incorporated in externally set exams or alternatively in internal coursework-based assessments which provide greater scope for assessing broader skills and interdisciplinary application that may be difficult to assess under exam conditions. The CBSE Standard X internal assessment provides scope for assessing different topic areas and skills through integrated portfolio work and coursework. Teachers are assisted in the design and marking of skills by the CBSE syllabus requirements for internal assessment, although it is

6

Pearson Edexcel, 2019. Transferable Skills. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/International-GCSEs-from-2016-and-2017/transferable-skills.html>.

noted that there is no explicit rubric (assessment criteria) or suggested tasks or pre-defined scope for the individual components of the internal assessment.

In reference to best practice in conducting internal skills-based assessment, assessment criteria are employed in the internal assessment of project or portfolio work to facilitate consistency in evaluating student performance in relation to predefined skills, for example:

Figure 91: Case Study: internal assessment of project-based work using assessment criteria

A Level 2 Higher Project qualification can be offered by schools alongside GCSEs, which assesses project planning and development skills. The assessment is conducted internally and is subject to external moderation. The use of assessment criteria, differentiated by level of achievement, the criteria for two selected assessment objectives (AO1 Manage and A04 Review) are shown below:

Assessment Objectives	Mark band	Assessment Criteria
AO1 Manage • select a topic and agree project aims and objectives • produce a project plan • carry out the project applying organisational skills and using a range of methods and resources, to achieve agreed objectives	7–10 marks	Clear identification of the topic to be investigated or researched and clear evidence of appropriate aims and objectives for the proposed project title. Detailed project plan, with clear evidence of monitoring progress of project work against the agreed project plan.
	4–6 marks	Some identification of the topic to be investigated or researched. Some evidence of appropriate aims and objectives for the proposed project title. Appropriate project plan, with some evidence of monitoring progress of project work against the agreed project plan.
	1–3 marks	Limited identification of the topic to be investigated or researched. Limited evidence of appropriate aims and objectives for the proposed project title. Brief project plan, with little evidence of monitoring progress of project work against the agreed project plan.
	0 marks	No relevant response.

Assessment Objectives	Mark band	Assessment Criteria
AO4 Review • analyse project outcomes including peer evaluation • communication skills • present project outcomes in an appropriate format	7–10 marks	Detailed analysis of the strengths and weaknesses of the completed project, the planning, implementation and outcomes, and the candidate's own learning during the project. Clear understanding of the key issues relating to the outcome of the project. Material is consistently relevant, well-structured and appropriately presented. Candidates clearly communicate their findings and outcomes which are soundly based upon research evidence.
	4–6 marks	Some analysis of the strengths and weaknesses of the completed project and the candidate's own learning during the project. Some understanding of the issues relating to the outcome of the project. Material is sometimes relevant, well-structured and appropriately presented. Candidates adequately communicate their findings and outcomes which are based on research evidence.
	1–3 marks	Limited analysis of the strengths and weaknesses of the completed project and the candidate's own learning during the project. Material is not always relevant, well-structured and appropriately presented. Candidates communicate some of their findings and outcomes which are based on little research evidence.
	0 marks	No relevant response.

7

AQA, 2020. Level 2 Higher Project Qualification Specification. [pdf] Published by: AQA. Available at: <https://filestore.aqa.org.uk/subjects/AQA-W-7992-SP-15.PDF>.

7.3 Overall assessment of integration of CBE principles and identification of areas for further development

The following table lists the CBE principles and summarises areas identified for further development in order to facilitate integration of competency-based approaches. As can be seen overleaf, steps have been taking to partially integrate competency-based approaches in the majority of areas, whilst there remain identified areas for development across every principle to enable full integration.

Table 36: Summary of analysis of CBSE examination system and current level of integration of competency-based approaches – curriculum and syllabus design

Key CBE Design Principles	Current CBSE Provision - Level of CBE integration High/Partial/ Limited	Development needs to facilitate CBE integration	
Curriculum and syllabus design			
1. Clearly defined aims and objectives	Partial Aims are defined for mathematics and English but not in science.	Yes	• Establish subject aims for science in a similar format to those of maths to ensure consistency in design • Elaborate on aims to include reference to a range of 21st-century skills.
2. Learning outcomes focused	Limited – partial Subject-specific learning outcomes are not defined in CBSE syllabus but are defined by NCERT. Prescribed question typologies are generic and not yet developed on a subject-specific basis.	Yes	• Consult with NCERT to link curriculum learning outcomes with the CBSE syllabus • Develop subject-specific competencies to accompany content topics • Include general level subject-specific assessment objectives / question typologies such as for example, experimental skills in the sciences • Ensure that the weightings and allocation of marks / questions match the exam papers.
3. Relevant depth and breadth of Content	Partial Broadly comparable core topic areas are included based on two years of study in line with other systems in maths and science. However, practical linkages in particular to employer / real-world skills are not evident particularly in mathematics. Technology used, including calculators, is not evident, placing limits on problem solving and practical real-world applications. In English, the omission of listening and speaking from the external assessment and the lack of clear monitoring of the skills in internal assessment may have an unfortunate washback impact on content prescribed vs what is covered	Yes	• Review the practical relevance and establishing practical links with theoretical topics • Increase engagement with employers in curriculum development and review to ensure alignment with workplace practical requirements • Include greater coverage of use and application of technologies including calculators in maths and science. • Consider whether listening and speaking should be integrated into external assessment or whether prescribed internal assessment should be developed to ensure that intended content is reflected in classroom delivery.

	in class. This may be particularly significant given that teachers emphasise that they focus a lot on past papers and examination preparation.		
4. Inclusion of Transferable skills/ general skills across academic subjects	Partial Curriculum outcomes have been developed by CBSE and are applied on a general level. Initiatives have addressed integrating 21st-century skills into the NCERT curricula, although the process is still ongoing for Standard X.	Yes	• Consult with NCERT to ensure correspondence between learning outcomes specified for delivery and the CBSE syllabi. • Map with 21st-century skills frameworks such as the NRC or ATCS to verify the integration of 21st-century skills in the global context.

Table 37: Summary of analysis of CBSE Examination system and current level of integration of competency-based approaches – assessment

Key CBE Design Principles	Current CBSE Provision - Level of CBE integration High/Partial/ Limited	Key CBE Design Principles	Current CBSE Provision - Level of CBE integration High/Partial/Limited
Assessment			
1. Equity	Partial Basic mathematics addresses needs of lower ability students in the subject, yet it is viewed as a separate, lower value qualification level compared to Standard maths, affecting student motivation engagement and parent / employer perception.	Yes	• Establish alignment of standards between Basic and Standard mathematics, and potential overlap of questions which may allow a student to pass Standard maths by scoring well in the Basic exam. • Include a greater number of practical topics, aligned with employability needs in the assessment, particularly in the Basic maths to engage less able students.
2. Accessibility	Limited – partial Questions in maths and science sometimes lack clarity and conciseness, embedding multiple tasks within the same question stem in previous papers from 2019 and 2018. Demands are often placed on language comprehension, while the focus is intended to be on problem solving and analysis. Although the 2020 paper demonstrates clearer language and more structured questions, there is nevertheless a need to review the language,	Yes	• Review the use of language as a priority, to ensure greater conciseness and precision to enhance understanding and reduce reading time and misunderstandings • Clarify the format and layout of the questions to ensure readability • Increase the use of diagrams and images to engage the student and to clarify scenarios in real-world / experimental questions.

	connection and flow of the questions in places. Only a small number of questions include images or diagrams, while guidance and instructions on how to respond to questions as well as mark allocations per sub-part to structured questions are not always clear and consistent across all questions and papers. Questions in language papers also demonstrate variability, with some command words used but also inconsistency and sometimes lack of clarity in question design		• Review sequencing of the papers, particularly in maths and science, to facilitate ramping of questions (progression of difficulty) throughout the papers to allow candidates to engage and build confidence. • Improve transparency of expectations in questions through scaffolding and clearer rubric.
3. Reliability	Partial CBSE are taking steps in introduce newer, unseen and less predictable HOTS based questions which will account for 10% of the papers. Marking processes and step-wise mark schemes are in place to facilitate reliability and paper setting processes aim to equate the overall difficulty level with previous years, while small adjustments can be made to the pass mark.	Yes	• Introduce measures to minimise predictability of the questions, focusing on changes to item writing guidelines as well as the procedural changes to item writing and paper setting. Enhance the novelty of the items with fresh wording, use of tables, images and newly presented datasets. • Reduce optionality in maths and science papers • Elaborate mark schemes to increase flexibility to assess alternative response, with additional guidance to examiners, analytic mark schemes in English to assess productive tasks in writing. • Clarify standardisation and threshold adjustment process to ensure consistency in the standard required to pass the exam.
4. Validity	Partial The CBSE syllabus shows an attempt at linking skills to specific questions. Content areas are also weighted, informing matrix approaches to exam development. Quantitative item level analysis is undertaken. Nonetheless, subject-specific objectives and not defined, mark schemes do not show a direct link between objectives and questions. Examiners reports are not available.	Yes	• Link assessment objectives (Typologies) to specific questions in the mark schemes to show which skills are assessed in each question • Improve tracking to link with objectives and to identify overlapping questions with other exams and NCERT textbooks to avoid duplication and similar wording with previous exams / textbooks. • Publish examiner reports combining qualitative and quantitative analysis of student performance, facilitating transparency.

5.	**Higher order thinking skills assessment**	Partial Some steps have been taken e.g. the inclusion of HOTS questions although these questions, including the multiple-choice questions have limitations in assessing higher order thinking. The ability of other questions in previous papers, using command words which appear to be targeted at higher order skills, may be compromised by student's prior familiarity with both the question scenario and solution from the NCERT textbooks.	Yes	• Include a greater number of questions on novel experimental contexts in science • Introduce more interrelated and scaffolded structured questions, varying the format of such questions, using tables, diagrams, experimental data and extended sub-parts which include unfamiliar / less predictable scenarios • Ensure that data analysis questions are focused on data interpretation, which necessitate analysis, not simply information extraction or recall. This will need to be accompanied with review of the mark schemes to allow for flexibility in mark allocation.
6.	**Real world Relevance and linkages**	Limited – partial A number of scenario-based questions were observed to be very similar to those given as questions with solutions in the NCERT textbooks, limiting the potential for real-world application to be reliably assessed. Limited use of authentic datasets taken from experiments in science and maths. In languages, questions do not always assess practical comprehension, there is an emphasis on word identification and extraction.	Yes	• Include a greater link in the assessment design with practical technology use in mathematics, mirroring actual use of mathematics in everyday life • Integrate real-world, authentic datasets, different to those that appear in the NCERT textbooks, on which to set novel data analysis and evaluation questions. • Review question design in language subjects to ensure assessment of detailed comprehension of meaning rather than word spotting and extraction of phrases, recall of literary facts.

Table 38: Summary of analysis of the current level of CBL integration - teaching and learning

Key CBE Design Principles	Current CBSE Provision - Level of CBE integration High/Partial/ Limited	Development needs to facilitate CBE integration	
Delivery of teaching and learning			
1. Learning Outcomes Focused Delivery	Partial Teachers are reportedly using outcomes-based lesson plans, although practice may vary across schools. Learning outcomes are not necessarily shared with students during the lessons.	Yes	• Increase guidance and support to teachers on how to implement outcomes-based approaches in planning and delivery lessons • Increase flexibility to elaborate on learning outcomes, specifying skills and competencies covered in lessons.
2. Interactive and activity-based learning	Limited – partial Despite some efforts to introduce interactive approaches, lesson observations predominantly found an emphasis on teacher-led delivery. Emphasis on teacher demonstrations and limited observed scope for individualised practical work in the sciences or communicative practice (particularly spoken production) in languages.	Yes	• Train and peer review of teachers, aimed at facilitating interactive and student-centred approaches • Increase the number of tasks and activities that can be completed in groups / teams of students.
3. Higher order thinking skills development	Limited A strong focus in Standard X on exam preparation in all subjects. There is some emphasis on HOTS, although opinion varies among teachers and students on the demand of these questions. The practical work in science reportedly places limited focus on skills of analysis and evaluation, devising new experimental design. The predictability of some literature questions and the focus on recall in some examination questions may limit testing of HOTS in literary analysis.	Yes	• Provide further guidance to teachers on how higher order thinking skills are assessed, including a glossary of command words which can be used when setting tasks. Provide further guidance to teachers on how to integrate “stretch” and extension questions to engage higher order thinking in discussion work. • Provision of a greater number of data analysis and evaluation tasks in mathematics and science to engage higher order thinking in the subject. A question bank of items compiled by CBSE could be of benefit for teachers and students. • Consider whether the integration of ‘unseen’ texts or a reduced focus on short answer or recall-based questions would support increased HOTS development in reading.

4.	**Facility for formative and self-assessment**	Limited A strong focus in Standard X on exam preparation in all subjects. There is some emphasis on HOTS, although opinion varies among teachers and students on the demand of these questions. The practical work in science reportedly places limited focus on skills of analysis and evaluation, devising new experimental design. The predictability of some literature questions and the focus on recall in some examination questions may limit testing of HOTS in literary analysis.	Yes	• Provide templates and questions for students to self-evaluate their progress on completion of each unit of study • Train teachers to facilitate a self-reflective form of assessment to form part of progress monitoring. • The integration of a self-assessment model based on the ELP may be of benefit in languages.
5.	**Self-paced, individualised learning**	Limited Scope for personalised learning is reportedly low across all the schools visited. Differentiation is identified as a key area where improvement would need to be seen in order to fully integrate CBE approaches.	Yes	• Capacity building for teaching, including guidelines on differentiation techniques • Introducing a system of peer review and evaluation as well as self-evaluation for teachers to successfully implement CBL approaches.

The following figure summarises the existing strengths of the current system and progress to date, while also noting some of the key areas for development and the challenges in improving these features of the system with a view to implementing CBE on a system-wide scale.

Figure 92: Overall analysis of the CBSE Standard X provision and potential to offer competency-based education and assessment

Strengths	Weaknesses
• The provision of summative assessment in Standard X as a means for facilitating progression • The CBSE syllabi and SQP papers offer clear support for students in preparing and familiarising them with the format and question types included in the exams • Strong theoretical base in terms of curriculum content in maths and science • Inclusion of a typology of questions, indicating a balance of assessed skills in addition to knowledge and understanding • Outcomes oriented curricula introduced by NCERT, with supporting examples and annotated textbooks	• Highly theoretical and complex content in maths, which places limits on the scope for setting higher order thinking and real-world application questions • Lower accessibility of exams and exam questions in comparison with international counterparts, potentially contributing to the high number of failures at Standard X • High emphasis placed on rote recall, given the similarity of the questions with NCERT textbook and previous exam questions, promoting a reported heavy reliance on cramming and “question spotting” practices among students and teachers

- Internal assessment provides scope for assessing a broader range of skills that may not be possible using external exams alone.
- Weaknesses observed in some of the SQP HOTs questions, particularly in the sciences, providing limited scope for assessing higher order thinking skills, pointing to gaps in item writer capacity and resources.
- Reduced value placed on listening and speaking skills due to the lack of external assessment in English, and mark schemes do not provide clarity on how to reward writing output.

Opportunities	Challenges
• Internal assessment weighted at 20% offers scope for interdisciplinary and transferable skill assessment • Provision of a Basic maths may promote equity of opportunity for weaker maths students • Opportunity to train item writers and paper setters to improve the balance between creating an accessible paper while also providing scope to stretch the ablest students • Opportunity to clarify the scope and role of CBSE personnel, including responsibilities and rules in item and paper development to facilitate consistency in design • Quality assurance procedures can be strengthened to increase the reliability of the Standard X exams, minimising predictability while optimising validity • Opportunity to review and further develop the CBSE syllabi to ensure a closer connection with the assessment itself, including the integration of subject-specific skills.	• Perceived resistance to reform from subject experts, item writers, paper setters • Resistance of teachers and parents to competency-based approaches • Broad spectrum of student backgrounds, needs and abilities taking the Standard X • Lack of understanding among stakeholders of CBE related reforms which may impede clear communication and foster resistance among certain groups when introducing changes to the syllabus / assessment based around CBE • Perceived variation in teachers marking practices absence of standardisation for internal assessment on a system-wide scale • Increasing weighting on internal assessment, in the absence of external moderation, may impact overall reliability on a qualification level.

Challenge 1: Perceived resistance to CBE approaches from subject experts/item writers/paper setters

A key point raised by the Head of CBSE is the ongoing challenge of balancing the need for autonomy of the item writers with the need for consistency in the development of items and papers. Indeed some resistance has already reportedly been felt by CBSE management in introducing changes to the format of the exam thus far, and the prospect of making further changes or introducing guidelines or rules for item writing may be problematic, given the embeddedness of traditional practices and procedures and mindset of item writers and examiners and the value placed on academic autonomy and judgement.

Addressing this particular challenge, establishing and maintaining clear lines of communication to all levels of CBSE staff would be important, including guidelines / rules for item development can be introduced with clear explanation as to how they benefit the reliability / validity of the assessment, and ultimately the end-users – the students taking the exams. This reflects the intention of the CBSE to move from a teacher- / examiner-centric system, to place the learner / examinee at the centre of the process, viewing the journey through the exam and the questions from the perspective of the student.

Likewise, clear recruitment policies for item writers, along with role profiles, are thought to be key, highlighting the requirement for flexibility as well as adherence to board guidelines. Performance

monitoring processes, to ensure adherence to guidelines and submission of items in accordance with guidelines would be important moving forward with the proposed reforms to the CBSE assessment system, ensuring the continued use and promotion of the highest performing item writers according to a clear set of criteria.

Capacity building and training built around developing items, tailored to the Indian context while at the same time ensuring the validity and consistency and their greater contribution to the assessment as a whole is recommended. Self-assessment, used by international exam boards, as highlighted below, could form part of this process, allowing item writers and examiners to reflect on their own performance.

Figure 93: Case study: Training and monitoring of item writers and examiners

Tailoring training needs to individual item writers / examiners is currently employed Pearson. In addition, Edexcel has implemented a self-assessment scheme where individual examiners judge their own performance annually and highlight any training needs or further guidance they require. Edexcel GCSE examiner self-assessment schemes are used to help with the monitoring and evaluation of their performance[8].

These various reporting mechanisms help recognise good work, identify possible examiners for promotion opportunities, address any training needs and prevent any re-use of failing examiners / item writers who do not adhere to guidelines when developing / marking questions.

Challenge 2: Variation in teacher mindset and perceived resistance of teachers and parents to competency-based approaches

Resistance from teachers and to some extent parents has been cited by CBSE management team and teachers as a potential barrier to implementing CBE approaches on a wider scale within the timeframes envisaged by CBSE. For example, teachers may continue to favour the use of traditional teaching methodologies, prioritising teacher-centred approaches to teaching and learning. Furthermore, it was noted that changes to assessment may be viewed with reservations by teachers who are familiar with “teaching to the test” methods of preparation.

Potential solutions include developing and disseminating of additional support materials to explain changes in assessment in a readily understandable way, including the benefit to teachers and students of outcomes-based approaches to learning, teaching and assessment. Support materials could be used to accompany CBSE curricula, SQP and sample mark schemes to highlight key features of assessment and the techniques teachers can use best prepare students. As mentioned previously, examiners reports could be one such resource that could be of great assistance to teachers and students.

8

QCA, 2008. Review of Question Setting and Senior Examiner Training for GCSE. [pdf] Published by: QCA. Available at: <https://dera.ioe.ac.uk/9401/1/QCA_08_3581_Question_paper_setting_and_examiner_training_report.pdf>.

In the mid-longer term, policy changes involving adapted teacher training standards and programmes at college level to better prepare teachers to provide student-centred teaching in line with CBE approaches would be important, although it is understood that these would likely need to be supported and implemented at a national level as well as at board level.

Implementing changes to assessment was mentioned in principal focus group meetings as giving the impetus for reforming teaching approaches in the short term, although in order to facilitate these changes, teacher training is also thought to be of paramount importance in tandem with changes in curriculum and assessment.

Figure 93: Case study: Training and monitoring of item writers and examiners[9]

In 2015, following the reforms introduced in the UK GCSEs, exam boards have published teacher support materials to explain changes to assessment and identifying teaching needs to inform teaching and deliver to best prepare students for the exams. For example, Pearson has a separate webpage for teacher support including the following guidance materials:

- Interactive schemes of work
- Teaching guides
- Course planners
- Topic booklets
- Assessment guides
- Sample assessment materials
- Examiners reports
- Exemplar student scripts at different levels of achievement (not only high grades)
- Results plus (…a free online results analysis tool for teachers that gives detailed breakdown of… students' performance in Edexcel exams)
- Exams wizard (An online resource containing a large bank of past paper questions and support materials to help teachers create mock exams and tests)

Challenge 3: Current capacity of Standard X teachers to provide outcomes-based delivery, reflecting current and past limitations in the teacher training system

A key challenge identified during the principal focus group meetings and reflected by the CBSE management was the current capacity of teachers, based on perceptions of their existing skill-set. As acknowledged, a number of older teachers will have been trained in traditional forms of delivery and be familiar with assessment which places emphasis on teaching knowledge and understanding and less on encouraging higher

9 Pearson, 2020. GCSE Teaching Support. [pdf] Published by: Pearson. Available at: <https://qualifications.pearson.com/en/qualifications/edexcel-gcses/sciences-2016/teaching-support.html>.

order thinking skills development. For languages, some teachers expressed concern regarding their own levels in English.

Tailored in-service teacher training on student-centred, outcomes-oriented approaches could be provided to focus primarily on encouraging collaboration between teachers via peer review and self-evaluation. Such methods have proved to be successful on a smaller scale in Armenia, with the introduction of the outcomes-based Araratian Baccalaureate programme. There the teacher training has focussed on developing teachers' key skills for delivering student-centred, learning outcomes-oriented curricula with focus on feedback. Teacher development promotes collaboration among teachers to share approaches among themselves, reflective teaching practice and feedback on observations.

Challenge 4: Broad spectrum of school and student backgrounds, needs and abilities

In terms of delivery, the breadth of student backgrounds and abilities is acknowledged as an ongoing challenge, compounded by reportedly large class sizes and resource limitations in some schools. In some cases, this will also mean that students are learning multiple languages at the same time which may overburden them cognitively.

General support on differentiation approaches should be considered in order to assist the teacher in planning according to individual student abilities and needs. However, introducing changes to assessment on a broad scale will affect students of all ability levels and backgrounds given lower levels of familiarity with other models of assessment, and in view of the variations in school type, background, regional as well as linguistic differences between students within the cohort.

So far, the proposed changes and introduction of HOTS question has reportedly been met positively by students, in contrast to teachers and parents who anecdotally may ascribe to more traditional types of assessment. Nevertheless, the overall readiness of students to respond well to competency-based assessments would appear to be low. Indeed, scores in the national student achievement tests reflect a poor overall performance in maths and science as well as English (only 35% of students passing from the highest ability cohort). Engagement with teachers and students during the in-country visit also revealed some degree of difficulty experienced by students, particularly those with lower-level language abilities, with competency-based questions which may place additional demands on reading comprehension.

Addressing these concerns, alongside measures to improve understanding of competency-based approaches and how to implement them among teachers, student-centred support could also be devised to facilitate clear communication to students on expectations regarding new assessment methods and learning required to succeed in these assessments. Further guidance could supplement the available materials such as the SQP and mark schemes.

Typically, in other national exam systems, when changes are introduced to assessment, it is the role of the examining body to ensure that these changes, and the preparation required to meet the changes, are clearly communicated in an accessible and easy to understand manner from the perspective of the student. The following case study highlights how Student Guides can include a broad range of support to assist students of varying abilities:

Figure 95: Case study: Communicating changes to assessment including new types of question and the learning and preparation materials required to meet the expectations

UK awarding bodies such as Pearson issue a Student Guide to Assessment which outlines the key facts on the scheme of assessment and the support materials available from a student's perspective. The different sections of the student guide include the following:

- User friendly introduction highlighting the value of the subject
- Schedules for self-study
- Revision guidance
- Types of question to be found in the exams and tips on preparation.

Challenge 5: Perceived variation in teachers marking practices absence of standardisation for internal assessment on a system-wide scale

The value and potential of the internal assessment component for providing a more well-rounded and

flexible system of assessment was widely acknowledged among the groups interviewed. The schools visited and focus group meetings with principals and management staff highlighted the potential to assess a broader range of skills, including the interdisciplinary skills and transferable skills that are important for further progression through secondary education and future employment.

Nevertheless, a key theme that arose in a few meetings with teachers and principals were the perceived differences in teachers' marking of student work within and between schools in the absence of guidelines and moderation practices for the internal assessment. Although the significance of the issue was debated (given that the internal assessment is currently only weighted at 20% and therefore is not as high stakes as the board examination), the lack of standardisation is a potential issue in implementing a fully flexible model of competency-based evaluation and more pertinent if the percentage allocation were to be increased or extended to Grades 11 and 12. For languages, this has a further implication in terms of overall development of proficiency levels across the four skills, as listening and speaking are only assessed internally.

A further challenge that other systems have faced with internal assessment is the perception of grade inflation and potential for plagiarism when internal assessment is combined with external assessment, forming part of the overall summative assessment contributing towards the final grade for the subject. In order to safeguard standards and retain confidence of stakeholders in the event of increasing the weighting above 20%, it would be particularly important that sufficient quality assurance mechanisms are in place to ensure consistency of the marking and reducing the risk of plagiarism with portfolio work.

CBSE could consider retaining the 20% contribution to the overall Standard X grade but could provide further guidance to teachers in terms of level descriptors and task guidelines to facilitate more standardised approaches to internal assessment. Noting that external moderation is likely to be difficult to implement in the CBSE system due to administrative challenges and volume, a secure system of internal moderation may be recommended, with reference to best practices as follows:

Figure 96: Case study: Internal standardisation of assessment[10]

UK awarding bodies such as Pearson issue a Student Guide to Assessment which outlines the key facts on the scheme of assessment and the support materials available from a student's perspective. The different sections of the student guide include the following:

- User friendly introduction highlighting the value of the subject
- Schedules for self-study
- Revision guidance
- Types of question to be found in the exams and tips on preparation.

10

Cambridge Assessment, 2015. The moderation of coursework and controlled assessment: A summary. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeassessment.org.uk/Images/465779-the-moderation-of-coursework-and-controlled-assessment-a-summary.pdf>.

Challenge 6: Lack of awareness and understanding among teachers, students and CBSE staff over what is meant by CBE and CBE approaches in general

When interviewing teacher focus groups, CBSE subject experts and management staff, there were variations in their understanding of the term "competency-based education", reflecting a general lack of consistency in stakeholder understanding in many cases. This may reflect the general lack of clarity of the term in international literature, particularly in view of how competency-based approaches are integrated into assessment at K12 level secondary education, with many systems applying the concept of competency-based education in vocational and technical education but less explicitly so in secondary school academic education.

In this context, CBSE may want to reconsider using the umbrella term "competency-based education" when introducing changes to assessment, and in particular when communicating and explaining these changes to teachers, parents and students. Instead, it may be advisable to focus on promoting general improvements to quality, and introducing student-centred, outcomes-focused education and assessment when communicating with and offering support to teachers and students, terms which are more universally and positively understood and accepted both nationally and internationally.

Challenge 7: Scale of CBSE school network, assessment implementation and cohort size

The scale, including the cohort size of those taking the CBSE exams, is identified as a key overarching challenge when implementing changes to the CBSE assessment scheme, in particular relating to any changes affecting development and administration of the assessment. One area where teachers thought it could be beneficial to have a separate calculator paper for maths, however, to introduce a separate paper (i.e. to have two papers for maths) may prove to be challenging from a logistical perspective. Solutions to this issue may include splitting the three-hour exam paper, conducting two one and a half hour examinations, with clear directions on resources permitted on the front cover of both exams (calculator vs non-calculator).

Furthermore, as highlighted, conducting external moderation of internal assessment would pose a significant challenge from the perspective of CBSE being required to mark samples from every school within its network. Introducing standardisation may instead include setting up a system of internal moderation and standardisation, with processes and procedures defined by CBSE and training / workshops provided by CBSE staff.

8. Ways forward and key recommendations

The following section provides overarching recommendations, taking into account the Indian context, the capacity, short, medium and long term needs and priorities of CBSE moving towards a competency-based approach to qualification design, delivery and assessment.

It is understood that some of the changes discussed are achievable in the short term while others may involve a more incremental introduction and development over the mid-longer term. With CBSE timeline for introducing CBE approaches spanning five years, it is anticipated that the majority of these areas for development can be implemented given assistance in the form of training and capacity building on specific themes highlighted in the recommendations.

In terms of facilitating development of qualification design in particular, consultation with NCERT may be beneficial in order to enable a harmonised approach to curriculum design and development. To successfully implement necessary changes in assessment, policy changes may be required at board level whilst consultation can be sought with examiners, markers and subject experts on the merits of particular approaches.

There are seven overarching themes, relating broadly to the CBE principles, under which there are more specific recommendations which apply to development across one or more subjects.

Table 39: Summary of Overarching Themes

Number	Overarching Themes
CBSE Curriculum Design	
1.	Strengthening the validity and consistency of the syllabus design
CBSE Assessment	
2.	Facilitating the validity of assessment
3.	Developing assessment reliability and transparency
4.	Promoting fairness and the student experience
CBSE Teaching and Learning	
5.	Enhancing teacher and student support
6.	Developing pedagogy

Overarching theme 1: Strengthening the validity and consistency of the syllabus design

Recommendation 1a: In consultation with NCERT, increase engagement with employers and universities to align curriculum content and competencies with practical workplace requirements and to facilitate flexible progression pathways for holders of Standard X

While the science content was observed to broadly match international systems at the same level, a significant proportion of the mathematics content is observed to be theoretical in comparison to that of other observed systems. A reoccurring theme highlighted from the stakeholder engagement was the desire of teachers for more practical topics in mathematics to be taught and assessed.

A potential gap in skills identified is calculator and technology use which are typically not used at Standard X, with reliance on mental arithmetic. This differs with practice in other systems where calculator use is encouraged across numerous topic areas and required for advancement to further levels of study, thereby highlighting a potential skills-gap of Standard X students. From a competency-based angle, calculator use could also facilitate interdisciplinary applications of mathematics. In science, there may be additional scope for calculator use to enable broader application of mathematics across biological and chemistry topics as well as those in physics, reflecting international best practice.

It would be useful to understand for languages which of the four skills – reading, writing, speaking and listening – may be most significant in different working contexts to ensure that those skills can be built from Standard X, acknowledging that as a second language programme wider skills (analysis, reflecting on how meaning is conveyed) may not be a prime focus.

Recommendation 1b: Adopt subject-specific assessment objectives / question typology, detailing the range of general skills that are applicable to the subject in question

In relation to syllabus design, CBSE currently includes a Typology of questions which includes skills that are applied in the assessment across subjects. It is recommended, to reflect the standard practice of international exam boards, that these could be accompanied by or adapted to include subject-specific assessment objectives that outline skills specific to language, maths and science. This would potentially allow for a closer connection between the assessment design as stated in the syllabus and the skills assessed in the questions set for the exams. Review and development may involve considering whether all of the skills currently included in the Typology can reasonably be assessed at secondary level within the current scope of the board exam, i.e. feasibility of assessing skills of evaluation and

creating (synthesis) in board-set mathematics questions.

Recommendation 1c: Consider whether the competency-based model of language proficiency as developed by the CEFR may have relevance and application to the English Standard X context through consultation with key stakeholders and field experts

Articulating the key competences to be tested in top level or overarching aims and objectives would be an important development for the Standard X English Language / Reading and Hindi components. Aligning these to a well-recognised, competency-based framework such as the CEFR would aim to bring the syllabus in line with similarly focused language programmes internationally and allow a clear articulation of the expected outcome proficiency level. An overarching focus would be on integrating practical communicative competencies, allowing for development and assessment of skills across a wide range of real-life situations. Engagement with a wide range of stakeholders and English language experts is likely to form an initial stage to this process.

Overarching theme 2: Facilitating the validity of assessment

Recommendation 2a: Consider appropriate tailored training for item writers, focusing on the following themes:

- Accessibility, including formatting, layout, wording of questions in line with best practice guidelines
- Use of authentic source material for scenario-based questions
- Scaffolded questions, supported with clear instructions, to ensure clarity and accessibility yet also providing scope for assessment of higher order thinking skills and differentiation of student ability
- Use and integration of visuals and diagrams to aid clarity, promote problem solving and facilitate student engagement and motivation in the assessment.

Review of CBSE exam papers and comparative review of items in relation to international board exams revealed some inconsistencies in design and format, potentially impacting on how accessible the questions are to a broad range of candidates.

Furthermore, it was also observed that a high number of questions are similar to those appearing in NCERT textbooks in math. Whilst it is acknowledged that the exam should provide an assessment of student's core knowledge and understanding of learnt material, by integrating features similar to previously encountered questions and solutions, the exam questions become predictable leading to very high scores by candidates who possess good recall and memorisation abilities. Training item writers to ensure that the wording of the questions and context are sufficiently different from those featuring in the textbooks and previous exams would be important to reduce negative predictability and reliance on recall.

A focus on integrating novel scenarios, utilising authentic datasets, devising fresh questions and wording, and using a range of command words focused on the intended target skills would be beneficial to facilitate the assessment of higher order thinking skills.

Recommendation 2b: Compile a glossary of command words as a guide for item writers, students and teachers, to clarify expectations of questions using particular action verbs in the exam papers

While it is acknowledged that command words can vary in terms of the skills and knowledge assessed by different types of question, a glossary with general definitions may be of benefit to provide additional transparency on expectations to a broad range of stakeholders. A glossary may also be a valuable reference to item setters to enable consistency of approach in developing questions of varying levels of cognitive demand while maintaining some level of flexibility.

Recommendation 2c: Engage language consultants in the item writing and paper setting process

To facilitate accessibility of the questions set for the CBSE exams, it may be beneficial to engage an assessment consultant with English / Hindi language and item writing expertise to work with individual item writers and to verify and edit the language prior to compiling the final papers. Ensuring clarity of the questions would help promote accessibility and validity by ensuring that the focus of the question is on the intended target skills and knowledge and less

on reading or language comprehension. Checklists that focus on language, including conciseness and accuracy could be more widely adopted across all subjects in the paper setting process. This recommendation applies across all subjects.

Recommendation 2d: Consider the use of tracking databases in the development of items and paper setting

As used in the development of GCSE examination papers, tracking databases can be employed to cross reference items within exams as well as with external sources such as previous questions in textbooks, online or previous exam series to ensure there is no duplication or overlap in terms of wording of the questions and / or scenarios presented. It is thought that use of tracking databases could greatly enhance validity by ensuring that there is also no overlap of questions, content and skills across individual papers and the item writing and paper setting processes can be monitored to ensure correspondence with the design specification.

Recommendation 2e: Support training, monitoring and progression, establish role profiles for item writers and paper setters with clear expectations. Supplement with guidelines for item and paper development in line with the CBSE syllabus

As discussed, role profiles and guidelines could be used to ensure clarity on the expectations of item writers and paper setters roles and responsibilities. Guidelines could provide greater support and transparency in establishing the key features of high-quality items intended to assess varying skills and levels of demand.

Recommendation 2f: Facilitate examiner reporting processes and consider publishing integrated examiner reports with item level qualitative analysis and recommendations

It is acknowledged that item level analysis is currently conducted, although it is not clear whether qualitative trends in performance on specific item types are reported and the reasons explored for variations in student performance on specific questions. Enhanced examiner reporting internally could be beneficial for continued review of validity of the exam and inform the design process.

Furthermore, a published examiner report, commenting on strengths and weaknesses, recommendations to enable future preparation for the exams, may enable greater stakeholder transparency and overall performance of future cohorts.

Overarching theme 3: Assessment reliability and transparency

Recommendation 3a: Consider tailored training for paper setters on mark scheme design and implementation to facilitate flexibility and consistency of the marking process

Tailored training on mark scheme development could assist the development of CBSE mark schemes in tandem with questions, ensuring that clear link is made between the allocation of marks and skills targeted by the question. Training on facilitating flexibility in marking approaches would cover the provision of additional guidance to examiners in terms of alternative answers to accept or reject as well as differentiating between method and accuracy marks in mathematics in a standardised manner. It is suggested that training could be subject-specific, recognising the differences in marking methodologies employed across the sciences, maths and languages.

In languages, consideration could be given to introducing analytic mark schemes that enable finer differentiation between levels of response, particularly in questions assessing writing productive skills. Examples have been discussed in Section 6 of this report.

Recommendation 3b: Consider reducing the number of question options or choice in maths and science in Standard X examinations

Including a high degree of optionality (up to 33% of the marks) may impact the reliability of the exams, specifically their ability to test fairly and differentiate according to a consistent set of competencies. In subjects like maths and science, which use a high number of shorter questions on different topics, options can lead to an imbalance both in terms of the skills, knowledge and level of demand. This may impact the reliability of the assessment as a whole. In languages, optionality of productive skills without

accompanying mark schemes may lead to different examiners awarding different competences across the options.

It is understood that question choice may be of benefit acknowledging that students have strengths and weaknesses in different areas and have to prepare a vast range of topics from two years of study. Nonetheless, it is thought that reducing the optionality component may be counterbalanced by increasing the accessibility of the exam papers and the use of structured questions.

Optionality could remain a key part of the internal assessment, whereby students are given the opportunity to select from a range of topics to focus on for portfolio / project work, increasing student engagement and autonomy by allowing students to pursue topics of personal interest.

Recommendation 3c: Provide additional guidelines and assessment criteria for internal assessment component, tailored to subject-specific and task requirements

There is scope for the CBSE to develop and include within the subject syllabi, assessment criteria for the internal assessment component. The development and application of assessment criteria for the assessment of portfolio, practical and investigative work would aim to provide a standardised approach to assessed skills and levels of performance, whilst maintaining flexibility and autonomy of teachers in evaluating students' work. Allied to the use of assessment criteria, meetings including interactive webinars and workshops could facilitate internal marking and internal standardisation processes, in reference to best practice examples.

Recommendation 3d: Consider implementing external moderation quality assurance procedures for the internal assessment, in the event of considering an increase above the current 20% weighting

In the absence of standardisation procedures, the current system in place may not support an increase in the weighting of internal assessment above 20%. In the event of increasing the percentage contribution of the internal assessment above 20%, it would be important to ensure sufficiently robust quality assurance processes are in place to facilitate stakeholder confidence in standards. This could entail a system of external, board level moderation of student assessed work as well as internal moderation. Furthermore, it would be important to ensure clear policies and controls, potentially using software, to combat plagiarism.

Overarching theme 4: Fairness and the student experience

Recommendation 4a: In relation to equity of assessment and with a view to promoting student engagement in the case of mathematics, explore the possibility of aligning standards between the Basic and Standard Mathematics

Potential issues were raised during teacher focus groups surrounding the perceived value and stakeholder recognition of the CBSE Basic Level Maths, as well as the motivation and confidence of the students opting for it instead of Standard Level. Recognising significant differences in mathematical ability across the cohort, CBSE may want to consider ways of equating the highest and lowest levels of achievement it the Basic and Standard level maths respectively.

A number of international board exams use tiering (Foundation and Higher tiers) in order to promote equity and engagement of lower ability cohorts, by incorporating an overlap between the grades / levels of achievement assessed in each tier. This gives less able students the opportunity to gain a passing score on the lower tier and is achieved by question alignment, inclusion of a set number of questions aimed at the middle grade across each tier.

Recommendation 4b: Reconsider the current structure of the exam papers, particularly those in maths and science, increasing scope for flexibility of question type and mark allocation throughout the papers

Some of the limitations of the current structure of the CBSE exams may impact the potential for a fully flexible competency-based assessment of knowledge and skills at Standard X. In particular, the papers are divided into sections based on mark allocation, not necessarily level of difficulty of the questions. CBSE may want to consider the approach taken by international exam boards, particularly in the sciences, by incorporating structured questions which include more accessible starter sub-parts and increase with difficulty as the student progresses

through the paper.

In terms of question types, it is recommended that the use of multiple-choice questions be reviewed, and any proposal to increase the number of multiple-choice questions carefully considered in light of the envisaged challenges analytical multiple-choice questions pose in terms of design and development. High quality multiple-choice questions targeted at analysis can require greater resources and pretesting to develop and as such typically are not found in the international secondary level exam board assessments reviewed. More typically multiple-choice questions aimed at higher order thinking skills are found in higher level professional examinations. It may be more feasible, from an item writing and paper setting perspective to continue setting a limited number of multiple-choice questions to assess knowledge, understanding and basic application as per the practice of other international exam boards, whilst using free-response only questions to assess the higher order thinking skills, as is more in line with international standard practice at secondary level.

In English and Hindi, where multiple-choice questions can be used to assess reading comprehension, it would be important to ensure that distractors are rooted in the input texts and well-constructed to ensure they test the appropriate competences.

Overarching theme 5: Enhancing teacher and student support

Recommendation 5a: Building a databank of competency-based questions as an internal and external resource to guide item writers and paper setters

The idea of an item bank of suitable questions would be of value when training prospective item writers, examiners internally. A certain proportion, including those already used in examinations, could be disseminated more widely to students and teachers to aid preparation.

However, the use of question bank items for future high stakes board exams would be discouraged due to the possibility of prior familiarity, potentially advantaging some students and disadvantaging others, affecting overall reliability of the examination. It is recommended that all questions, including those common topic areas focused on knowledge and conceptual understanding, are designed using fresh approaches and wording which does not directly mirror that of previous papers or textbooks.

Recommendation 5b: Addressing on a system-wide level in implementing CBE on a system wide level, provide support and guidance documentation to the following groups of stakeholders:

- **A teacher guide to facilitate understanding of changes to assessment, guidance on how best to prepare students**
- **A student guide written to set out expectations and talk the student through the main types of questions included in the exams**

Engagement with the key stakeholders i.e. teachers and students would be important in developing support guides that suitably address the concerns surrounding the inclusion of new higher order thinking skills questions and changes to question paper format and any necessary changes in approach to teaching and learning that may be involved to best prepare students.

CBSE may want to consider tailoring each handbook to the specific audience, including student /teacher centric terminology, as well as suitable approaches to highlight the wider benefits of the changes to teachers and students (better progression opportunities, wider range of skills and greater flexibility) to promote engagement in students and endorsement and support from teachers.

Overarching theme 6: Developing pedagogy

Current weaknesses in teacher training systems have been acknowledged, as such it is recommended to build the capacity of teachers to implement CBL approaches. In-service approaches could draw heavily on successful approaches used in other systems, albeit having been used on a smaller scale. In particular, approaches which emphasise collaboration between teachers, peer reviews and observations as well as self-reflection approaches could be extremely beneficial. Following piloting at a small number of schools, such approaches have the potential to be rolled out across the country and used across a broad range of schools.

FINAL REPORT APPENDICES

Appendix 1: CBE overview

Based on a review of relevant literature, this section provides a general overview of what constitutes competency-based education, including how competency-based approaches are reflected in qualification design, teaching and learning as well as assessment.

Context and background

Whilst acknowledging that there is no single global definition or unifying framework for CBE, an overarching principle highlighted in the literature reviewed is that competency-based education focuses on the student's demonstration of learning outcomes as central to the learning process.[1] CBE has traditionally been applied to design, delivery, and assessment of professional, vocational, and skills-based education and training, arising from a need to ensure that training is in balance with the needs of society and the labour market. Focusing on workplace proficiency and employability, initiatives have sought to link competencies developed within vocational training programmes with the skills required to carry out tasks of a particular vocation in the workplace. Moreover, within academic Higher Education settings competency-based approaches have been interpreted with a view to ensuring employability and transferable skills of graduates.

Representing a departure from teacher-led content mastery approaches to curriculum design and delivery, competency-based approaches in recent years have become increasingly becoming embedded within school-based academic education alongside the concept of "mastery learning". As in vocational education, there is a similar emphasis on designing learning outcomes-oriented school curricula, while also developing the necessary skills and knowledge for progression and defining and assessing the competencies required for further academic success.[2]

The Aurora Institute developed and updated the following definition of high-quality CBE in the context of K12 education as follows:

- "Students are empowered daily to make important decisions about their learning experiences, how they will create and apply knowledge, and how they will demonstrate their learning.
- Assessment is a meaningful, positive, and empowering learning experience for students that yields timely, relevant, and actionable evidence.
- Students receive timely, differentiated support based on their individual learning needs.
- Students progress based on evidence of mastery, not seat time.
- Students learn actively using different pathways and varied pacing.

1
Yelena Butova, 2015. The History of the Development of Competency-based Education. [pdf] Published by: EU Scientific Journal. Available at: <eujournal.org › index.php › esj › article › viewFile>.

2
INACOL, 2018. Competency-based Education Quality Principles Book . [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

- Strategies to ensure equity for all students are embedded in the culture, structure, and pedagogy of schools and education systems.
- Rigorous, common expectations for learning (knowledge, skills, and dispositions) are explicit, transparent, measurable, and transferable."[3]

Whether "mastery" should be an expected or required aspect of CBE at secondary level and in what context has been debated in CBE related literature, nevertheless the working definition highlights a number of key themes of quality CBE which can apply across systems within the context of lower and upper secondary school academic education and can be considered in the following sections on curriculum design, teaching and learning and assessment.

Curriculum design

2.1 General

Learning outcomes based qualification design has become an integral feature across international systems at secondary level, a commonly shared CBE principle that emerges from comparative studies of CBE in different systems is that learning outcomes should be clearly defined, measurable and directly linked to the assessment.[4] In this sense, it is understood that learning outcomes should specify command words, i.e. action verbs which specify the key skills which students are expected to develop and be able to demonstrate on completion of the programme of study. There is some debate and variation across education systems in CBE as to the level learning outcomes should be written at and what proportion of the learning outcomes can be expected to be met by groups of learners. The general consensus is that learning outcomes should describe the range of skills a typical student should achieve,[5] rather than the minimum or threshold level, while qualification aims can describe desired skills and attributes for a programme in more aspirational terms that are less subject to direct measurement.

Competency-based curriculum development has involved the design of overarching learning outcomes that incorporate reference to skills taxonomies such as Blooms Taxonomy.[6] Higher order thinking skills, including analysis, evaluation and synthesis, are designed to stretch secondary level students to develop the cognitive skills for further progression onto more advanced level study. Successful CBE approaches have nevertheless recognised the need for accessibility and balance in the definition and weighting of learning outcomes,[7] incorporating skills which vary in terms of their stage of cognitive level and allow for development of a range of skills that reflect learners of a wide range of ability levels and learning styles.

Subject content and developing mastery of the prerequisite knowledge nevertheless remain key components of curriculum design, the key best practice principle being that the breadth and depth of the content/topic areas should ideally facilitate the development of the prescribed overarching learning outcomes in CBE oriented approaches. A core principle in the design of CBE curricula is that it should be grounded, where possible in real-world contexts, allowing for coverage of topics which highlight the relevance to employment and daily life.[8] Reflecting a holistic approach to qualification design, the inclusion of interdisciplinary content also reflects the competency-based approach,

3
Competency Works, 2019. What is Competency-based Education - An Updated Definition. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/what-is-competency-based-education-an-updated-definition-web.pdf>.

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INACOL, 2018. Competency-based Education Quality Principles Book. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

5
NILOA, 2020. A New Decade for Assessment: Embdedding Equity into Assessment. [pdf] Published by: National Institute for Learning Outcomes Assessment. Available at: <https://www.learningoutcomesassessment.org/wp-content/uploads/2020/01/A-New-Decade-for-Assessment.pdf>.

6
Richard A Voorhees, 2014. Working with Competency-based Learning Models. [online] Available at: <https://www.academia.edu/7021970/Working_with_Competency-Based_Learning_Models> [Accessed April 2020].

7
Richard A Voorhees, 2014. Working with Competency-based Learning Models. [online] Available at: <https://www.academia.edu/7021970/Working_with_Competency-Based_Learning_Models> [Accessed April 2020].

which allows students to establish links between and within subject domains.[9]

Following the development of 21st-century skills frameworks, there has also been a focus on integrating 21st-century skills or alternatively, core or transferrable skills within secondary level qualification design, with explicit links to core skills such as numeracy, literacy, social and emotional skills development. Moreover, global citizenship and developing global literacy embedded within 21st-century frameworks to enable learners to be competent not only in the national context but also in the international labour market; hence the term "global competence".[10] 21st-century skills have been incorporated or mapped at a subject level, for example, the US State Core standards for maths and English[11] set out standards which link subject-specific outcomes with core 21st-century skills specified on the ACT21 framework. A further example, in which transferrable skills have been mapped across to subjects, the Pearson mapping of science, English and mathematics GCSE specifications to the NRC international framework of 21st-century skills. The development of 21st-century skills can also be explicitly integrated through skills-based courses such as project-based learning, career-related studies or research-oriented activities or Critical Thinking programmes.

2.2 Maths

In mathematics, competency-based approaches to qualification design have emphasised the development of general mathematical competencies alongside subject-specific skills which relate to those relevant to particular topic areas.[12] Examples of general competencies can, for example, include developing skills of mathematical communication, logical deduction and induction in mathematical contexts, problem-solving, mathematical modelling and translation of real-life situations as well as cross-disciplinary and transferrable skills involving the use of technology, including ICT, in mathematical problem solving.

Moreover, in the qualification design and delivery of competency-based mathematics programmes, inquiry approaches[13] have been integrated within the qualification design level. These approaches are most apparently expressed through learning outcomes and the inclusion of tasks which focus on practical and investigative mathematics, also allowing scope for solving less structured and/or extended problems which draw on and develop higher order thinking skills of analysis and synthesis at a subject level.

2.3 Science

In the context of science, competency-based approaches to qualification design are evident through the adoption of the learning outcome approach which, similar to mathematics, may include the development of general scientific skills and cognitive abilities relevant to science at a qualification level, and specification of more subject-specific learning outcomes at a topic level.

In tandem with outcomes-based approaches, internationally, there has been a strong observable emphasis on integrating practical scientific skills across all sciences. Practical science and associated competencies

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INACOL, 2018. Competency-based Education Quality Principles Book . [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

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INACOL, 2018. Competency-based Education Quality Principles Book . [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

10

Irenka Suto and Helen Eccles, 2014. The Cambridge Approach to 21st Century Skills. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeassessment.org.uk/Images/461811-the-cambridge-approach-to-21st-century-skills-definitions-development-and-dilemmas-for-assessment-.pdf>.

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http://www.corestandards.org/

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Mogens Niss, 2020. Mathematical Competencies and the Learning of Maths. [pdf] Published by: IMFUFA, Roskilde University. Available at: <http://www.math.chalmers.se/Math/Grundutb/CTH/mve375/1112/docs/KOMkompetenser.pdf>.

13

Aalborg University, Department of Education, Learning and Philosophy, 2017. Inquiry-based learning in mathematics education: Important themes in the literature. [pdf] Available at: <https://www.mnd.su.se/polopoly_fs/1.333730.1495454237!/menu/standard/file/Dreyøe_Moeskaer%20Larsen_Dreier%20Hjelmborg_Michelsen%20and%20Misfeldt_%20Inquiry-based%20learning%20in%20mathematics%20education%20Important%20themes%20in%20the%20literature%5B1%5D.pdf>.

help to strengthen the link made in school curricula between real-world applications of science and traditional scientific theory-based learning.[14] Moreover, practical skills development also allow scope for developing higher order thinking skills highlighted in Bloom's taxonomy, particularly in reference to the skills of planning, predicting, analysing and evaluating scientific / experimental data, taken from authentic sources and real-life experiments, synthesising scientific arguments and evaluation.[15]

Furthermore, cross-disciplinary linkages are developed across competency-based education systems through learning outcomes which make reference to exploring the impact of scientific advances, by considering social, environmental and technological effects of particular processes and discoveries.

Teaching and learning

Whilst delivery is not a key area of research for the document review of this project, it will relate to subsequent stages and be reviewed in the context of the fieldwork to guide the development of criteria used to evaluate delivery in the lesson observations.

A general principle of CBE oriented delivery, as highlighted in the Aurora Institute Competency Works Initiative definition of CBE, comprises student-centred learning, with a focus on the teacher empowering the students to learn actively and engagingly, supported by feedback[16]. Whilst traditional methods have emphasised the role of the teacher as the imparter of knowledge, and subsequently place emphasis on lecturing, dictation and drilling as techniques of classroom delivery, CBE seeks to place the student at the centre and actively engage the student in the learning process.[17]

In practical terms, CBE delivery is facilitated by the development of lesson plans based on learning outcomes, and the sharing of learning outcomes with students at the outset to ensure mutual understanding of expectations. While the teacher acts as a facilitator in such lessons, competency-based delivery advocates the importance of student-focused approaches including pair work, group work and student practice without step-by-step instruction by the teacher. Student engagement can be facilitated by real-world application problems or tasks set by the teacher as well as linkages made explicit in teacher explanations of theoretical concepts.

Equity,[18] whereby each student is given the opportunity to learn is a further CBE principle. Equity is supported by differentiation which involves the adaptation of tasks for different learners with varying styles or ability levels. Although all students would be expected to attain the learning outcomes on completion, delivery methods in lessons should account for and build in support to students to attain outcomes at their own pace. Whilst accounting for variations in ability levels in classes, the use of stretch questions and discussion work initiated by the teacher is a further feature of CBL delivery intended to engage students and develop higher order thinking skills which go beyond knowledge and understanding.

The use of formative assessment, particularly elements of peer and self-assessment are key characteristics of competency-based

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INACOL, 2018. Competency-based Education Quality Principles Book. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

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INACOL, 2018. Competency-based Education Quality Principles Book. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

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INACOL, 2018. Competency-based Education Quality Principles Book. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

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INACOL, 2018. Competency-based Education Quality Principles Book. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

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INACOL, 2018. Competency-based Education Quality Principles Book. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/Quality-Principles-Book.pdf>.

approaches, where students are encouraged to reflect on their own workand identify areas for improvement. As well as benefiting the student, CBE also emphasises the value to the teacher in being able to provide feedback on the effectiveness of delivery methods, informing changes / improvement in approach relevant to the individual learning style of the student.

Assessment

Robust and valid assessment, allowing for evaluation of the full range of learning outcomes can be considered a core feature of good practice in CBE summative assessment. Data driven, CBE oriented summative assessments should accurately gauge the extent to which the student can demonstrate the learning outcomes, including the key skills and knowledge on completion of the programme. Precision[19] in the design of assessment tools is valued in CBE, while the use of different assessment methods can improve validity by providing multiple opportunities for students to demonstrate the learning outcomes, and also support a further principle of CBE assessment that it should be considered comprehensive.[20] Balance and coherence in effective assessment also link back to best practice in qualification design, allowing for different skills and knowledge to be assessed across the curriculum.

Assessing the application of knowledge and skills to real-world contexts can be observed as a key feature of CBE assessment systems which concern themselves with real world performance. The design of assessment questions and tasks grounded in the real world seek to evaluate real world competency. To achieve this, authentic problems which draw on real-life data and source material can be used.[21] Assessment items linked with the real world also provide scope for innovation and engaging the student. The success of this depends on making the link to the real world explicit while minimising ambiguity and promoting the validity of assessment items in terms of the accuracy with which teachers assess the learning outcome(s) they are intended to assess.

Synoptic assessment is a further key feature of competency-based assessment and one that is becoming increasingly prioritised at secondary level, as it encompasses the use of assessment tasks/ questions which seek to assess multiple learning outcomes and/or topic areas from across the curriculum. Synoptic assessment tasks can enhance validity by reducing the need for separate questions as well as contribute towards raising the overall robustness and demand[22] of an assessment by drawing on varying cognitive processes.

Assessing knowledge transfer from across different domains, i.e. Interdisciplinary application, is a further feature of competency-based assessment, which reflects the idea that knowledge can be transferred across domains. Assessment which focuses on connections between topics within the same subject is more commonly reflected in competency-based assessments at secondary level, although forms of project-based and portfolio assessment may integrate knowledge from across disciplines.

Competency-based assessments should be designed to be equitable,[23] enabling evaluation of a wide range of ability levels of the target group of

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Aurora Institute, 2017. How Systems of Assessment Aligned with Competency-based Education can Support Equity. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/how-systems-of-assessment-aligned-with-competency-based-education-can-support-equity-jan-2020-web.pdf>.

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Aurora Institute, 2017. How Systems of Assessment Aligned with Competency-based Education can Support Equity. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/how-systems-of-assessment-aligned-with-competency-based-education-can-support-equity-jan-2020-web.pdf>.

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Pearson, 2016. Defining Competencies and Outlining Assessment Strategies for CBE Programs. [pdf] Published by: Pearson. Available at: <https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/pearson-ed/downloads/INSTR111428_CBE_Assessment_WhtPaper_WEB_f.pdf>.

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Paul Newton, 2018. Grading Competence Based Assessments . [pdf] Published by: Ofqual. Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/755765/Grading_competence-based_assessments.pdf>.

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Aurora Institute, 2017. How Systems of Assessment Aligned with Competency-based Education can Support Equity. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/how-systems-of-assessment-aligned-with-competency-based-education-can-support-equity-jan-2020-web.pdf>.

students, which at secondary level comprises a countrywide cohort between the ages of 15 and 16. Use of assessment tasks (questions) pitched at varying levels of demand, scaffolding in certain questions in external, and consideration given to the sequence of tasks, question and/or question sub-parts depending on the subject allow for fine differentiation in terms of the level of skills and knowledge. Maintaining a balance between accessibility on the one hand and providing opportunities to demonstrate higher order thinking skills on the other is one of the aspects to consider in design of competency-based secondary school level assessments.[24]

Internal assessment has become an increasingly used method of assessment in systems which incorporate CBE approaches arguably allowing for a more comprehensive assessment. It may allow for a broader range of assessment evidence to be evaluated as well as supporting the principle of an equitable assessment by engaging a broader range of learning styles. Moreover, internal assessment can allow for autonomy and creativity, assessment of skills such as unstructured problem solving, extended investigation and research; elements which are difficult to assess through controlled examination conditions.[25] The challenge associated with internal assessment principally concerns standardisation, thereby impacting the comparability of assessed student outcomes between students, schools and regions which can be addressed by external moderation and the application of criterion approaches.

Marking approaches

The overall effectiveness of CBE oriented assessment frequently depends on the validity of the marking approaches[26] and how well they are able to assess the prescribed competencies. The use of levels based descriptors is considered important in the evaluation of complex, unstructured tasks such as extended questions in summative examinations. In this respect, assessment criteria can be applied in a consistent approach across similar questions, assessing how well the candidate/student has succeeded in achieving the learning outcomes.[27]

Positive marking and a focus on awarding credit for strategy in the form of method marks as well as accuracy marks are considered best practice in the assessment of maths and science. This marking approach reflects the CBE principle of promoting the accessibility of assessment, and of measuring and recognising the extent of the learning outcomes that students can demonstrate in practice. Marking approaches which contain an explicit link to the learning outcomes or the assessment criteria they seek to evaluate are similarly important, as is an emphasis on assessing sequenced reasoning while allowing flexibility for alternative methods and/or responses which meet the prescribed outcomes.[28]

In terms of overarching grading systems within competency-based assessment models, an important consideration is determining an approach which best differentiates between varying levels of performance. This enables grades to reflect how well the prescribed learning outcomes have been achieved by the student.[29] As such some systems have adopted overarching grade descriptors or pass-fail descriptors, describing the typical performance achieved by a student

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Mohamed and Lebar, 2017. Authentic Assessment in Assessing Higher Order Thinking Skills. [pdf] Published by: International Journal in Academic Research in Business and Social Sciences. Available at: <http://hrmars.com/hrmars_papers/Authentic_Assessment_in_Assessing_Higher_Order_Thinking_Skills.pdf>.

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Pearson, 2016. Defining Competencies and Outlining Assessment Strategies for CBE Programs. [pdf] Published by: Pearson. Available at: <https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/pearson-ed/downloads/INSTR111428_CBE_Assessment_WhtPaper_WEB_f.pdf>.

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Aurora Institute, 2017. How Systems of Assessment Aligned with Competency-based Education can Support Equity. [pdf] Published by: Aurora Institute. Available at: <https://aurora-institute.org/wp-content/uploads/how-systems-of-assessment-aligned-with-competency-based-education-can-support-equity-jan-2020-web.pdf>.

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Paul Newton, 2018. Grading Competence Based Assessments. [pdf] Published by: Ofqual. Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/755765/Grading_competence-based_assessments.pdf>.

28
Paul Newton, 2018. Grading Competence Based Assessments. [pdf] Published by: Ofqual. Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/755765/Grading_competence-based_assessments.pdf>.

29
Paul Newton, 2018. Grading Competence Based Assessments. [pdf] Published by: Ofqual. Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/755765/Grading_competence-based_assessments.pdf>.

attaining a particular grade or score in a particular numerical range. Whilst providing a useful guide in assessment development and standardisation processes, grade descriptors can provide a useful incentive to students in setting out the expectations for higher levels of performance. While less common in secondary assessment systems, threshold level descriptors can be used to provide an overall description of the typical level of skills and knowledge of the 'just qualified' candidate/student.[30]

Quality assurance

First and foremost, curriculum development and review processes in systems that use CBE and CBL approaches are characterised by their focus on ensuring the validity of the competencies and associated content coverage by engaging a wide range of relevant stakeholders including teachers, students, employers and higher education bodies. This allows the competencies agreed on to be reflective of what is necessary to progress in further education and employment in the 21st-century context.[31]

With the expansion and adoption of outcomes-oriented assessment within international education systems, there has been an increased focus on measuring and monitoring reliability and validity of assessment. Of particular concern to examining bodies is how effectively the assessment evaluates the range of competencies prescribed in the qualification design as well as how accurately the outcomes of assessment reflect performance and ability from cohort to cohort.

Measuring the reliability of assessment may include approaches which look at performance across papers and item-level analysis as well as qualitative feedback from examiners. Criterion-referenced assessment and standardisation approaches are commonly used across many systems that incorporate a CBE approach. The underlying principle is that grade thresholds draw on multiple criteria including grade descriptors, sampling of student responses, statistical comparison as well as expert opinion.[32]

Ensuring the validity of competency-based assessment involves developing assessments that include tasks/questions explicitly linked to prescribed learning outcomes and content (content validity). Numerous methods are used to ensure the process of assessment design reflects the scope of the syllabus, whilst allowing the continuous review and evaluation of how students perform not only on the assessment as a whole but also on specific tasks can facilitate design and validity of future assessments.[33]

Summary

Having undertaken this review of CBE approaches, several components emerge as key features and themes of best practice in competency-based approaches shared between secondary examination systems including:

Qualification design

- Learning outcomes describing the skills of a typical student on completion
- Integration of higher order thinking skills

30

Research Matters, 2007. Is Passing Just Enough? Some Issues to Consider in grading Competency-based Assessments. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeassessment.org.uk/Images/505312-is-passing-just-enough-some-issues-to-consider-in-grading-competence-based-assessments-.pdf>.

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Pearson, 2016. Defining Competencies and Outlining Assessment Strategies for CBE Programs. [pdf] Published by: Pearson. Available at: <https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/pearson-ed/downloads/INSTR111428_CBE_Assessment_WhtPaper_WEB_f.pdf>.

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Pearson, 2016. Defining Competencies and Outlining Assessment Strategies for CBE Programs. [pdf] Published by: Pearson. Available at: <https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/pearson-ed/downloads/INSTR111428_CBE_Assessment_WhtPaper_WEB_f.pdf>.

33

Pearson, 2016. Defining Competencies and Outlining Assessment Strategies for CBE Programs. [pdf] Published by: Pearson. Available at: <https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/pearson-ed/downloads/INSTR111428_CBE_Assessment_WhtPaper_WEB_f.pdf>.

- Emphasis on real-world application and problem solving in terms of skills and knowledge
- Balance of learning outcomes, reflecting a breadth of learning styles and abilities of students
- Interdisciplinary – links within and between subjects
- Links to core and transferrable skills linked to subject-specific skills and knowledge

Assessment

- Varied assessment methods reflecting a comprehensive assessment of learning outcomes
- Setting of questions and assessment tasks targeting and explicitly linking with specific learning outcomes, ensuring balance and coherence
- Higher order thinking skills assessment of analysis, synthesis and evaluation
- Equity allowing for varying ability levels to be accurately assessed
- Real-world scenario-based assessment, drawing on authentic data and sources
- Criterion referenced approaches to marking, including step wise (points-based) marking and assessment criteria linked to learning outcomes with an emphasis on evaluating how learning outcomes have been achieved in practice

Quality assurance

- Stakeholder engagement in qualification design to ensure relevance
- Reliability monitoring of assessment over time, utilising both qualitative and quantitative methods
- Defined assessment development processes
- Criterion-referenced approaches to marking and standardisation

The CBE features discussed and highlighted will guide the review and evaluation of the CBSE framework for Standard X to gauge the extent to which CBE is currently embedded within the system, and when reviewing examples of international best practice to identify features that characterise CBE in the design, implementation and assessment of maths, English and science in practice.

Appendix 2: Review of selected international qualifications

GCSE

1.1 Mathematics

The following table sets out the aims and objectives of the GCSE

Mathematics:

Table 1: Aims of the GCSE in Mathematics *A*

GCSE [34]
The aims and objectives of the Pearson Edexcel Level 1/Level 2 GCSE (9–1) in Mathematics are to enable students to: • Develop fluent knowledge, skills and understanding of mathematical methods and concepts • Acquire, select and apply mathematical techniques to solve problems • Reason mathematically, make deductions and inferences, and draw conclusions • Comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

The following table summarises the key content areas of the GCSE:

Table 2: Content of the GCSE Mathematics A

GCSE [35]
Number: (Foundation: 22 - 28%, Higher: 12-18%) • Structure and calculation • Fractions, decimals and percentages • Measures and accuracy Algebra: (Foundation: 17 - 23%, Higher: 27-33%) • Notation, vocabulary and manipulation • Graphs • Solving equations and inequalities • Sequences

34
Pearson Edexcel, 2015. GCSE (9-1) Mathematics Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/mathematics/2015/specification-and-sample-assesment/gcse-maths-2015-specification.pdf>.

Ratio, Proportion and Rates of change (Foundation: 17-23%, Higher: 22 - 28%)

Geometry and Measures (Foundation: 12 - 18%, Higher: 17-23%)

- Properties and constructions
- Mensuration and calculation
- Vectors

Statistics & Probability (Foundation: 12 - 18%, Higher 12-18%)

Table 3: Assessment objectives of the GCSE in Mathematics

GCSE [36]
AO1 Use and apply standard techniques Students should be able to: • Accurately recall facts, terminology and definitions • Use and interpret notation correctly • Accurately carry out routine procedures or set tasks requiring multi-step solutions. (50% Foundation, 40% Higher)
AO2 Reason, interpret and communicate mathematically. Students should be able to: • Make deductions, inferences and draw conclusions from mathematical information • Construct chains of reasoning to achieve a given result • Interpret and communicate information accurately • Present arguments and proofs • Assess the validity of an argument and critically evaluate a given way of presenting information. (25% Foundation, 30% Higher)
AO3 Solve problems within mathematics and in other contexts. Students should be able to: • Translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes • Make and use connections between different parts of mathematics • Interpret results in the context of the given problem • Evaluate methods used and results obtained • Evaluate solutions to identify how they may have been affected by assumptions made. (25% Foundation, 30% Higher)

35
Pearson Edexcel, 2015. GCSE (9-1) Mathematics Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/mathematics/2015/specification-and-sample-assesment/gcse-maths-2015-specification.pdf>.

36
Pearson Edexcel, 2015. GCSE (9-1) Mathematics Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/mathematics/2015/specification-and-sample-assesment/gcse-maths-2015-specification.pdf>.

Table 4: GCSE Mathematics assessment format

	GCSE [37]
Number and type of assessments each examination series	Higher and foundation tiers: Three external written examination papers focusing on all topics in the syllabus. Paper 2 is a non-calculator paper.
Duration	Higher and foundation tiers: Paper 1: 1 hour 30 minutes Paper 2: 1 hour 30 minutes Paper 3: 1 hour 30 minutes
Type(s) of question	Higher and foundation tiers: Papers 1, 2 and 3: Structured multi-part questions, stand-alone shorter questions and extended questions.
Total marks available	Higher and foundation tiers: Paper 1: 80 marks Paper 2: 80 marks Paper 3: 80 marks
Weighting toward overall qualification	Higher and foundation tiers: Paper 1: 33.33% Paper 2: 33.33% Paper 3: 33.33%

Questions across all papers are generally structured, with multiple parts of the question assessing different skills, from knowledge to technique, as well as application and the ability to formulate strategies to solve more complex problems. The types of questions used are the same across both the foundation and higher tiers and there is an overlap between the questions included in the tiered papers. The higher tier papers include additional questions assessing more complex topic areas and techniques.

The GCSE papers include a number of short answer questions worth one or two marks, typically involving single step calculation, solving a basic problem involving knowledge of numerical concepts:

Figure 1: Exam questions from the GCSE Mathematics – Example 1

8. Work out 15% of 80 (2).
9. Work out the value of (9 × 10 –4) × (3 × 10 7) Give your answer in standard form.

GCSE Sample Paper1 (Foundation tier) and GCSE Sample Paper 1 (Higher tier)

More extended stand-alone questions involving knowledge and application of numerical concepts, worth three marks or more are also evident in the GCSE which involve solving real-world problems:

37

Pearson Edexcel, 2015. GCSE (9-1) Mathematics Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/mathematics/2015/specification-and-sample-assesment/gcse-maths-2015-specification.pdf>.

Figure 2: Exam questions from GCSE in Mathematics – Example 2

4. Axel and Lethna are driving along a motorway. They see a road sign. The road sign shows the distance to Junction 8. It also shows the average time drivers take to get to Junction 8. The speed limit on the motorway is 70 mph. Lethna says "We will have to drive faster than the speed limit to drive 30 miles in 26 minutes. Is Lethna right? You must show how you get your answer. (3)

GCSE Sample Paper 2 (Higher tier)

Questions involving numerical concepts feature on the higher tier papers in the GCSE and assess skills which include, for example, calculating lower and upper bounds (degrees of accuracy).

Questions assessing knowledge and skills in algebra vary in terms of mark allocation and presentation, with some questions broken down into numerous parts and others presented as stand-alone questions. There is nevertheless an overall emphasis on solving linear, simultaneous and quadratic equations and inequalities, sketching and interpreting graphs of functions/equations and manipulating/rearranging equations into different formats:

Figure 3: Exam Questions from the GCSE in Mathematics – Example

9. (a) Factorise $y2 + 7y + 6$ (2)

   (b) Solve $6x + 4 > x + 17$ (2)

19. (b) On this grid, sketch the graph of $y = –f(x) + 3$ (1)

17. Make a the subject of the following: (3)

GCSE Sample Papers 1-3 (Higher and foundation tiers)

As indicated in the specifications, questions on algebra in the higher tier papers in the GCSE sample, additionally involve tasks such as solving quadratics by completing the square and simultaneous equations with quadratics.

Questions assessing geometry and shapes and space can also be presented in varying formats. Questions typically ask the candidate, for example, to calculate an angle, areas and lengths of shapes given prerequisite data and to calculate volumes and masses. Examples of questions assessing this range of knowledge and skills from the sample GCSE papers are demonstrated below:

Figure 4: Exam Questions from the GCSE Mathematics – Example 4

13. ABE and CBD are straight lines. Show that triangle ABC is an isosceles triangle. (4)

22. A frustum is made by removing a small cone from a large cone as shown in the diagram (diagram not shown). The frustum is made from glass. The glass has a density of 2.5g/cm3. Work out the mass of the frustum. Give your answer to an appropriate degree of accuracy. (5)

GCSE Sample Paper 2 (Foundation tier) and Paper 2 (Higher tier)

The additional questions on the higher tier papers, assessing shape and space, typically focus on the likes of standard circle theorems, solving problems involving the sine rule and transformations involving vectors.

Questions on handling data can include interpreting and extrapolating from data presented in different formats, including graphs. Questions assessing statistics include calculating averages and standard deviations. Questions on probability frequently involve calculating probability of events (independent and mutually exclusive) based on specific scenarios, drawing and completing tree diagrams and commenting on probability (higher tier).

Figure 5: Exam Questions from the GCSE in Mathematics – Example 5

22. Bhavna recorded the lengths of time, in hours, that some adults watched TV last week. The table shows information (table not shown) about her results. Bhavna made some mistakes when she drew a histogram for this information. Write down two mistakes Bhavna made. (2)

GCSE Sample Paper 1 (Higher tier)

12. Sami selects at random one of the 50 people.

    (a) Work out the probability that this person likes tea. (4)

GCSE Sample Paper 3 (Higher tier)

Figure 6: Extract from GCSE in Mathematics Mark Schemes

23		152	M1	Start to method $ABD = 38°$ **and** BAD or DBC or $DCB = 38°$
			M1	ADB or $BDC = 180 - 2 \times 38$ (=104)
			A1	for 152 with working

GCSE Sample Mark Scheme

1.2 Combined Science

Table 5: Aims of the GCSE in Science

GCSE [38]
The GCSE in Combined Science should enable students to: • Develop scientific knowledge and conceptual understanding through the specific disciplines of Biology, Chemistry and Physics • Develop understanding of the nature, processes and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them • Develop and learn to apply observational, practical, modelling, enquiry and problem-solving skills in the laboratory, in the field and in other learning environments • Develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence and conclusions, both qualitatively and quantitatively.

Table 6: Content of the GCSE in Science

GCSE [39]		
Biology 1	**Chemistry 1**	**Physics 1**
Topic 1 – Key concepts in biology, Topic 2 – Cells and control, Topic 3 – Genetics, Topic 4 - Natural selection and genetic modification Topic 5 – Health, disease and the development of medicines	Topic 1 – Key concepts in chemistry, Topic 2 – States of matter and mixtures, Topic 3 – Chemical changes Topic 4 – Extracting metals and equilibria	Topic 1 – Key concepts of physics, Topic 2 – Motion and forces, Topic 3 – Conservation of energy, Topic 4 – Waves, Topic 5 – Light and the electromagnetic spectrum Topic 6 – Radioactivity
Biology 2	**Chemistry 2**	**Physics 2**
Topic 6 – Plant structures and their functions, Topic 7 – Animal coordination,	Topic 6 – Groups in the periodic table, Topic 7 – Rates of reaction and energy changes	Topic 8 – Energy - Forces doing work Topic 9 – Forces and their effects

38

Pearson Edexcel, 2016. GCSE (9-1) Combined Science Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf>.

39

Pearson Edexcel, 2016. GCSE (9-1) Combined Science Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf>.

control and homeostasis Topic 8 – Exchange and transport in animals, Topic 9 – Ecosystems and material cycles	Topic 8 – Fuels and Earth science	Topic 10 – Electricity and circuits, Topic 12 – Magnetism and the motor effect Topic 13 – Electromagnetic induction Topic 14 – Particle model Topic 15 – Forces

Table 7: Assessment objectives of the GCSE in Science

GCSE [40]
AO1 Demonstrate knowledge and understanding of: • Scientific ideas • Scientific techniques and procedures. (40%)
AO2 Apply knowledge and understanding of: • Scientific ideas • Scientific enquiry, techniques and procedures. (40%)
AO3 Analyse information and ideas to: • Interpret and evaluate • Make judgements and draw conclusions • Develop and improve experimental procedures. (20%)

Table 8: GCSE Science assessment format

	GCSE [41]
Number and type of assessments each examination series	Six external examination papers (available at Higher or Foundation tier): Paper 1: Biology 1 Paper 2: Biology 2 Paper 3: Chemistry 1 Paper 4: Chemistry 2 Paper 5: Physics 1 Paper 6: Physics 2
Duration	Papers 1-6: 1 hour 10 minutes each
Type(s) of question	Papers 1-6: A mixture of different question styles, including multiple-choice questions, short answer questions, calculations and extended open-response questions.
Total marks available	Papers 1-6: 60 marks per paper
Weighting toward overall qualification	Each paper counts 16.67%.

40
Pearson Edexcel, 2016. GCSE (9-1) Combined Science Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf>.

41
Pearson Edexcel, 2016. GCSE (9-1) Combined Science Specification. [pdf] Published by: Pearson Edexcel. Available at: <https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf>.

A variety of types of question are used throughout the six papers of the GCSE, this section discusses the key feature of each. These include

- Short answer
- Multiple choice
- Structured questions – scenario-based and data response
- Structured questions – experimental
- Calculation questions
- Extended six mark questions

Short answer

Short answer questions in the GCSE vary from one or two mark basic recall questions (no more than 5% of marks) typically requiring candidates to define, name or state a principle, process or material:

Figure 7: GCSE Question Example 1

(b) Some liquid is left in a warm room. After a few days no liquid can be seen. Give the name of the process that has occurred. (1)

(ii) State what is meant by the term electrolyte.(2)

(i) Under each box write the name of the state of matter shown. (2)

Short answer questions also include those that call for an explanation of a scientific term, technique or process or observation which can be provided in isolation, without reference to a particular situation or context:

Figure 8: GCSE Question Example 2

2. b) (iii) Explain how people become infected with both Chlamydia and Gonorrhoea. (2)

GCSE Sample Paper 1, Biology 1 (Foundation tier)

6. (a) Explain what happens to the wavelength of light when it passes from air into glass. (2)

GCSE Sample Paper 5, Physics 1 (Higher tier)

Overall, a limit of 15% of the marks are based on knowledge and recall in isolation, while some knowledge and understanding questions also draw upon additional information provided in the question.

Multiple-choice

Whilst there is no separate multiple-choice section or paper, a small number of multiple-choice questions are used throughout the papers, usually as a lead in part to a structured question, to test knowledge, understanding and in some cases, application of knowledge in experimental and real-world scenarios. The following multiple-choice exemplar question assesses knowledge and understanding of a scientific process, in this case, osmosis:

Figure 9: GCSE Question Example 3

(b) Osmosis is one method that single-celled organisms, such as bacteria, use to obtain molecules from their environment. Which of the following is a correct description of a process involving the transport of molecules? (1)

A Diffusion is used to transport molecules against the concentration gradient

B Active transport is used to obtain molecules in a low concentration environment

C Active transport moves substances along the concentration gradient

D Diffusion uses energy to transport molecules into cells

Structured questions – scenario-based and data response

Scenario-based structured questions may present and require the application of knowledge and understanding and frequently, analysis and interpretation of data, to solve related problems.

Figure 10: GCSE Question Example 4

Figure 12 shows the effectiveness of different methods of contraception in the prevention of pregnancy during their first year of use.

(c) Compare and contrast the data for different contraceptive methods and types, to advise a young adult as to the best method of contraception to avoid pregnancy. (6)

The above question involves comparing and contrasting the data contained in a large dataset presented within the question, identifying trends to provide advice to a young adult as to the best method of contraception to avoid pregnancy. The

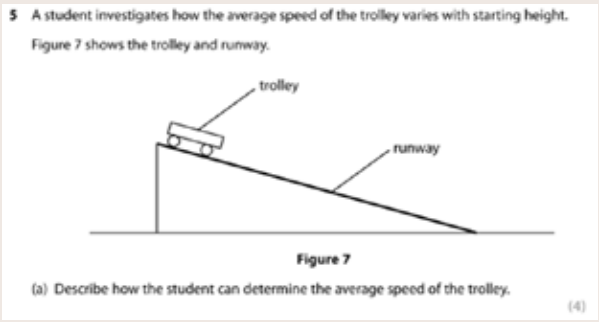
question engages analytical skills in being able to correctly manipulate and interpret the data from the table and draw conclusions, with supporting justification.

Structured questions – experimental

Questions assessing application are often linked to a specific context that may be experimental, involving interpretation and explanation of experimental data. Overall a total of 20% of the marks are allocated to the assessment of practical skills. A number of the sub-parts to these questions are targeted towards assessing AO3, analysing scientific information to develop and improve experimental processes as well as making judgement and drawing conclusions.

In terms of format and design, these questions typically set out the experimental scenario by means of a diagram or visual aid which sets the scene for the sub-parts that follow:

Figure 11: GCSE Question Example 5



The above question requires the student to plan how they would determine the average of a trolley on a runway. Subsequent parts to the question require the candidate to calculate the average kinetic energy of the trolley based on data points provided and the trolley mass. The final two parts to the question involve describing how the speed of the trolley varies with changes in the height, and devising a new experiment to investigate the effect of different surfaces on the speed of the trolley:

Figure 12: GCSE Question Example 6

Describe how the speed of the trolley varies with the changes in height made by the student between 0.04 m and 0.12 m. (2)

Calculation questions

Both types of structured (scenario-based and experimental) can include problem solving sub-parts involving use of mathematics in science, particularly in the chemistry and physics papers. These mostly assess AO2, application of scientific processes and principles to solve problems. Some examples can be seen below:

Figure 13: GCSE Questions Example 7

3. b) (i) Calculate the rate of water loss from the plant in mm 3/s if the volume of water lost was 12 mm3 in 10 minutes. (3)

3. b) v)The iron(II) sulfate solution contained 6.2g of iron(II) sulfate in 50cm3 of solution. Calculate the concentration of the iron(II) sulfate solution in g dm−3. (2)

6. A car accelerates at a constant rate of 1.83 m/s 2 along a flat straight road.

(a) The force acting on the car is 1.870 kN. Calculate the mass of the car. Give your answer to three significant figures. (3)

GCSE Sample Paper 2, Biology 2 (Foundation tier), Paper 4, Chemistry 2 (Foundation tier) and Paper 5, Physics 1 (Higher tier)

Extended questions

Extended six mark questions can vary, some may assess detailed knowledge and understanding, whilst the majoirty, particularly questions in the higher tier papers, seek to also assess higher order thinking skills of analysis, evaluation and synthesis of information targeting AO3. Approximately 15% of the marks are allocated to this type of question across all six papers.

Figure 14: Sample Extended Questions from the GCSE

*(c) Explain how the changes in the trends for smoking may affect the occurrence of cardiovascular disease. (6)

*(b) The order of reactivity of chlorine, bromine and iodine can be determined by carrying out displacement reactions. Explain how displacement reactions can be used to show the reactivity of these three elements. (6)

*(c) The battery charger shown in Figure 14 is connected to the 230 V a.c. domestic mains supply. The output voltage of the charger is 335 V and it provides a d.c. charging current. Charging stops if the charging current exceeds 15 A. Explain how electrical components in the charger can be connected together to give this type of output. (6)

GCSE Sample Assessment Materials 2016

The National Certificate in Educational Achievement (NCEA) Level 1 – New Zealand

2.1 Mathematics

Table 9: Content of NCEA Level 1 in Maths[42]

NCEA Level 1
Externally assessed unit standards (students typically take all four)
• Apply geometric reasoning in solving problems
• Apply algebraic procedures in solving problems
• Demonstrate understanding of chance and data
• Investigate relationships between tables, equations and graphs
Internally assessed units (students typically take two)
• Apply knowledge of geometric representations in solving problems
• Apply right-angled triangles in solving measurement problems
• Apply transformation geometry in solving problems
• Apply numeric reasoning in solving problems
• Apply linear algebra in solving problems
• Apply measurement in solving problems
• Investigate a given multivariate data set using the statistical enquiry cycle
• Investigate bivariate numerical data using the statistical enquiry cycle
• Investigate a situation involving elements of chance

42 NZQA, 2020. standards and Assessment for NCEA Level 1 Mathematics. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search

Table 10: Assessment Objectives of NCEA Level 1 in Maths

NCEA Level 1 Achievement objectives
Number and algebra
Number strategies and knowledge
• Apply direct and inverse relationships with linear proportions.
• Extend powers to include integers and fractions.
• Apply everyday compounding rates.
• Find optimal solutions, using numerical approaches.

Equations and expressions

- Form and solve linear equations and inequalities, quadratic and simple exponential equations, and simultaneous equations with two unknowns.
- Patterns and relationships
- Generalise the properties of operations with rational numbers, including the properties of exponents.
- Relate graphs, tables, and equations to linear, quadratic, and simple exponential relationships found in number and spatial patterns.
- Relate rate of change to the gradient of a graph.

Geometry and measurement

Measurement

- Measure at a level of precision appropriate to the task.
- Apply the relationships between units in the metric system, including the units for measuring different attributes and derived measures.
- Calculate volumes, including prisms, pyramids, cones, and spheres, using formulae.

Shape

- Deduce and apply the angle properties related to circles.
- Recognise when shapes are similar and use proportional reasoning to find an unknown length.
- Use trigonometric ratios and Pythagoras' theorem in two and three dimensions.
- Position and orientation
- Use a co-ordinate plane or map to show points in common and areas contained by two or more loci.

Transformation

- Compare and apply single and multiple transformations.
- Analyse symmetrical patterns by the transformations used to create them.

Statistics

Statistical investigation

Plan and conduct investigations using the statistical enquiry cycle:

- justifying the variables and measures used
- managing sources of variation, including through the use of random sampling
- identifying and communicating features in context (trends, relationships between variables, and differences within and between distributions), using multiple displays
- making informal inferences about populations from sample data
- justifying findings, using displays and measures.

Statistical literacy

Evaluate statistical reports in the media by relating the displays, statistics, processes, and probabilities used to the claims made.

Probability

Investigate situations that involve elements of chance:

- comparing discrete theoretical distributions and experimental distributions, appreciating the role of sample size
- calculating probabilities in discrete situations.

Table 11: NCEA Level 1 Science Assessment Format 43

	NCEA Level 1
Number and type of assessments of each examination series	There are 13 unit standards for NCEA Level 1, each external unit carries 4 credits while internal units carry 3 credits. Students typically take 6 units (6 of the 13 available unit standards, 2 internally assessed units plus 4 externally assessed units).
Duration	Each unit exam is a maximum of three hours in duration, candidates complete the examination in their own time.
Type(s) of question	Each unit exam focuses on theory and contains a mixture of short answer, structured question and extended questions, calculators are allowed.
Total marks available	The external unit examinations comprise approx. 30 marks per paper, papers are scored pass, merit or with excellence.
Weighting toward overall qualification	Each externally assessed unit examination counts 4 credits while internal units are worth 3 credits.

Short answer

A number of questions in the NCEA Level 1 involve a short calculation, equation or function, typically worth one or two marks. These are typically the opening parts to longer structured answer questions.

Figure 15: NCEA Level 1 Examples

1a) What is the value of 2x 4 − 3x + 5 when x = − 2?

2a) w = pq 2 + r.

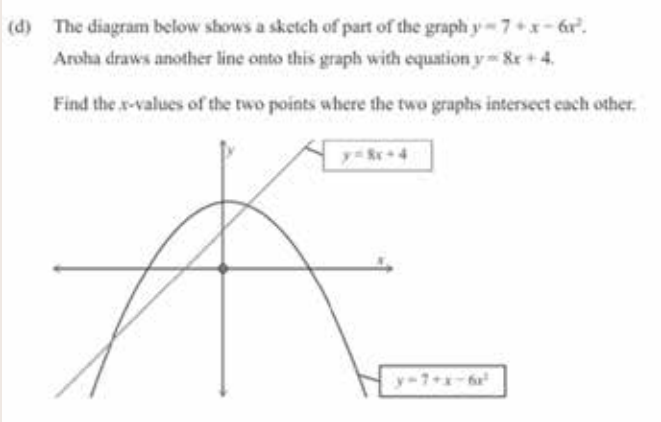
Give the equation for p in terms of q, r, and w.

Question 1a and 2a of NCEA Level 1 2019 Unit Paper: Apply Algebraic Procedures in Solving Problems

Structured questions

All unit papers include structured questions, typically starting with shorter sub-parts, progressing to longer and more extended sub-parts. The following question involves multi-step problem solving in a mathematical context, involving quadratic and linear equations:

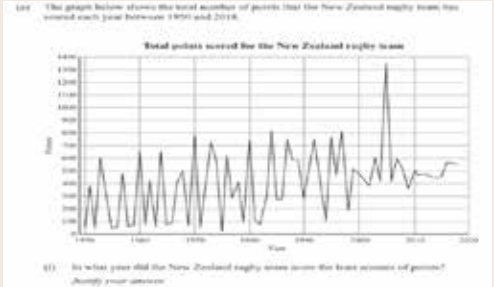
Figure 16: NCEA level 1 Example Question



Question 2d of NCEA Level 1 2019 Unit Paper: Apply Algebraic Procedures in Solving Problems

A number of structured questions and sub-parts also include real-world contexts and involve applying mathematical procedures to solve problems, such as the question below which involves interpreting a graph and trends:

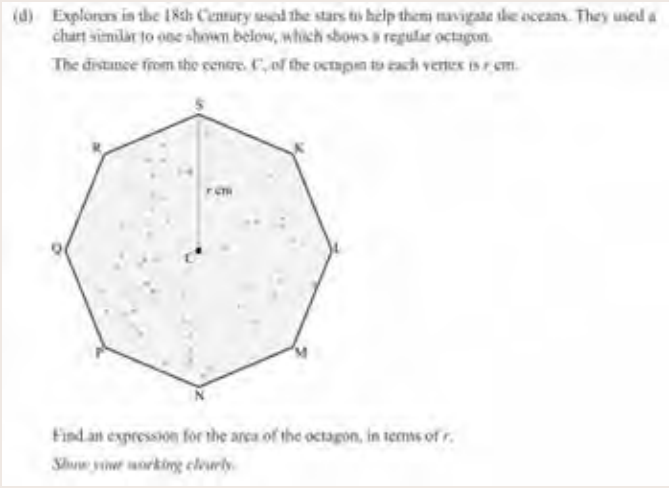
Figure 17: NCEA Level 1 Example Question



Question 2d of NCEA Level 1 2019 Unit Paper: Apply Algebraic Procedures in Solving Problems

Extended parts

A number of structured questions culminate in an extended problem where the student has to devise a strategy comprising a number of stages to reach a solution:


(d) Explorers in the 18th Century used the stars to help them navigate the oceans. They used a chart similar to one shown below, which shows a regular octagon.

The distance from the centre, C, of the octagon to each vertex is r cm.

Find an expression for the area of the octagon, in terms of r.

Show your working clearly.

Question 3, NCEA Level 1 Apply geometric reasoning in solving problems 2019

2.2 Science

Table 12: Aims of the NCEA Level 1 in Science44

Achievement Aims – Science NCEA Level 1

Achievement Aims – Nature of Science

Understanding about science

- Learn about science as a knowledge system: the features of scientific knowledge and the processes by which it is developed; and learn about the ways in which the work of scientists interacts with society.

Investigating in science

- Carry out science investigations using a variety of approaches: classifying and identifying, pattern seeking, exploring, investigating models, fair testing, making things, or developing systems.

Communicating in science

- Develop knowledge of the vocabulary, numeric and symbol systems, and conventions of science and use this knowledge to communicate about their own and others' ideas.

Participating and contributing

- Bring a scientific perspective to decisions and actions as appropriate.

Living world (biology)

Life processes

- Understand the processes of life and appreciate the diversity of living things.

Ecology

- Understand how living things interact with each other and with the nonliving environment.

Evolution

- Understand the processes that drive change in groups of living things over long periods of time and be able to discuss the implications of these changes.

Planet Earth and beyond (Earth and space science)

Earth systems

- Investigate and understand the spheres of the Earth system: geosphere (land), hydrosphere (water), atmosphere (air), and biosphere (life).

Interacting systems

- Investigate and understand that the geosphere, hydrosphere, atmosphere, and biosphere are connected via a complex web of processes.

Astronomical systems

- Investigate and understand relationships between the Earth, Moon, Sun, solar system, and other systems in the universe.

44

NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01> [Accessed May 2020].

Physical world (physics)

Physical inquiry and physics concepts

- Explore and investigate physical phenomena in everyday situations.

Physical concepts

- Gain an understanding of the interactions that take place between different parts of the physical world and the ways in which these interactions can be represented.

Using physics

- Apply their understanding of physics to various applications.

Material world (chemistry)

Properties and changes of matter

- Investigate the properties of materials.

The structure of matter

- Interpret their observations in terms of the particles (atoms, molecules, ions, and sub-atomic particles), structures, and interactions present.
- Understand and use fundamental concepts of chemistry.

Chemistry and society

- Make connections between the concepts of chemistry and their applications and show an understanding of the role chemistry plays in the world around them.

Sixteen achievement standards are offered, from which students typically select five or six:

Table 13: Content and Structure of NCEA Level 1 Science 45

NCEA Level 1 Science Achievement Standards – Content
Externally assessed units (Candidates typically take 3):
• Demonstrate understanding of aspects of mechanics
• Demonstrate understanding of aspects of acids and bases
• Demonstrate understanding of biological ideas relating to genetic variation
Internally assessed units (Candidates typically take 2-3):
• Demonstrate understanding of the formation of surface features in New Zealand
• Demonstrate understanding of carbon cycling
• Demonstrate understanding of the effects of astronomical cycles on planet Earth
• Investigate implications of electricity and magnetism for everyday life
• Investigate implications of wave behaviour for everyday life
• Investigate implications of heat for everyday life

45
NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01> [Accessed May 2020].

- Investigate implications of the use of carbon compounds as fuels
- Investigate the implications of the properties of metals for their use in society
- Investigate selected chemical reactions
- Investigate life processes and environmental factors that affect them
- Investigate biological ideas relating to interactions between humans and micro-organisms
- Investigate the biological impact of an event on a New Zealand ecosystem
- Investigate an astronomical or Earth science event

Assessment or "Achievement" objectives for the NCEA Level 1 (NZQF Level 6) are defined by subject area. These also specify the core content areas students are expected to cover within each objective as follows:

Table 14: Assessment Objectives of NCEA Level 1 Science[46]

NCEA Level 1 Science Achievement Objectives
Nature of science
Understanding about science
• NOS 6-1 Understand that scientists' investigations are informed by current scientific theories and aim to collect evidence that will be interpreted through processes of logical argument.
Investigating in science
• NOS 6-2 Develop and carry out more complex investigations, including using models; Show an increasing awareness of the complexity of working scientifically, including recognition of multiple variables; Begin to evaluate the suitability of the investigative methods chosen.
Communicating in science
• NOS 6-3 Use a wider range of science vocabulary, symbols, and conventions; Apply their understandings of science to evaluate both popular and scientific texts (including visual and numerical literacy).
Participating and contributing
• NOS 6-4 Develop an understanding of socio-scientific issues by gathering relevant scientific information in order to draw evidence-based conclusions and to take action where appropriate.
Biology (living world)
Life processes
• LW 6-1 Relate key structural features and functions to the life processes of plants, animals, and micro-organisms and investigate environmental factors that affect these processes.
Ecology
• LW 6-2 Investigate the impact of natural events and human actions on a New Zealand ecosystem.

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NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01> [Accessed May 2020].

Evolution

- LW 6-3 Explore patterns in the inheritance of genetically controlled characteristics; Explain the importance of variation within a changing environment.

Earth and space science (Planet Earth and beyond)

Earth systems

- PEB 6-1 Investigate the external and internal processes that shape and change the surface features of New Zealand.

Interacting systems

- PEB 6-2 Develop an understanding of how the geosphere, hydrosphere, atmosphere, and biosphere interact to cycle carbon around Earth.

Astronomical systems

- PEB 6-3 Investigate the interactions between the solar, lunar, and Earth cycles and the effect of these on Earth.

Physics (Physical world)

Physical inquiry and physics concepts

- PW 6-1 Investigate trends and relationships in physical phenomena (in the areas of mechanics, electricity, electromagnetism, heat, light and waves, and atomic and nuclear physics); Demonstrate an understanding of physical phenomena and concepts by explaining and solving questions and problems that relate to straightforward situations.

Using physics

- PW 6.2 Investigate how physics knowledge is used in a technological or biological application.

Chemistry (Material world)

Properties and changes of matter

- MW 6-1 Identify patterns and trends in the properties of a range of groups of substances, for example, acids and bases, metals, metal compounds, and hydrocarbons; Explore factors that affect chemical processes.

The structure of matter

- MW 6-2 Distinguish between atoms, molecules, and ions (includes covalent and ionic bonding); Link atomic structure to the organisation of the periodic table; Use particle theory to explain factors that affect chemical processes.

Chemistry and society

- MW 6-3 Investigate how chemical knowledge is used in a technological application of chemistry.

Table 15: NCEA Level 1 Science Assessment Format[47]

	NCEA Level 1
Number and type of assessments of each examination series	There are 16 unit standards for NCEA Level 1, each carrying 4 credits. Students typically take 24 credits (6 of the 16 available unit standards, 2 internally assessed units plus 4 externally assessed units). One unit standard each is required in chemistry and physics while two are required in biology.
Duration	Each unit exam is a maximum of three hours in duration, candidates complete the examination in their own time.
Type(s) of question	Each unit exam focuses on theory and contains a mixture of short answer, structured question and extended questions, with a number of calculation problems.
Total marks available	The external unit examinations comprise approx. 30 marks per paper, papers are scored pass, merit or with excellence.
Weighting toward overall qualification	Each externally assessed unit examination counts 4 credits (16.7%) towards a typical 24 credit total for science. Each internally assessed unit also counts 4 credits (16.7%).

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NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01> [Accessed May 2020].

Short answer

A small number of shorter answer questions are included within the structured questions of the NCEA Level 1 unit standard exams. For example:

Figure 18: NCEA Level 1 Example Question

Some adults can digest milk, but the majority 65% cannot. The ability to digest milk as an adult is caused by a DNA mutation.

(b) What is a mutation?

It should be noted that short answer questions which involve recall of knowledge in isolation are allocated very few marks across the unit papers, no more than 1-2% of the total for the assessment.

Structured scenario-based questions

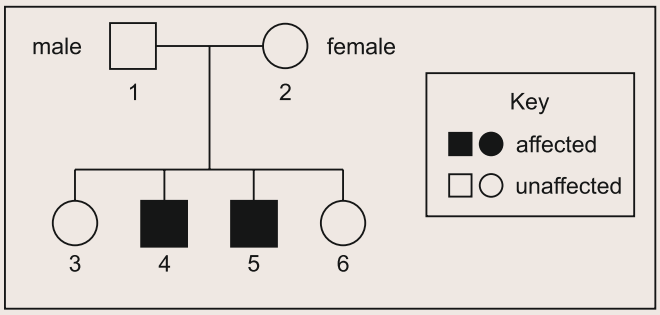
Structured scenario-based questions are the most commonly used question type which feature across all standard unit papers. They typically open with a shorter answer part and proceed with more extended questions which involve the application of knowledge to a specific scenario or context. For example, whilst the genetic condition cystic fibrosis is familiar as it is covered within the

syllabus, in the following scenario, the student is expected to apply his / her knowledge to construct a punnet square for two individuals given a sample pedigree in the exam:

Figure 19: NCEA Level 1 Example Question 2

Cystic fibrosis is a genetically inherited condition. It can be traced through a family, as shown in the pedigree chart. The cystic fibrosis allele (t) is recessive to the unaffected allele (T).

Sample pedigree - cystic fibrosis



(a) Complete the Punnett square for the cross between individual 1 with individual 2.

A further example of a scenario-based application question is provided below, in which the candidate is expected to apply principles of pressure to explain differences in footprints and surface area:

Figure 20: NCEA Level 1 Example Question 3

Cystic fibrosis is a genetically inherited condition. It can be traced through a family, as shown in the pedigree chart. The cystic fibrosis allele (t) is recessive to the unaffected allele (T).


An adult and a child's feet sink into soft sand. The footprints are the same depth. The child's footprints cover a smaller area than the adult's.

(a) Pressure is defined as the force exerted divided by the surface contact area.

Using this pressure definition, explain how it applies to the adult standing in the sand.

(a) Complete the Punnett square for the cross between individual 1 with individual 2.

Pressure is defined as the force exerted divided by the surface contact area.

Using this pressure defination, explain how it applies to the adult standing in the sand.

Further sub-parts to the question involve explaining qualitatively how the footprints can be the same depth despite the fact the child is smaller, applying scientific terms such as mass, pressure and force to the specific situation presented.

Calculation questions

Calculation questions are often sub-parts to structured questions and involve the application of relevant formulate to carry out multi-step procedures. For example, the second part of the sample question on pressure, requires the candidate to calculate the pressure, given the surface area of the footprint and the weight of the individual. Then the final part involves calculating the mass of the child, in the given scenario that the footprints are the same depth:

Figure 21: NCEA Level 1 Example Question 4

The surface area of one of the adult's footprints is 200 cm2 (0.0200 m2), and the surface area of one of the child's footprints is 150 cm2 (0.0150 m2). The adult has a weight of 690 N.

(b) Show the total pressure the adult exerts on the sand is 17 250 Pa.

(d) Both the adult's and the child's footprints are the same depth.

Calculate the mass of the child.

Extended questions

The extended questions in the NCEA Level 1 unit exams are often included as the final sub-part to structured questions and so draw upon and involve discussion of ideas and concepts previously encountered in the question. For example:

Figure 22: NCEA Level 1 Example Question 5

(b) Explain how the sexual reproduction of kauri trees causes genetic variation AND how this could lead to increased survival of the species when faced with kauri dieback disease.
In your answer you should consider:

- the processes of gamete formation (meiosis) and fertilisation
- how sexual reproduction leads to variation in the population
- the link between genetic variation and the survival of kauri trees as a species

(iii) Describe how you could make solid copper sulfate crystals in a school laboratory.
In your answer, include how you would know the reaction had been completed.

International General Certificate of Secondary Education (IGCSE)

3.1 Mathematics

Table 16: Aims of the IGCSE in Mathematics[48]

IGCSE
• Develop an understanding of mathematical principles, concepts and methods in a way which encourages confidence, provides satisfaction and enjoyment, and develops a positive attitude towards mathematics
• Develop a feel for number and understand the significance of the results obtained
• Apply mathematics in everyday situations and develop an understanding of the part that mathematics plays in learners' own lives and the world around them
• Analyse and solve problems, present the solutions clearly, and check and interpret the results
• Recognise when and how a situation may be represented mathematically, identify and interpret relevant factors, select an appropriate mathematical method to solve the problem, and evaluate the method used
• Use mathematics as a means of communication with emphasis on the use of clear expression and structured argument
• Develop an ability to apply mathematics in other subjects, particularly science and technology
• Develop the ability to reason logically, make deductions and inferences, and draw conclusions
• Appreciate patterns and relationships in mathematics and make generalisations
• Appreciate the interdependence of different areas of mathematics
• Acquire a foundation for further study of mathematics or for other disciplines.

48
Cambridge International Examinations, 2020. Syllabus for IGCSE Mathematics. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/414416-2020-2022-syllabus.pdf>.

The following table summarises the key content areas of the IGCSE:

Table 17: Content of the IGCSE in Maths

IGCSE
• Number • Algebra • Shape and Space • Probability and Statistics

Table 18: Assessment Objectives of IGCSE[49]

IGCSE
AO1 Demonstrate knowledge and understanding of mathematical techniques Candidates should be able to recall and apply mathematical knowledge, terminology and definitions to carry out routine procedures or straightforward tasks requiring single or multi-step solutions in mathematical or everyday situations including: • organising, processing and presenting information accurately in written, tabular, graphical and diagrammatic forms • using and interpreting mathematical notation correctly • performing calculations and procedures by suitable methods, including using a calculator • understanding systems of measurement in everyday use and making use of these • estimating, approximating and working to degrees of accuracy appropriate to the context and converting between equivalent numerical forms • using geometrical instruments to measure and to draw to an acceptable degree of accuracy • recognising and using spatial relationships in two and three dimensions. **AO2 Reason, interpret and communicate mathematically when solving problems** Candidates should be able to analyse a problem, select a suitable strategy and apply appropriate techniques to obtain its solution, including: • making logical deductions, making inferences and drawing conclusions from given mathematical data • recognising patterns and structures in a variety of situations, and forming generalisations • presenting arguments and chains of reasoning in a logical and structured way • interpreting and communicating information accurately and changing from one form of presentation to another

49
Cambridge International Examinations, 2020. Syllabus for IGCSE Mathematics. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/414416-2020-2022-syllabus.pdf>.

- assessing the validity of an argument and critically evaluating a given way of presenting information
- solving unstructured problems by putting them into a structured form involving a series of processes
- applying combinations of mathematical skills and techniques using connections between different areas of mathematics in problem solving
- interpreting results in the context of a given problem and evaluating the methods used and solutions obtained.

Table 19: IGCSE Mathematics Assessment Format[50]

	Cambridge IGCSE (Core and Extended)
Number and type of assessments of each examination series	Two written examination papers (Core: Paper 1 and 3; Extended: Paper 2 and 4)
Duration	Core: Paper 1 (1 hour); Paper 3 (2 hours) Total: 3 hours Extended: Paper 2 (1.5 hours); Paper 4 (2.5 hours) Total: 4 hours
Type(s) of question	Short answer / Extended answer / Gap-fill (open) / Gap-fill (closed) / Matching / Multiple-choice
Use of calculator	Calculator allowed in all papers (Core and Extended)
Total marks available	Core: Paper 1 (56 marks); Paper 3 (104 marks) Extended: Paper 2 (70 marks); Paper 4 (130 marks)
Weighting toward overall qualification	Core: Paper 1 (35%); Paper 3 (65%) Extended: Paper 2 (35%): Paper 4 (65%)

50

NZQA, 2020. Standards and Assessment for NCEA Level 1 Science. [online] Available at: <https://www.nzqa.govt.nz/ncea/assessment/search.do?query=Science&view=all&level=01> [Accessed May 2020].

Students taking the Cambridge IGCSE Core and Extended assessments are required to sit two examination papers (Core Papers 1 and 3 or Extended Papers 2 and 4) totalling 3 hours for the Core papers and 4 hours for the Extended. Calculators are allowed in all Cambridge IGCSE mathematics papers, although in the specimen Core and Extended examination papers reviewed in this study, there is one question (worth three marks in both papers) where students are instructed not to use a calculator. The Cambridge IGCSE as the Paper 1 (Core) and Paper 2 (Extended) contribute 35% to the overall assessment of the qualification, and Paper 3 (Core) and Paper 4 (Extended) contribute 65% overall.

Reviewing specimen examination papers for the Cambridge IGCSE in regard to the question structure contain a mix of:

- Single questions with no sub-divisions / further parts;
- Multi-part questions that further test the application/concept separately; and
- Multi-part questions (as above) with sub-sections relating to the same scenario
- Multiple-choice question in both the Core and Extended and a closed gap-fill question in the Core specimen.

Extended problems which provide minimum guidance to solve complex multi-step problems are found in the Cambridge IGCSE Extended examinations but not in the Cambridge IGCSE Core examinations. The use of familiar [to student] 'real-life' scenarios in question contexts, is used where appropriate. The question commands used include asking students, for example, to 'work out', 'calculate', 'write down', 'draw', 'complete a diagram', 'give reasons', 'explain why', and 'describe/describe fully'. A similar proportion of marks is available for these types of commands, typically between 1 and 3 marks.

Additionally, guidance is frequently provided across the questions. Guidance on the answer format, where appropriate, is also provided in the IGCSE papers, including asking students to give their answer 'as a mixed number in its simplest form'. Where marks are awarded for 'workings-out', these are clearly highlighted in the IGCSE question wording with 'You must show your working'.

In terms of assessed content, the Cambridge IGCSE Core specimen papers include questions testing content that includes, for example, isosceles triangles, Venn diagrams, surface area of a sphere, ratio problems, lowest common multiples (LCM), and pie charts. Content assessed in the Cambridge IGCSE Extended specimen papers includes boxplots, histograms, cumulative frequency diagrams, cosine and turning points.

In the Cambridge IGCSE, the number of marks available for a given question appears proportionate to the required output and/or required stages to reach the output (e.g. for two marks - finding the value [1 mark] and giving a reason for the answer [1 mark]).

Individual mark schemes for each examination paper, each containing the answers to the questions (including alternatives) and set out the number and type of mark that can be awarded per question. In terms of types of marks awarded, the IGCSE offers marks for accuracy, which can be given with or without a correct method depending on the particular question and answer required, and marks for a correct method.

Marks in the GCSE can also be awarded for process (as part of a problem-solving question) and communication. The Cambridge IGCSE mark schemes highlight where equivalent answers are accepted, and those that require the correct answer only. Marks are also defined for special cases, follow-through (after error), dependent (on a previous mark), and when to ignore subsequent working.

3.2 Combined Science

The table below demonstrates the aims of IGCSE Combined Science:

Table 20: Aims of IGCSE Science[51]

IGCSE
• Provide an enjoyable and worthwhile educational experience for all learners, whether or not they go on to study science beyond this level
• Enable learners to acquire sufficient knowledge and understanding to: become confident citizens in a technological world and develop an informed interest in scientific matters, be suitably prepared for studies beyond Cambridge IGCSE
• Allow learners to recognise that science is evidence-based and understand the usefulness, and the limitations, of scientific method
• Develop skills that: are relevant to the study and practice of science, are useful in everyday life, encourage a systematic approach to problem-solving, encourage efficient and safe practice, encourage effective communication through the language of science
• Develop attitudes relevant to science such as: concern for accuracy and precision, objectivity, integrity, enquiry, initiative, inventiveness
• Enable learners to appreciate that: science is subject to social, economic, technological, ethical and cultural influences and limitations, the applications of science may be both beneficial and detrimental to the individual, the community and the environment.

The following table lists the content areas of IGCSE Combined Science:

Table 21: Content of IGCSE Science[52]

IGCSE
Biology
B1. Characteristics of living organisms
B2. Cells
B3. Biological molecules
B4. Enzymes
B5. Plant nutrition
B6. Animal nutrition
B7. Transport
B8. Gas exchange and respiration
B9. Coordination and response
B10. Reproduction
B11. Organisms and their environment
B12. Human influences on ecosystems

51 Cambridge International Examinations, 2019. Syllabus for IGCSE Combined Science. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/329756-2019-2021-syllabus.pdf>.

Chemistry

C1. The particulate nature of matter

C2. Experimental techniques

C3. Atoms, elements and compounds

C4. Stoichiometry

C5. Electricity and chemistry

C6. Energy changes in chemical reactions

C7. Chemical reactions

C8. Acids, bases and salts C9. The Periodic Table

C10. Metals

C11. Air and water

C12. Organic chemistry

Physics

P1. Motion

P2. Work, energy and power

P3. Thermal Physics

P4. Properties of waves, including light and sound

P5. Electrical quantities

P6. Electric circuits

Table 22: Assessment Objectives of IGCSE Science[53]

IGCSE
AO1: Knowledge with understanding Candidates should be able to demonstrate knowledge and understanding of: • scientific phenomena, facts, laws, definitions, concepts and theories • scientific vocabulary, terminology and conventions (including symbols, quantities and units) • scientific instruments and apparatus, including techniques of operation and aspects of safety • scientific and technological applications with their social, economic and environmental implications. Syllabus content defines the factual material that candidates may be required to recall and explain. Candidates will also be asked questions which require them to apply this material to unfamiliar contexts and to apply knowledge from one area of the syllabus to another. Questions testing this assessment objective will often begin with one of the following words: define, state, describe, explain (using your knowledge and understanding) or outline. AO2: Handling information and problem solving Candidates should be able, in words or using other written forms of presentation (i.e. symbolic, graphical and numerical), to:

52
Cambridge International Examinations, 2019. Syllabus for IGCSE Combined Science. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/329756-2019-2021-syllabus.pdf>.

53
Cambridge International Examinations, 2019. Syllabus for IGCSE Combined Science. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/329756-2019-2021-syllabus.pdf>.

- locate, select, organise and present information from a variety of sources
- translate information from one form to another
- manipulate numerical and other data
- use information to identify patterns, report trends and draw inferences
- present reasoned explanations for phenomena, patterns and relationships
- make predictions and hypotheses
- solve problems, including some of a quantitative nature.

Questions testing these skills may be based on information that is unfamiliar to candidates, requiring them to apply the principles and concepts from the syllabus to a new situation, in a logical, deductive way. Questions testing these skills will often begin with one of the following words: predict, suggest, calculate or determine.

AO3: Experimental skills and investigations Candidates should be able to:

- demonstrate knowledge of how to safely use techniques, apparatus and materials (including following a sequence of instructions where appropriate)
- plan experiments and investigations
- make and record observations, measurements and estimates
- interpret and evaluate experimental observations and data
- evaluate methods and suggest possible improvements.

Table 23: GCSE Science Assessment Format

	IGCSE[54]
Number and type of assessments of each examination series	Candidates must enter for three of six available papers. Core candidates take Paper 1 and 3 while Extended candidates take Papers 2 and 4. All candidates take either Paper 5 (A practical test) or Paper 6 (An alternative to practical).
Duration	Core Paper 1: 45 minutes Paper 3: 1 hour 15 minutes Extended Paper 2: 45 minutes Paper 3: 1 hour 15 minutes Additional papers Paper 5: 1 hour 15 minutes Paper 6: 1 hour

54
Cambridge International Examinations, 2019. Syllabus for IGCSE Combined Science. [pdf] Published by: Cambridge Assessment. Available at: <https://www.cambridgeinternational.org/Images/329756-2019-2021-syllabus.pdf>.

Type(s) of question	Core Paper 1: 45 minutes Paper 3: 1 hour 15 minutes Extended Paper 2: 45 minutes Paper 3: 1 hour 15 minutes Additional papers Paper 5: 1 hour 15 minutes Paper 6: 1 hour
Total marks available	Core Paper 1: 40 marks Paper 3: 80 marks Extended Paper 2: 40 marks Paper 4: 80 marks Additional papers Paper 5: 40 marks Paper 6: 40 marks
Weighting toward overall qualification	Core Paper 1: 30% Paper 3: 50% Extended Paper 2: 30% Paper 4: 50% Additional papers Paper 5: 20% Paper 6: 20%

A variety of types of question are used throughout the six papers of the IGCSE, this section discusses the key feature of each. These include

Multiple choice (Exclusively Papers 1 and 2)

Short answer (Papers 2 and 4)

Structured questions –scenario-based (Papers 2 and 4)

Calculation questions (Papers 2, 4, 5 and 6)

Structured questions – experimental (Papers 5 and 6)

Multiple-choice

Multiple-choice questions are designed to assess AO1 and AO2. Examples of each type are as follows:

Figure 23: IGCSE Example Question 1[55]

12 At which trophic level in a food chain does transpiration occur?

A trophic level 1 B trophic level 2 C trophic level 3 D trophic level 4

32 A machine does 6.0 kJ of useful work in 20 minutes. How much useful power does it produce?

A 0.30 W B 5.0 W C 120 W D 300 W

Short answer

There are varying types of short answer question included in papers 3 and 4. Short answer questions are typically worth between one and two marks, require naming, stating, listing key scientific ideas, processes and materials.

Figure 24: IGCSE Example Question 2

Petroleum is a mixture of different compounds. State what is meant by the terms mixture and compound. mixture compound (2)

(i) Describe what is meant by a catalyst. (1)

A number of questions also involve explanation of key processes, though relying on knowledge and understanding from the programme of study.

Figure 25: IGCSE Question Example 2

A molecule of ethane contains covalent bonds. Explain how covalent bonds form between non-metallic elements. Use ideas about electrons in your answer. (1)

Others explain type short answer questions, while also drawing on knowledge and understanding, also involve some degree of application to address new information or a context presented in the question. For example, the following question introduces the concept of a stent being

55 Cambridge International Examinations, 2018. IGCSE Examination Papers Combined Science. Internal document.

inserted into a narrowed coronary artery which is not explicit within the syllabus, then asks the candidate to explain the effect of a stent based on the diagram presented and suggest ways in which a stent may be of benefit to the heart muscle drawing on conceptual understanding of blood flow and circulation:

Figure 26: IGCSE Questions – Example 3

(d) Coronary heart disease can be treated by inserting a stent into a narrowed coronary artery. Fig. 1.1 shows a stent inside a coronary artery. Blood can flow freely through the stent.

(i) Describe the effect of the stent on the rate of blood flow through the coronary artery. Explain your answer. (1)

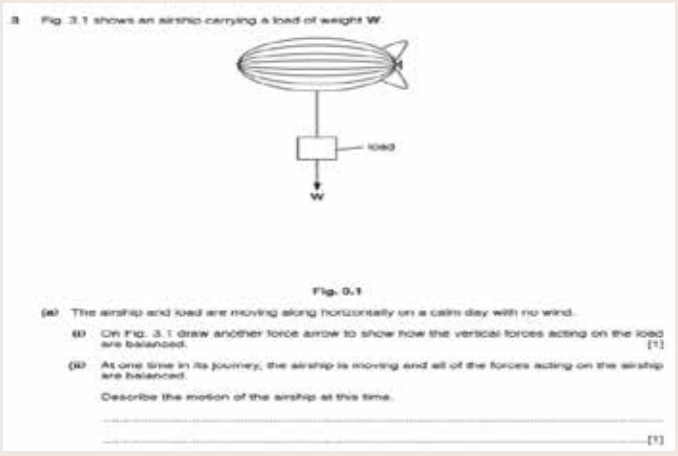
(ii) Explain how the stent can benefit the heart muscle.(2)

Structured – scenario-based

The majority of structured questions in Papers 3 and 4 are scenario-based, where candidates are expected to apply their knowledge and understanding to a specific scenario while drawing on information provided in the question. These questions often begin with a visual stimulus to engage students within the context of the question, then set a series of tasks, drawing on their knowledge and understanding.

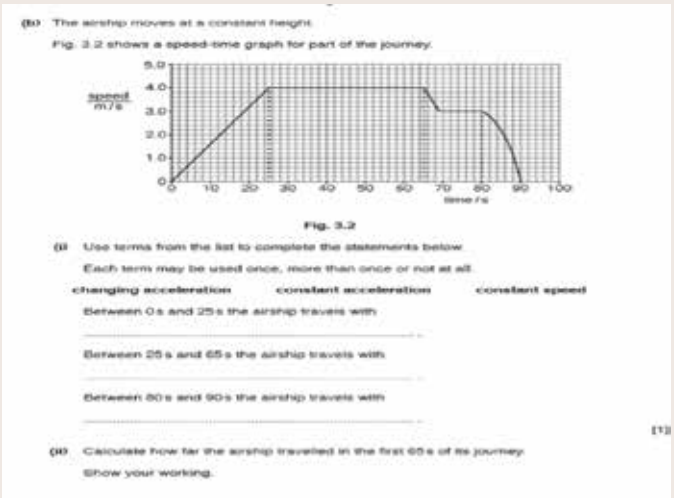
For example, the following question, for instance, the student is expected to show the forces acting on an airship carrying a specified load:

Figure 27: IGCSE Question Example 4



In the subsequent sub-tasks, a speed-time graph for one part of the journey is presented and the candidate is expected to interpret the graph to describe the processes taking place at various points and to carry out a calculation to work out the total distance travelled. Whilst candidates should be familiar with speed-time graphs, they are expected to apply their knowledge and understanding to interpret the specific journey presented in the context of an airship moving at a constant height:

Figure 28: IGCSE Question Example 5



Structured questions – experimental

The structured experimental questions in the practical test (Paper 5), start with a diagram of an experiment/procedure with a series of follow-up tasks that involve planning, analysis and evaluation. The structured question in the below example, for instance, assesses interpretation and analysis, requiring the student to produce a pencil drawing of cell-based on a photograph:

Figure 29: IGCSE Question Example 6

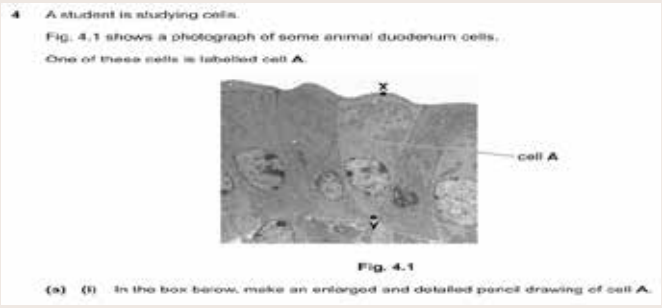


Figure 29: IGCSE Question Example 6

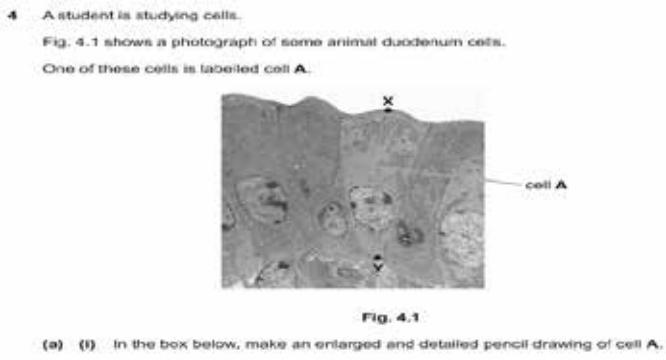

4 A student is studying cells.

Fig. 4.1 shows a photograph of some animal duodenum cells.

One of these cells is labelled cell **A**.

Fig. 4.1

(a) (i) In the box below, make an enlarged and detailed pencil drawing of cell **A**.

Further sub-parts to the question draw on experimental quantitative data analysis and evaluation skills:

Figure 30: IGCSE Questions Example 7

(i) On the grid provided, plot a graph of L against l. Start both axes from the origin (0, 0).[2] (ii) Draw the best-fit straight line. [1]

(iii) Use your graph to determine the length l0 of the unstretched spring. Show on your graph how you arrived at this value. l0 = ... mm [1]

(d) Compare your answer in (a)(i) with your answer in (c)(iii). State whether the answers agree within the limits of experimental accuracy. Give a reason for your statement.

Parts i, ii and iii involve plotting a graph from experimental data, establishing line of best fit and then interpreting this data to determine the length of an unstretched spring. As can be seen in part c in the example above, evaluation often asks the candidate to comment on experimental accuracy.

Additional sub-parts to experimental structured questions require candidates to plan alternative experiments, specifying the apparatus, independent and dependent variables and procedure:

Figure 31: IGCSE Questions Example 8

(e) Plan an experiment, using the same apparatus, to investigate the effect of changing the concentration of the hydrogen peroxide solution on the volume of the mixture. You should not carry out this experiment. In your answer you should include:

- variables you need to keep constant
- suggestions for values of the variable you are going to change. (4)

Sijil Pelajaran Malaysia (SPM)

4.1 Mathematics

Table 24: Aims of the SPM in Mathematics[56]

SPM
The mathematics curriculum for the secondary school enables pupils to:
1. Understand definitions, concepts, laws, principles, and theorems related to Number, Shape and Space, and Relationship;
2. Widen the use of basic operations of addition, subtraction, multiplication and division related to Number, Shape and Space, and Relationship;
3. Acquire basic mathematical skills such as:
– making estimation and rounding;
– measuring and constructing;
– collecting and handling data;
– representing and interpreting data;
– recognising and representing relationship mathematically;
– using algorithm and relationship;
– solving problems; and
– making decisions.
4. Communicate mathematically;
5. Apply knowledge and skills of mathematics in solving problems and making decisions;
6. Relate mathematics with other areas of knowledge;
7. Use suitable technologies in concept building, acquiring skills, solving problems and exploring the field of mathematics;
8. Acquire mathematical knowledge and develop skills effectively and use them responsibly;
9. Inculcate a positive attitude towards mathematics;
10. Appreciate the importance and beauty of mathematics.

56 Ministry of Education Malaysia, 2006. Integrated Curriculum for Secondary Schools - Mathematics Form 5.

The following table summarises the key content areas of the SPM in Mathematics:

Table 25: Content of the SPM in Mathematics[57]

SPM
• Chapter 01: Number Bases
• Chapter 02: Graphs of Functions II
• Chapter 03: Transformations III
• Chapter 04: Matrices
• Chapter 05: Variations
• Chapter 06: Gradient And Area Under A Graph
• Chapter 07: Probability II
• Chapter 08: Bearing
• Chapter 09: Earth As A Sphere
• Chapter 10: Plans And Elevations

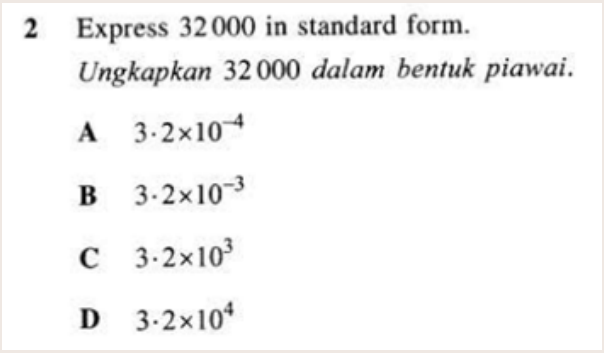
Table 26: SPM Mathematics Assessment format

	SPM
Number and type of assessments of each examination series	Two externally set written examinations.
Duration	Paper 1: 1 hour 15 minutes Paper 2: 2 hours 30 minutes
Type(s) of question	Paper 1: Multiple-choice questions Paper 2: Structured questions Section A: Mixture of stand-alone tasks and structured questions Section B: Structured questions, some with extended sub-parts
Total marks available	Paper 1: 40 marks Paper 2: 100 marks
Weighting toward overall qualification	Paper 1: 30% Paper 2: 70%

Paper 1 comprises multiple-choice questions, involving assessment of core principles from across the curriculum. Candidates have to select one of four options, and they are not required to show any working out or strategy. Multiple-choice questions vary from requiring basic numerical operations (first figure below) to more advanced level problem solving involving algebra and trigonometry (second figure below)

57 Ministry of Education Malaysia, 2006. Integrated Curriculum for Secondary Schools - Mathematics Form 5. Internal document.

Figure 32: Example SPM multiple-choice question 1



2 Express 32 000 in standard form.
Ungkapkan 32 000 dalam bentuk piawai.

A $3 \cdot 2 \times 10^{-4}$

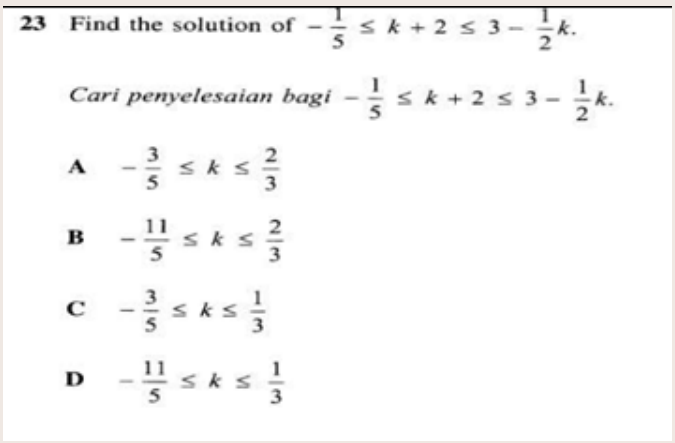
B $3 \cdot 2 \times 10^{-3}$

C $3 \cdot 2 \times 10^{3}$

D $3 \cdot 2 \times 10^{4}$

Question 2, SPM Mathematics 2014 Paper 1

Figure 33: Example SPM multiple-choice question 2



23 Find the solution of $-\frac{1}{5} \leq k + 2 \leq 3 - \frac{1}{2}k$.

Cari penyelesaian bagi $-\frac{1}{5} \leq k + 2 \leq 3 - \frac{1}{2}k$.

A $-\frac{3}{5} \leq k \leq \frac{2}{3}$

B $-\frac{11}{5} \leq k \leq \frac{2}{3}$

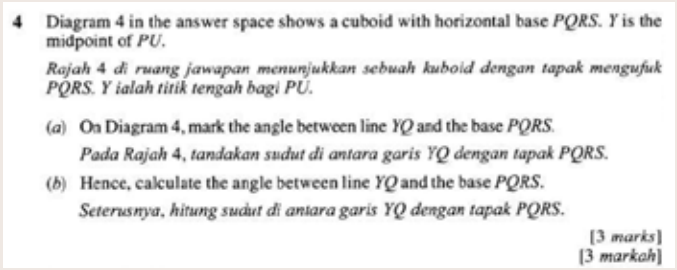
C $-\frac{3}{5} \leq k \leq \frac{1}{3}$

D $-\frac{11}{5} \leq k \leq \frac{1}{3}$

Question 23, SPM Mathematics 2014 Paper 1

Paper 2 contains two sections, Section A contains a mixture of structured and stand-alone questions assessing topics from across the curriculum. The context varies, although the majority of questions relate to a mathematical context while a smaller number of questions incorporate real-world scenarios.

Figure 34: SPM Example 3 – Mathematical Context



4 Diagram 4 in the answer space shows a cuboid with horizontal base *PQRS*. *Y* is the midpoint of *PU*.
Rajah 4 di ruang jawapan menunjukkan sebuah kuboid dengan tapak mengufuk PQRS. Y ialah titik tengah bagi PU.

(*a*) On Diagram 4, mark the angle between line *YQ* and the base *PQRS*.
Pada Rajah 4, tandakan sudut di antara garis YQ dengan tapak PQRS.

(*b*) Hence, calculate the angle between line *YQ* and the base *PQRS*.
Seterusnya, hitung sudut di antara garis YQ dengan tapak PQRS.

[3 *marks*]
[3 *markah*]

Question 4, SPM Mathematics 2014 Paper 2

Figure 35: SPM Example 4 – Real-world scenario

6 Salleh drives his car for 150 km from Butterworth to Ipoh to visit his father. Table 6 shows the note of his journey.
Salleh memandu kereta sejauh 150 km dari Butterworth ke Ipoh untuk melawat ayahnya. Jadual 6 menunjukkan catatan perjalanannya.

Time *Masa*	24 August / *Ogos* 2013 Saturday / *Sabtu*
8.00 a.m.	Start journey *Memulakan perjalanan*
9.04 a.m.	Breakfast at R&R Bukit Merah after drive for 70 km *Sarapan pagi di R&R Bukit Merah setelah memandu untuk sejauh 70 km*
9.30 a.m.	Continue journey for another 80 km *Meneruskan perjalanan untuk 80 km lagi*
10.15 a.m.	Arrive at father's house *Tiba di rumah ayah*

Table 6
Jadual 6

(*a*) Diagram 6 on page **13** shows the distance-time graph.
Rajah 6 pada halaman **13** *menunjukkan graf jarak-masa.*
(i) State the value of *m* and of *n*.

Question 6, SPM Mathematics 2014 Paper 2

Section B includes six questions, from which students have to select four. All are broken down into sub-parts and each question is worth a total of 12 marks, each assessing a range of skills such as equation modelling, manipulation, graph interpretation and plotting, transformations and extended problem solving in question parts worth four to five marks.

4.2 Combined Science

Table 27: Aims of SPM Science[58]

SPM Science
The science curriculum for secondary school enables students to:
1. Acquire knowledge in science and technology in the context of natural phenomena and everyday life experiences.
2. Understand developments in the field of science and technology.
3. Acquire scientific and thinking skills.
4. Apply knowledge and skills in a creative and critical manner for problem solving and decision making.
5. Face challenges in the scientific and technological world and be willing to contribute towards the development of science and technology.
6. Evaluate science- and technology-related information wisely and effectively.
7. Practise and internalise scientific attitudes and good moral values.
8. Realise the importance of inter-dependence among living things and the management of nature for survival of mankind.
9. Appreciate the contributions of science and technology towards national development and the well-being of mankind.
10. Realise that scientific discoveries are the result of human endeavour to the best of his or her intellectual and mental capabilities to understand natural phenomena for the betterment of mankind.
11. Be aware of the need to love and care for the environment and play an active role in its preservation and conservation.

Table 28: Content of SPM Science[59]

SPM Science
Year 4 (Themes in Bold)
Learning Area: 1. Scientific Investigation
Maintenance and Continuity of Life
Learning Area:
1. Body Coordination
2. Heredity and Variation
Matter in Nature
Learning Area: 1. Matter and Substance
Energy in Life
Learning Area:
1. Energy and Chemical Changes
2. Nuclear Energy
3. Light, Colour and Sight

58 Ministry of Education Malaysia, 2006. Integrated Curriculum for Secondary Schools - Science Form 5.

Technological and Industrial Development in Society

Learning Area: 1. Chemicals in Industry

Year 5 (Themes in Bold)

Man and the Variety of Living Things

Learning Area 1. Microorganisms and their Effects on Living Things

Maintenance and Continuity of Life

Learning Area 1. Nutrition and Food Production

Balance and Management of the Environment

Learning Area 1. Preservation and Conservation of the Environment

Matter in Nature

Learning Area: 1. Carbon Compounds

Force and Motion

Learning Area: 1. Motion

Technological and Industrial Development in Society

1. Food Technology and Production
2. Synthetic Materials In Industry
3. Electronics and Information and Communication Technology (ICT)

59

Ministry of Education Malaysia, 2006. Integrated Curriculum for Secondary Schools - Science Form 5. Internal document.

Table 29: SPM Science Assessment Format

	SPM Science
Number and type of assessments of each examination series	Two compulsory externally assessed examinations: Paper 1 and Paper 2.
Duration	Paper 1: 1 hour 15 minutes Paper 2: 2 hours 30 minutes
Type(s) of question	Paper 1: 50 multiple-choice questions Paper 2: Three sections Section A: 4 structured questions Section B: 5 structured questions Section C: 1 compulsory structured question 2 optional structured questions (answer one)
Total marks available	Paper 1: 50 marks Paper 2: 70 marks Section A: 20 marks Section B: 30 marks Section C: 20 marks
Weighting toward overall qualification	Paper 1: 40% Paper 2: 60%

Multiple-choice questions

Multiple-choice questions predominantly assess knowledge and understanding, comprising 40% of the overall assessment in Paper 1. The most common format is four plausible distractor items:

Figure 36: SPM Question Example 1

4. Which part of the brain is the first to be affected by alcohol?

A. A Cerebrum

B. B Cerebellum

C. C Spinal cord

D. D Medulla Oblongta

A number of items also assess application of knowledge and problem solving, for example the question below requires a calculation to determine the correct momentum of a trolley given its velocity and mass and distance moved.

Figure 37: SPM Question Example 2

41. Diagram 26 shows a trolley move with velocity 15 ms^{-1}.
Rajah 26 menunjukkan sebuah troli yang bergerak dengan halaju 15 ms^{-1}.

Diagram 26/*Rajah 26*

What is the momentum of the trolley?
Berapakah momentum troli itu?
[momentum =mass x velocity]
[*momentum = jisim x halaju*]

A 3 kg ms^{-1} C 27 kg ms^{-1}
B 12 kg ms^{-1} D 180 kg ms^{-1}

Short answer

Paper 2 Section B includes a number of short answer free response questions assessing knowledge and understanding, usually presented as lead-in sub-parts within structured questions. For example, a reviewed question presents a diagram of the atmospheric structure of the earth and asks the candidate to identify a layer within the structure for one mark.

Structured scenario-based

Structured scenario-based questions feature in Sections B and C of SPM Paper 2, although the scenarios presented are invariably familiar to the candidate and feature within the syllabus for Year 4 and 5. Therefore, they predominantly assess knowledge and understanding. Questions usually begin with a diagram or visual aid, initially asking the candidate to name specific processes/materials or procedures identified in the diagram and then proceeding to assess their understanding of the concepts by asking the candidate to describe or explain the process. An example of this type of question is highlighted below:

Structured data response experimental

Section A of the paper opens with a data response structured question. For example, the following shows data gained from an experiment and requires plotting a graph then interpreting the relationship between the variables investigated in the experiment.

Figure 38: SPM Question Example 3

1. Diagram 1 shows an experiment to study the reaction of metal P with dilute hydrochloric acid.
Rajah 1 menunjukkan satu eksperimen untuk mengkaji tindakbalas logam P dengan asid hidroklorik cair.

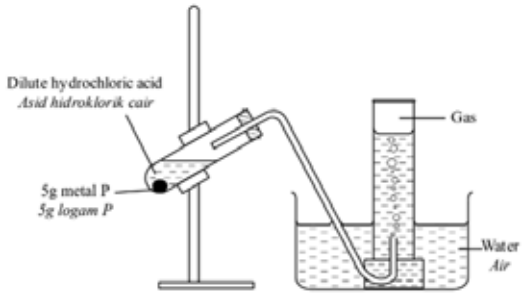
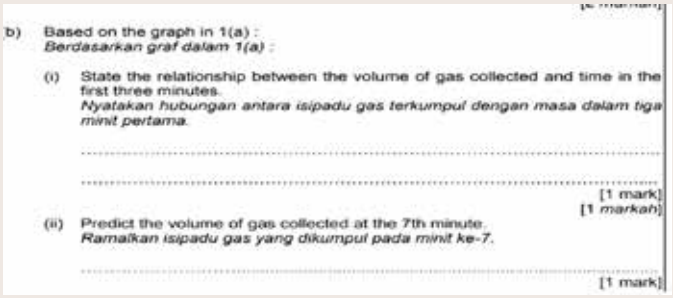


Diagram 1
Rajah 1

The volume of gas collected is recorded every minute for six minutes.
Table 1 shows the result of the experiment.
Isipadu gas yang telah dikumpul telah direkod setiap minit selama enam minit.
Jadual 1 menunjukkan keputusan eksperimen.

Time (minutes) *Masa (minit)*	1	2	3	4	5	6
Volume of gas collected (cm^3) *Isipadu gas terkumpul (cm^3)*	15	28	39	44	46	46



b) Based on the graph in 1(a) :
Berdasarkan graf dalam 1(a) :

(i) State the relationship between the volume of gas collected and time in the first three minutes.
Nyatakan hubungan antara isipadu gas terkumpul dengan masa dalam tiga minit pertama.

.....

.....

[1 mark]
[1 markah]

(ii) Predict the volume of gas collected at the 7th minute.
Ramalkan isipadu gas yang dikumpul pada minit ke-7.

.....

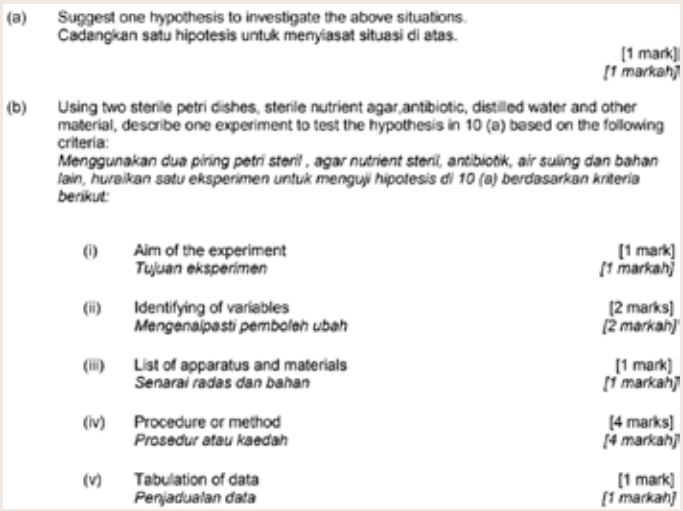
[1 mark]

Structured experimental

Structured experimental questions also feature in Section A. An example would be a question such as the one below which assesses the ability to make an inference based on a scientific observation and then to identify the key variables in the experiment (the constant and the responding variable).

Section C includes experimental questions, which are similar to the structured questions in Section A but require additional tasks of planning, methods and procedures as opposed to analysing experimental results. For example, the following question asks the candidate to hypothesise, and involves stating the aims, identifying the variables, listing the apparatus, procedure and tabulating the data based on a scenario.

Figure 39: SPM Question Example 4



(a) Suggest one hypothesis to investigate the above situations.
Cadangkan satu hipotesis untuk menyiasat situasi di atas.

[1 mark]
[1 markah]

(b) Using two sterile petri dishes, sterile nutrient agar,antibiotic, distilled water and other material, describe one experiment to test the hypothesis in 10 (a) based on the following criteria:
Menggunakan dua piring petri steril , agar nutrient steril, antibiotik, air suling dan bahan lain, huraikan satu eksperimen untuk menguji hipotesis di 10 (a) berdasarkan kriteria berikut:

(i)	Aim of the experiment *Tujuan eksperimen*	[1 mark] *[1 markah]*
(ii)	Identifying of variables *Mengenalpasti pemboleh ubah*	[2 marks] *[2 markah]*
(iii)	List of apparatus and materials *Senarai radas dan bahan*	[1 mark] *[1 markah]*
(iv)	Procedure or method *Prosedur atau kaedah*	[4 marks] *[4 markah]*
(v)	Tabulation of data *Penjadualan data*	[1 mark] *[1 markah]*

Appendix 3: Comparative item level analysis – maths and science

1. Maths

1.1 Question format and design

Use of command words

The use of command words is fairly consistent across the international mathematics exams reviewed, with short answer questions requiring candidates to "find", "show", "determine" or "state". Questions that use "calculate" or "work out" can require further steps and working out, reflective of the longer answer questions, although some variations are evident within and between examination papers reviewed.

The command word "prove" is also used in the CBSE, GCSE and IGCSE exams, typically for more extended questions worth three marks or more in which a longer mathematical argument is required:

Figure 40: GCSE and CBSE Question Examples

GCSE

14 Prove algebraically that

(2n + 1) 2 – (2n + 1) is an even number for all positive integer values of n.

Question 14, GCSE Sample Paper 2 (Higher Tier)

CBSE

36. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

CBSE SQP 2019-2020

It is observed that the CBSE exam papers, particularly the most recent SQP, may use a broader range of different command words than those observed in the GCSE / IGCSE / NCEA Level 1, including identify, obtain and evaluate in specific questions. Justify is also used on occasion, indicating that extended reasoning would be expected in response to the question whilst "justify" is very rarely used in the GCSE / IGCSE / NCEA Level 1 examination papers as a command word.

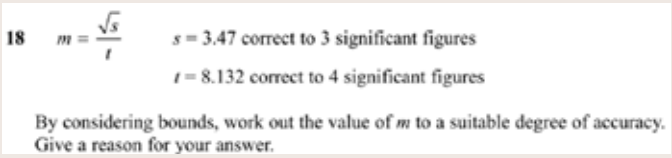
Command words used in mathematics assessment are not necessarily linked to the level of demand or mark allocations of the questions as they tend to be in sciences and social sciences. Nevertheless, the typical practice is to use one command word per question / sub-question and per sentence to ensure clarity and accessibility of the questions as is evidenced in the IGCSE, NCEA Level 1 and GCSE papers. The CBSE papers display some inconsistencies in this regard, with a number of extended questions involving embedded command words (i.e. separate, yet related tasks/problems).

Guidance and instructions

Some differences are evident in the instructions and level of guidance provided in the questions. For instance, for calculation questions, the IGCSE and GCSE questions indicate the degree of accuracy that is expected in response. This is particularly the case in the calculator papers which assess the candidate's ability to precisely state the answer to a suitable degree of accuracy, for example:

Figure 41: GCSE Example Question

GCSE



Question 18, GCSE Sample Paper 2 (Higher Tier)

Furthermore, whilst demonstrating strategy and working out are expected in the CBSE papers, this is not explicitly stated in the questions nor stated at the start of the paper apart from the small number of questions which may indicate "Justify". The IGCSE papers also provide further guidance in extended questions where a high proportion of marks are allocated for strategy, directing students to show all their working:

Figure 42: GCSE and NCEA Level 1 Examples

GCSE Papers

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

AE, DBG and CF are parallel.

DA = DB = DC.

Angle EAB = angle BCF = 38°

Work out the size of the angle marked x.

You must show your working.

NCEA Level 1

For the canoes to sail as fast as possible, the total area of both sails needs to be greater than 14 m².

Using the measurements shown in the diagram above, show whether or not the sails satisfy the size requirement. Justify your answer with clear geometrical reasoning and working.

The above guidance reflects the overall emphasis on mathematical communication in the selected international awards, the GCSE, IGCSE and NCEA Level 1, highlighted in the assessment objectives. This includes the assessment of the candidate's strategy, conciseness and ability to clarify each step leading to the final answer.

A further observable difference between the CBSE and examples of international exams in how mark allocations are presented in structured questions. Whereas the CBSE shows the total for each question, the GCSE and IGCSE also show the breakdown of marks for each sub-part in the structured questions for clarity.

Diagrams and visuals

Whilst the CBSE provides diagrams and images for a few questions in the latest SQP (2019-2020), a significant number of questions require the candidate to draw a diagram and construct a shape before solving a related problem. In the international exams diagrams are typically provided to enable a visual point of reference for the candidate, allowing the focus of the question to be more exclusively on problem solving. For example, in the question below, candidates are given the height of an object and its diameter but there is no diagrammatic representation. Instead, the candidate will have to construct their own object (without instruction) or visualise the cone to solve the problem. In the GCSE, by contrast, a similar question clearly provides a diagram of an object and its dimensions, while giving a problem to solve:

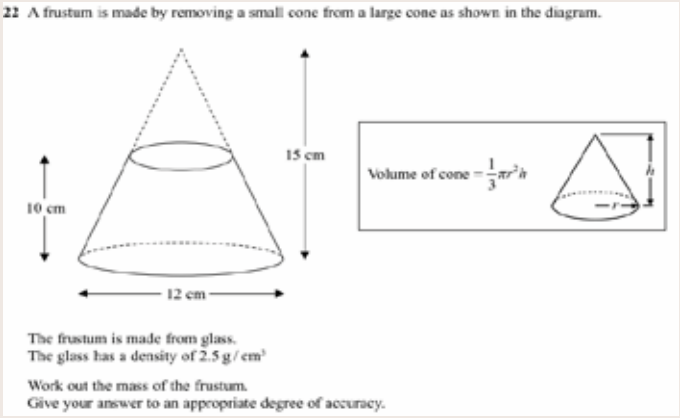
Figure 43: CBSE and GCSE Example Questions

CBSE

A petrol tank is in the form of a frustum of a cone of height 20 m with diameters of its lower and upper ends as 20 m and 50 m respectively. Find the cost of petrol which can fill the tank completely at the rate of Rs.70 per litre. Also find the surface area of the tank.

Two concentric circles are of radii 5cm and 3cm. Find the length of the chord of the larger circle which touches the smaller circle. (Question 17, 30-B 2018)

GCSE



Question 22, GCSE Sample Paper 1

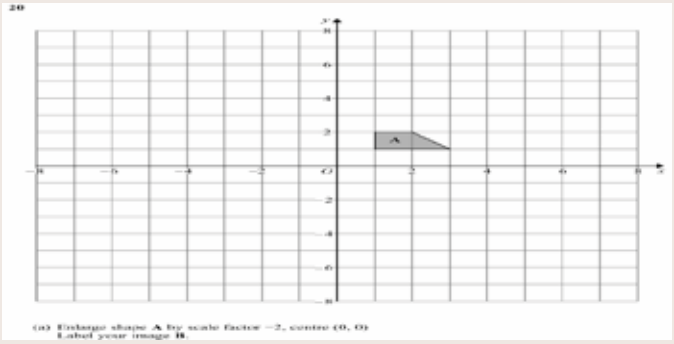
As can be seen in the figure above, while both the GCSE and the CBSE question focus on volumes of cones, the GCSE question provides a clearly labelled diagram as well as the relevant formula, placing focus of the question on problem solving involving mass and density.

A number of questions in the GCSE, IGCSE and NCEA Level 1 may nevertheless require the completion of a diagram and/or annotation to a diagram provided in

the exam. For example, in the following question candidates are expected to draw a transformation, given a shape on a graph:

Figure 44: GCSE Example Question

GCSE



Question 29, GCSE Sample Paper 1 (Higher Tier)

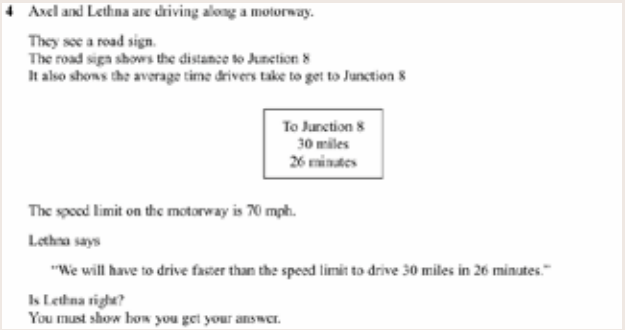
Questions involving the interpretation of graphs, manipulating shapes on graphs (transformations) or alternative means of presenting mathematical information are notably absent in the previous CBSE examinations while it is acknowledged that one such question (Question 34) in the SQP for 2019-2020 involves graphical interpretation.

Question layout

Standard practice in question layout and format typically follows the principle of using short concise sentences, with each sentence typically presented on a separate line, and in the GCSE and IGCSE, key facts are given in bold for clarity. Sometimes text boxes are used as well as diagrams with key information relevant to the question being posed, particularly in the case of extended or scenario-based questions:

Figure 45: GCSE Question Example

CBSE



4 Axel and Lethna are driving along a motorway.

They see a road sign.
The road sign shows the distance to Junction 8
It also shows the average time drivers take to get to Junction 8

To Junction 8
30 miles
26 minutes

The speed limit on the motorway is 70 mph.

Lethna says

"We will have to drive faster than the speed limit to drive 30 miles in 26 minutes."

Is Lethna right?
You must show how you get your answer.

Question 4, GCSE Sample Paper 2 (Higher Tier)

The layout of the CBSE examination questions does vary somewhat, with some of the shorter questions featuring in Sections A and B presented in single sentences. A number of the extended questions may be comprised of paragraphs in which the tasks are integrated within the body of text, for example:

Figure 46: CBSE Example Question

CBSE

A milkman uses a container, in the shape of frustum of a cone, to store milk. The container, open from the top, is of height 40 cm with radii of its lower and upper circular ends as 14 cm and 35 cm respectively. Find the volume of milk (in litres) which can completely fill the container. If he sells the milk at 35 per litre, for how much amount he can sell the whole milk? He had a desire to give one-tenth of the whole milk free to the children of economically weaker section of society. What value is reflected by his desire?

CBSE 30-B Question 29 2018

A clear contrast in the wording and layout of the CBSE question can be seen when compared to the GCSE question which is broken down into sub-parts, each with a separate mark allocation indicating how many steps the candidate should demonstrate in determining the answer.

1.2 Item level analysis – assessed skills

Short answer/gap fill

Short answer in both the CBSE and selected international examinations (the IGCSE and GCSE) broadly assess mathematical knowledge and the ability to carry out short procedures/operations based on familiar contexts. These are often focused on the knowledge and application of numerical principles. Examples are provided below:

Figure 47: CBSE and GCSE Example Questions

GCSE

9 Work out the value of $(9 \times 10^{-4}) \times (3 \times 10^{7})$

Give your answer in standard form.

8. Write 0.000068 in standard form.

16 Find the Highest Common Factor (HCF) of 24 and 60

GCSE Sample Assessment Materials

The demand of the shorter answer and gap fill questions in the CBSE is generally lower than the more extended/structured questions in Sections C and D but can include some more challenging questions which involve manipulation of an equation or a formula, albeit in two steps. Similarly, in the CBSE exams, a number of multiple-choice questions are used to assess mathematical procedural knowledge and application although multiple-choice questions do not feature in the other awards apart from the Malaysian SPM and to a small extent in the IGCSE.

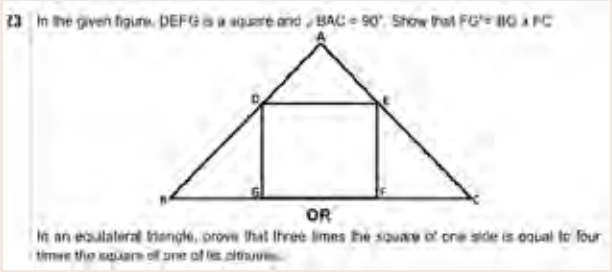
In the CBSE exams, there are also short answer stand-alone questions in Section B worth two marks each. In the IGCSE, GCSE and NCEA Level 1, two and three mark questions tend to feature as sub-parts to longer, structured questions.

Structured questions – mathematical contexts

Structured questions set in mathematical contexts can assess a broad range of topic areas, in shape and space, algebra and number in the international exams such as the GCSE, IGCSE and NCEA Level 1. Examples of questions assessing knowledge and problem solving in geometry alongside a stand-alone question in the CBSE exam are provided below:

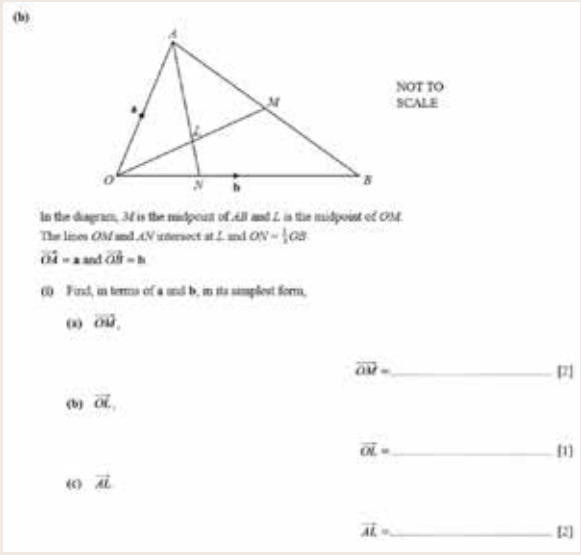
Figure 48: CBSE and IGCSE Example Questions

CBSE



Question 23, CBSE SQP 2019-2020

IGCSE



IGCSE Paper 2018

Both the CBSE and the IGCSE questions highlighted assess the application of trigonometric principles to solve problems involving shapes. Again, the most apparent differences when comparing the questions are the use of diagrams in the IGCSE question to orient the candidate and the breaking down of the question into sub-parts.

Mathematical context questions are common in algebra, particularly in the GCSE and IGCSE exams which contain a number of structured and stand-alone questions with list a series of linear, quadratics, simultaneous equations, algebraic fractions. The CBSE similarly sets some shorter questions as well as a number of stand-alone longer questions involving algebra and solving equations.

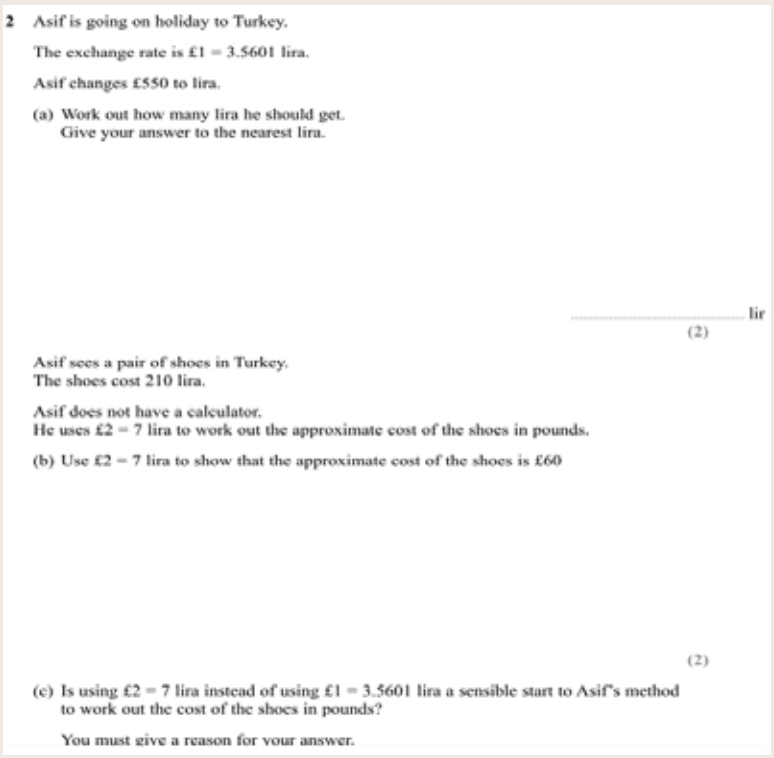
Structured questions – scenario-based / real-world contexts

Scenario-based questions in the CBSE exams are observed to vary in terms of assessed topic areas, from previous exams scenario-based questions are presented as single stand-alone question. In the most recent SQP, two scenario-based structured questions are included.

Numerical concepts are often assessed using real-world contexts in the international exam papers reviewed, for instance, the GCSE non-calculator paper includes a number of such questions:

Figure 49: GCSE Example Question

GCSE



2 Asif is going on holiday to Turkey.

The exchange rate is £1 = 3.5601 lira.

Asif changes £550 to lira.

(a) Work out how many lira he should get.
Give your answer to the nearest lira.

..... lir

(2)

Asif sees a pair of shoes in Turkey.
The shoes cost 210 lira.

Asif does not have a calculator.
He uses £2 = 7 lira to work out the approximate cost of the shoes in pounds.

(b) Use £2 = 7 lira to show that the approximate cost of the shoes is £60

(2)

(c) Is using £2 = 7 lira instead of using £1 = 3.5601 lira a sensible start to Asif's method to work out the cost of the shoes in pounds?

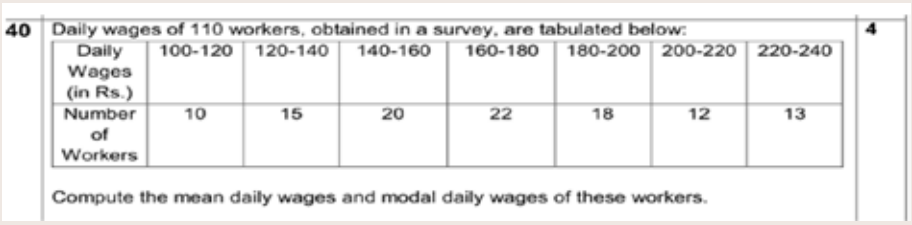
You must give a reason for your answer.

Question 2, GCSE Sample Paper 1 (Higher Tier)

The above example extract from the GCSE at the Higher Tier involves the application of numerical principles to solve real-world problems involving exchange rates. By contrast, questions in the CBSE assessing number are mainly mathematical in context and short answer, although some questions set around data handling can also draw upon numeracy skills, given that the CBSE paper is a non-calculator paper. For example, the final question on the SPQ requires calculating mean and modal wages based on numerical values in a table:

Figure 50: CBSE Question Example

GCSE



40 Daily wages of 110 workers, obtained in a survey, are tabulated below: 4

Daily Wages (in Rs.)	100-120	120-140	140-160	160-180	180-200	200-220	220-240
Number of Workers	10	15	20	22	18	12	13

Compute the mean daily wages and modal daily wages of these workers.

Question 40, CBSE SQP (2019-2020)

It is noted that the above “real world” problem is very similar to numerous problems set in the NCERT textbook chapter on statistics so the context and associated calculations required should already be familiar to the candidate, thereby providing assessment of the candidate’s understanding and numeracy rather than application and problem solving in a new context.

Questions assessing problem solving in probability are commonly presented in real-world scenarios, similar types of questions are evident across the CBSE, IGCSE and GCSE papers:

Figure 51: CBSE and GCSE Example Questions

CBSE

ayanti throws a pair of dice and records the product of the numbers appearing on the dice. Pihu throws 1 dice and records the squares the number that appears on it. Who has the better chance of getting the number 36? Justify?

Question 25, SQP 2019-2020

A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is (i) white or blue, (ii) neither white nor black.

Question 7, CBSE Paper 30-B 2018

GCSE

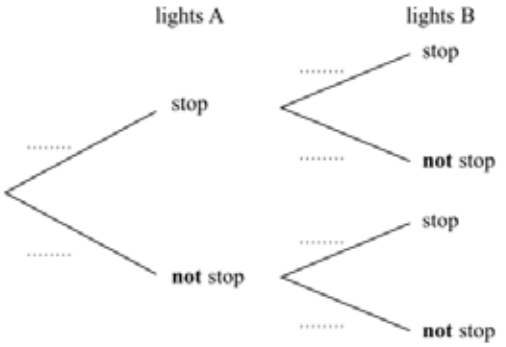
12 A and B are two sets of traffic lights on a road.

The probability that a car is stopped by lights A is 0.4

If a car is stopped by lights A, then the probability that the car is **not** stopped by lights B is 0.7

If a car is **not** stopped by lights A, then the probability that the car is **not** stopped by lights B is 0.2

(a) Complete the probability tree diagram for this information.



(2)

Mark drove along this road.
He was stopped by just one of the sets of traffic lights.

(b) Is it more likely that he was stopped by lights A or by lights B?
You must show your working.

The above questions taken from the CBSE and GCSE assess the understanding and solving of problems in conditional probability. Whereas both the CBSE questions comprise a single problem, the GCSE problem is broken down into two sub-parts. The GCSE question has a lead in question in which the candidate is given a visual context and has to complete a tree diagram, leading onto a problem involving calculating the likelihood based on the probabilities in the tree diagram. Explicit instruction is given in the GCSE exam question to show that working out and marks are allocated accordingly to each sub-part, whilst the CBSE questions sometimes require the candidate to "justify".

When comparing the question context, throwing a dice, a bag containing multi-coloured balls and traffic lights are similarly familiar contexts in which probability concepts may be assessed. Nevertheless, the second part of the structured question in the GCSE allows for a less predictable element to be introduced by asking whether the overall likelihood is greater of being stopped by lights A and B, a scenario which the candidate has to respond to in the examination.

Questions which assess translation of real-world contexts into mathematical notation, using algebra are evident in the CBSE SPQ and they are also included in the GCSE and IGCSE, although less so in previous papers of the CBSE (prior to 2019). The first example from the IGCSE presented below requires modelling of a scenario in terms of inequalities before drawing a graph of the inequalities and shading the unwanted regions. The NCEA Level 1 exemplar question shown below similarly involves representing a situation in terms of an equation then solving an equation, assessing algebraic manipulation and deduction.

Likewise, a sample question in the CBSE, taken from the recent SQP (2019-2020), involves translating a scenario into an equation and using algebra to work out the original speed of a train.

Figure 52: CBSE, IGCSE and NCEA Level 1 Question Examples

IGCSE

8 Sima sells x biscuits and y cakes.

(a) (i) She sells at least 100 biscuits.

Write down an inequality in x.

..... [1]

(ii) She sells at least 120 cakes.

Write down an inequality in y.

..... [1]

(iii) She sells a maximum of 300 biscuits and cakes altogether.

Write down an inequality in x and y.

..... [1]

(iv) Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake.
Her total profit is at least $160.

Show that $x + 2y \geqslant 400$.

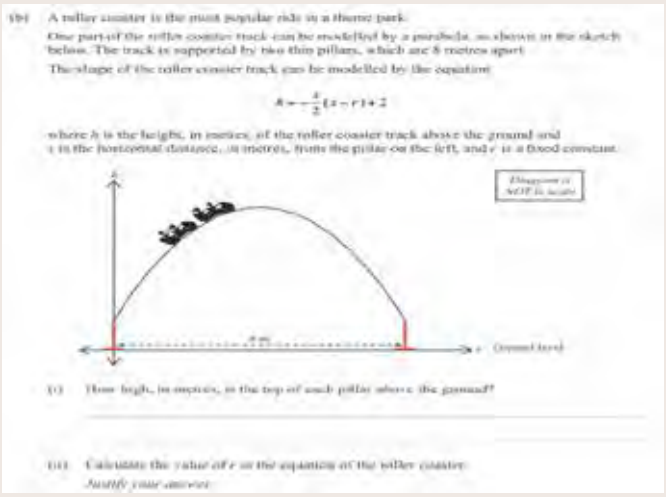
(b) On the grid, draw four lines to show the four inequalities and shade the unwanted regions. (6)

IGCSE Paper 3 2018

CBSE

A train covers a distance of 360 km at a uniform speed. Had the speed been 5km/hour more, it would have taken 48 minutes less for the journey. Find the original speed of the train.

Question 37, CBSE SQP 2019-2020



(iv) A roller coaster is the most popular ride in a theme park.
One part of the roller coaster track can be modelled by a parabola, as shown in the sketch below. The track is supported by two thin pillars, which are 8 metres apart.
The shape of the roller coaster track can be modelled by the equation

$$h = -\frac{4}{5}(x - r)^2 + 2$$

where h is the height, in metres, of the roller coaster track above the ground and x is the horizontal distance, in metres, from the pillar on the left, and r is a fixed constant.

(I) How high, in metres, is the top of each pillar above the ground?

(II) Calculate the value of r in the equation of the roller coaster.
Justify your answer.

Question 1, NCEA Level 1 Unit Exam: Understand Relationships between tables, equations and graphs

Extended questions

Extended stand-alone questions are included in the GCSE and IGCSE, more frequently in the NCEA Level 1. Similarly, section D of the CBSE includes four mark questions which may involve extended reasoning.

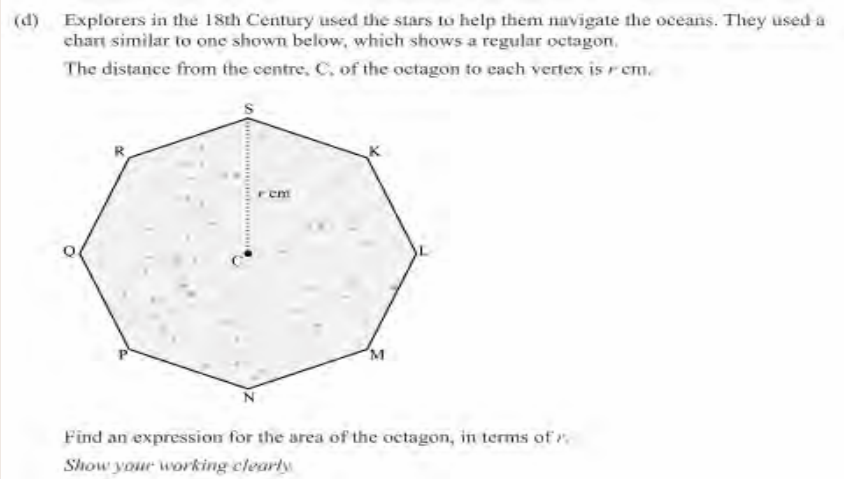
Figure 53: CBSE and NCEA Level 1 Example Questions

CBSE

On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. From a point 9 m away from the foot of the tower, the angles of elevation of the top and foot of the flag pole are 60° and 30° respectively. Find the heights of the tower and the flag pole mounted on it.

CBSE Standard X Paper (2018)

NCEA Level 1


(d) Explorers in the 18th Century used the stars to help them navigate the oceans. They used a chart similar to one shown below, which shows a regular octagon.

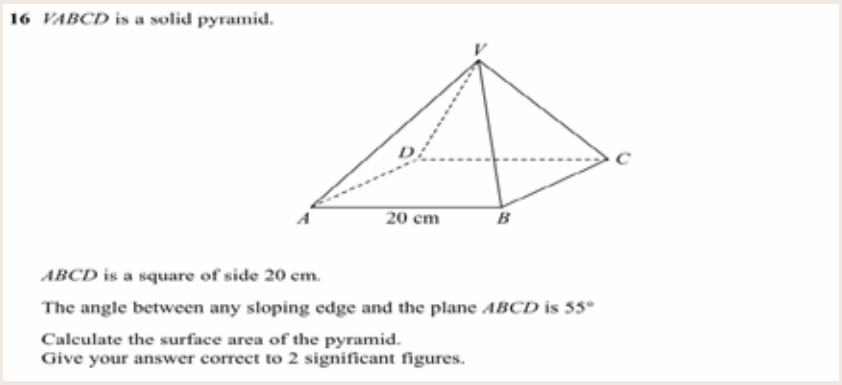
The distance from the centre, C, of the octagon to each vertex is r cm.

Find an expression for the area of the octagon, in terms of r.

Show your working clearly.

Question 3, NCEA Level 1 Unit Paper 2019: Apply geometric reasoning in solving problems

GCSE


16 *VABCD* is a solid pyramid.

ABCD is a square of side 20 cm.

The angle between any sloping edge and the plane *ABCD* is 55°

Calculate the surface area of the pyramid.
Give your answer correct to 2 significant figures.

Question 16, GCSE Sample Paper 3 (Higher Tier)

Comparing the above extended questions, the CBSE,the selected international exam questions from the NCEA Level 1 and the GCSE all assess the ability to infer and construct a strategy for solving a longer problem in a series of steps, in response to the given stimulus. In the CBSE, the scenario is given in written form, while in the GCSE and NCEA Level 1, diagrams are provided to facilitate problem solving in novel situations.

It is observed that some of the more extended questions on the CBSE and indeed some of the shorter answer questions are very similarly worded to those set in previous years, to the point where any prior exposure may confer a significant advantage in the examination. Examples from the SPQ and the 2018 exam paper are given below:

Figure 54: CBSE Example Questions

36 Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

CBSE SQP 2019-2020

24 If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

CBSE Past Paper

Furthermore, some of the questions appearing in the CBSE exam papers exhibit close similarities with those included as exercises in the NCERT textbooks as shown in the examples below:

Figure 55: CBSE and NCERT Textbook Questions

CBSE SQP 2019-2020

On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. From a point 9 m away from the foot of the tower, the angles of elevation of the top and foot of the flag pole are 60° and 30° respectively. Find the heights of the tower and the flag pole mounted on it.

NCERT Mathematics Standard X Textbook

Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles and the distances of the point from the poles.

NCERT Textbook

8. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

CBSE SQP

A train covers a distance of 360 km at a uniform speed. Had the speed been 5km/hour more, it would have taken 48 minutes less for the journey. Find the original speed of the train.

CBSE SQP 2019-2020 Mathematics

In the above example, an exercise from the NCERT textbook has very similar wording and scenario to that presented in the exam and the numerical values presented are also the same or very similar. While knowledge and some extent of conceptual understanding can therefore be assessed, the familiarity of the context increases predictability and potentially limits the scope of higher order thinking skills assessment in the examination. In addition to the examples given above, other such similarities are evident across past papers.

Whilst some reoccurring concepts are indeed assessed in multiple exam series, the GCSE, IGCSE and NCEA exams all contain unique questions in each examination, placing emphasis on application and problem solving as opposed to knowledge and procedural recall. Where similar topics are assessed, the wording of the questions is typically differentiated and scenarios are selected to be distinct from those featuring in previous examination series. The structured format of the questions in the GCSE, IGCSE and NCEA Level 1, in particular, allows for flexibility in the wording and scenarios presented to candidates throughout the questions which are unique to each exam paper.

2. Science

2.1 General question-level design features

When comparing the wording of the question, the range of command verbs used varies by assessment. One difference that is evident relates to the placement of the command word in the question stem. The use of command words demonstrates variability in the CBSE papers. Where command words are used, the placement of the command word can vary from the beginning to the end of the question stem.

Figure 56: CBSE Example Questions

CBSE Examples

Two elements X and Y have atomic numbers 12 and 16 respectively. To which period of the modern periodic table do these two elements belong? What type of bond will be formed between them and why? Also give the chemical formula of the compound formed.

Question 17, CBSE SQP 2019-2020

(i) Create a terrestrial food chain depicting four trophic levels.

(ii) Why do we not find food chains of more than four trophic levels in nature?

Question 18, CBSE SQP 2019-2020

Although contextual information is likely to be placed at the beginning of structured questions, IGCSE and GCSE exam questions invariably start with the command word so that it is clear what action is expected to be performed by the candidate at the outset of the question.

A number of other CBSE questions include multiple command words and tasks set within the same question as can be seen in the two example questions below. All of the questions set in the GCSE, IGCSE, NCEA Level 1, by contrast, uniformly include one task and command word per structured question sub-part or per question.

Figure 57: CBSE Example Questions

2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid.

Question 10, 2018 CBSE Set 31-2-2

In a pea plant, the trait of flowers bearing purple colour (PP) is dominant over white colour (pp). Explain the inheritance pattern of F1 and F2 generations with the help of a cross following the rules of inheritance of traits. State the visible characters of F1and F2 progenies.

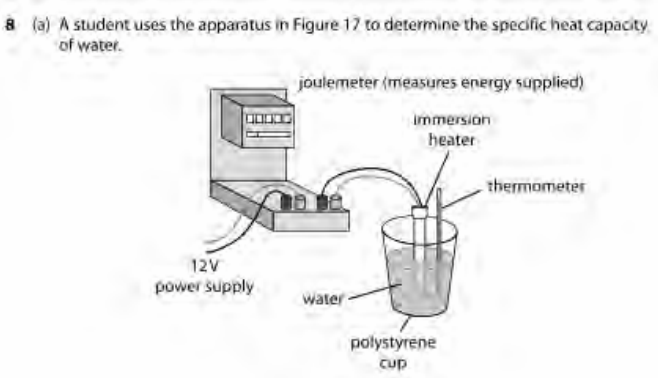
Question 20 SQP 2019-2020

In first of the above example from the CBSE papers, the candidate is expected to carry out three tasks within the same question whereas in the second, two distinct tasks could be identified (explain and state). This merging of tasks within the same question is commonly observed across the CBSE SQPs and past exam papers.

A further observation concerns the design of structured questions. All sub-parts of structured questions are interrelated and are focused on the same topic / scenario. Whilst this is usually also the case in the CBSE papers, there are a number of structured questions which present sub-parts/tasks which assess alternative topics.

As a general observation relating to question format, where scenarios or experiments are included within the question, they are typically described in the CBSE papers rather than visually presented to the candidate. By contrast, the IGCSE, GCSE and NCEA Level 1 paper questions which typically present experiments and scenarios visually either using pictures, diagrams or photographs, while providing additional textual and/or contextual information.

Figure 58: GCSE Example Question



In such questions, the visual cue is designed to orient the candidate within the scenario of the question, to ensure understanding of the context prior to attempting assessment tasks, alongside the short description to facilitate the candidate's understanding prior to attempting the tasks.

2.2 Assessed skills by question type

A review of similarly focused questions was undertaken with a view to identifying similarities and differences in terms of the assessed skills and cognitive levels:

Short answer – knowledge recall

The format of short answer questions and assessment of knowledge is observed to be similar between all systems reviewed. The command words used typically include state, name, list describe, define scientific processes and principles.

Figure 59: CBSE and GCSE Example Questions

CBSE

1. Define catenation (1)
2. How does valency of an element vary across a period? (1)

CBSE SQP 2019-2020

1. Name two industries based on forest produce.

CBSE Standard X 2019

GCSE

(b) Some liquid is left in a warm room. After a few days no liquid can be seen. Give the name of the process that has occurred. (1)

(ii) State what is meant by the term electrolyte.(2)

(i) Under each box write the name of the state of matter shown. (2)

Pearson Edexcel GCSE Sample Assessment Materials

Overall the level of demand is considered low, as these questions are similarly relying heavily on recall only, and do not require any detailed explanation and frequently ask for a one sentence response. Whilst these questions can be stand-alone in the CBSE, featuring in Section A of the CBSE exam, in the GCSE, IGCSE, NCEA Level 1 and SPM, these are typically lead-in questions to more demanding sub-parts to structured questions. In the CBSE, the short answer questions can also be stand-alone questions as in the two examples above.

Short-medium answer – understanding

Similarities are evident between the CBSE questions and those targeting understanding in the GCSE, IGCSE and SPM. Typically these questions begin with "describe" or "explain" or ask the candidate "why" and involve not only recall of knowledge, but the ability to structure this knowledge and demonstrate understanding of the concepts, processes or principles being assessed in a logical and coherent response. Although with this type of question, understanding is typically assessed within a context familiar to the candidate or related to a context covered in the NCERT textbooks:

Figure 60: CBSE and IGCSE Example Questions

CBSE

State the laws of refraction of light. Explain the term 'absolute refractive index of a medium' and write an expression to relate it with the speed of light in vacuum. (3)

(a) Why are most carbon compounds poor conductors of electricity?

(b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

IGCSE

d) The mesophyll cells and stomata of the leaf are involved in transpiration. Describe the process of transpiration. Use the terms mesophyll cells and stomata in your answer. (2)

A molecule of ethane contains covalent bonds. Explain how covalent bonds form between non-metallic elements. Use ideas about electrons in your answer. (1)

Multiple-choice

Similarities are evident in the format and skills assessed in the multiple-choice questions included in the CBSE papers and those included in the IGCSE, GCSE and SPM. Multiple-choice questions similarly vary in terms of their demand, according to the plausibility of the distractor items. As with most international assessments, three distractor items are included in each multiple-choice question, the majority are targeted at assessing knowledge and understanding whilst a smaller number assess application.

The multiple-choice questions, as in the international examples, are less targeted towards the assessment of higher order thinking skills of analysis or evaluation given the constraints of the question type which requires one correct definitive response. One observed difference is that a smaller number of multiple-choice questions in the IGCSE additionally assess the interpretation of a dataset (see example below from the IGCSE multiple-choice paper), while CBSE multiple-choice questions may not assess data interpretation (apart from question 4d in the CBSE SQP):

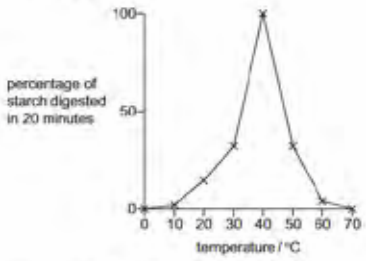
Figure 61: Example IGCSE Question

3 Amylase is an enzyme that digests starch.

Identical mixtures of starch and amylase are kept at different temperatures.

The percentage of starch digested in 20 minutes is recorded.

The results are shown in the graph.



The mixtures that were kept at 0 °C and 70 °C are then kept at a temperature of 40 °C for one hour.

What are the results after this hour?

	percentage of starch digested	
	sample originally kept at 0 °C	sample originally kept at 70 °C
A	0	0
B	0	100
C	100	0
D	100	100

IGCSE 2018 Paper 2 (Extended) Question 3

Data response questions

Data response questions which involve analysis of a graph or dataset have been used in the CBSE past papers, with two structured questions included in the sample 2019-2020 paper. The figure below illustrates question 4, a data response question, from the 2019-2020 SQP of the CBSE:

Figure 62: CBSE Example Question

4(a) Refer to Table B showing the blood report of the levels of glucose of patients X and Y. Infer the disease which can be diagnosed from the given data. 1

4(b) Identify the hormone whose level in the blood is responsible for the above disease. 1

4(c) Which one of the following diets would you recommended to the affected patient? 1

i) High sugar and low fat diet.
ii) Low sugar and high protein diet.
iii) High Fat and low fiber diet.
iv) Low sugar and high fiber diet.

4(d) Refer to the Table A and suggest the value of the mean blood glucose level beyond which doctor's advice is necessary: 1

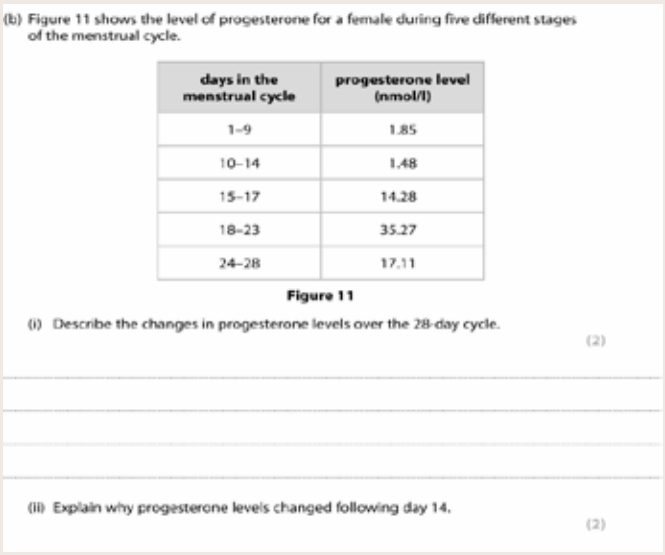
i) 180 mg/dL
ii) 115 mg/dL
iii) 50 mg/dL
iv) 80 mg/dL

Question 4, CBSE SQP 2019-2020

While the CBSE question above assesses knowledge and understanding of blood glucose and the hormone involved in its regulation, the answers to 4a and 4b could potentially be recalled from memory given the context of blood – glucose levels, without any real analysis of the table in Table B. Likewise, general knowledge of diabetes would allow the candidate to answer part 4c, whilst only part 4d requires the ability to interpret the data presented in Table A but this is only worth one mark (equal to the other parts of the question assessing knowledge).

Data response questions in the IGCSE and GCSE, by contrast, are generally observed to focus more specifically on analysing data presented, whilst they may also draw upon topic knowledge. The following question, focused on hormones involved in the reproductive cycle is found in the GCSE sample questions:

Figure 63: GCSE Example Question



(b) Figure 11 shows the level of progesterone for a female during five different stages of the menstrual cycle.

days in the menstrual cycle	progesterone level (nmol/l)
1–9	1.85
10–14	1.48
15–17	14.28
18–23	35.27
24–28	17.11

Figure 11

(i) Describe the changes in progesterone levels over the 28-day cycle. (2)

(ii) Explain why progesterone levels changed following day 14. (2)

Question 2, Pearson Edexcel GCSE Sample Paper 2 Biology

The example taken from the GCSE sample question paper given above requires the candidate to describe changes in hormone levels, by referencing and interpreting the data provided in the table and then to suggest why a particular value does not correspond to the overall trend. It draws not only on a candidate's knowledge of the menstrual cycle but also precise interpretation of the data presented and application of this knowledge to explain specific values recorded in the dataset. Other examples of higher demand data response questions, from the GCSE papers, for example, require candidates to "compare" and "contrast" a larger dataset given in a table:

Figure 64: GCSE Example Question

Figure 12 shows the effectiveness of different methods of contraception in the prevention of pregnancy during their first year of use.

(c) Compare and contrast the data for different contraceptive methods and types, to advise a young adult as to the best method of contraception to avoid pregnancy. (6)

Pearson GCSE Sample Paper 2 Biology Question 6

While a small number of questions may use the command word "compare" in the CBSE papers, analysis, such as in the question above, of a large dataset is not an assessed skill in the CBSE exam papers reviewed.

Scenario-based structured questions

In general, scenario-based questions were observed to vary in terms of the skills assessed and the overall cognitive demand across all examined papers, depending on the level of familiarity of the context and the abstractness of the concepts assessed in the question.

Differences were observed in the format and skills assessed in the scenario-based questions between those in the CBSE and international assessments. Most notably it was found that scenario-based questions in the CBSE sample exams mainly relate to contexts previously encountered in the NCERT textbooks, although some application of theoretical knowledge is expected albeit in a fairly familiar contexts. For example, interpreting a time / distance graph in a specific scenario is a commonly encountered scenario-based question in both the CBSE papers and in selected international assessments. These questions involve interpreting the different stages of a journey on the time / distance graph showing a specific journey, and carrying out associated calculations to work out velocity or, less commonly, speed time graphs to work out distance and acceleration.

Application questions in chemistry in the CBSE papers may typically present unknown elements or compounds in a chemical reaction, for example, in the figure below. In this case, however, the context provided in the following question should be familiar given prior coverage of converting ethanol to ethane and the references to heating with sulphuric acid to give an unsaturated compound:

Figure 65: CBSE Example Question

A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction.

31-2-2 CBSE 2018 Question 5

Less familiar contexts are often included in some of the international examinations reviewed, that may assess included concepts but do not directly feature in the syllabus. A less familiar context is presented in the following question from the IGCSE focusing on the extraction of metals, iron extraction using carbon is covered within the syllabus and is familiar. However, in the following item, the candidate is asked to consider why calcium ore cannot be extracted, applying using ideas about reactivity and understanding of the periodic table and calcium's properties in the following scenario:

Figure 66: IGCSE Example Question

(ii) Iron can be extracted from its ore using carbon. Calcium, a Group II metal, cannot be extracted from its ore using carbon. Explain this difference. Use ideas about the reactivity of carbon and metals in your answer. (2)

IGCSE 2019

Numerous examples of unfamiliar scenarios being used to assess conceptual understanding and application can be found across the international exam papers reviewed. The following question from the 2019 NCEA Level 1 unit test on aspects of mechanics presents the new everyday scenario of different sized footprints in the sand to assess the candidate's understanding of the relationship between force, pressure and mass:

Figure 67: NCEA Level 1 Example Question

An adult and a child's feet sink into soft sand. The footprints are the same depth. The child's footprints cover a smaller area than the adult's.

(a) Pressure is defined as the force exerted divided by the surface contact area.

Using this pressure definition, explain how it applies to the adult standing in the sand.

Question 2 NCEA Level 1 Demonstrate Understanding of Aspects of Mechanics 2019 Paper

The further type of scenario-based question included in the CBSE sample paper (2019) involves reading a passage and answering questions, based on the topic covered in the passage. This type of question does not feature in the GCSE, IGCSE, NCEA Level 1 or SPM yet can be used to assess comprehension and application of knowledge in real-world scenarios, although the effectiveness and validity of such questions are dependent on how the questions are worded in relation to the case study / textual scenario being presented in the question.

Calculation questions

As mentioned the review of the CBSE sample paper and past papers highlight a number of calculation questions. Some similarities are apparent between the CBSE calculation questions with similarly focused questions in international assessments– for example, in the items below:

Figure 68: CBSE Example Questions

(b) Calculate the equivalent resistance of the following network

CBSE Standard X 2019

A concave mirror has a focal length of 20 cm. At what distance from the mirror should a 4 cm tall object be placed so that it forms an image at a distance of 30 cm from the mirror? Also calculate the size of the image formed.

Question 14, CBSE 2019 31-5-3

It was observed that the vast majority of calculation questions are in a narrow range of specific topic areas within the CBSE syllabus, where calculations are heavily emphasised in the NCERT textbooks in physics topic units whereas in the GCSE and IGCSE, calculation type problems are typically more spread out across different topic areas, and in chemistry and biology topics including in some contexts where calculations may not necessarily have been previously applied/encountered in previous exercises, for example:

Figure 69: GCSE Example Questions

GCSE

6. The ratio of waist-to-hip measurements can be used to determine the risk of a person developing cardiovascular disease.

(a) Calculate the waist-to-hip ratio for a person with a waist measurement of 830 mm and a hip measurement of 0.99 m. (2)

Give your answer to two decimal places.

Pearson Edexcel GCSE Biology Sample Paper 1 Question 6

(i) Calculate the rate of water loss from the plant in mm 3 /s if the volume of water lost was 12 mm 3 in 10 minutes. (3)

Pearson GCSE Biology Sample Paper 2 Question 3

The CBSE exams typically include questions on balancing equations in chemistry, although calculation questions involving volumes, masses and quantities such as those included in the IGCSE, GCSE and NCEA Level 1 are not typically included. Similarly, the CBSE papers were not observed to include any calculation problems in biology, however, the GCSE papers include a number of such calculation problems involving biological topic areas.

Whilst substitution type calculations of a single / two steps are the most commonly encountered type of question and considered of medium level demand, a smaller number of calculation problems in the CBSE require multiple steps or manipulation (rearrangement) of a formula, these comprise some of the most demanding questions in the CBSE papers, although they are generally restricted to a small number of topic areas in the syllabus. In some cases, it is noted that these questions as in the example below are frequently given as options in the CBSE papers so it is understood that it is possible that not all candidates will be assessed on their ability to solve multi-stage calculations. Multi-step calculation problems are also included in the IGCSE, GCSE, NCEA Level 1, but are mandatory and set across a broader range of topic areas, with candidates asked to demonstrate their working out and strategy in full:

Figure 70: Examples from CBSE, NCEA Level 1 and GCSE Exams

CBSE

A student has to trace the path of a ray of light through a glass slab. List four precautions he should observe for better results.

OR

You have a convex lens of focal length 12 cm. You place a candle flame on its principal axis at a distance of 60 cm from the lens on its one side and place a screen on its other side. Write two characteristics of the image formed on the screen. If you now shift the candle flame towards the lens so that its distance from the lens becomes 15 cm, then state the changes that are observed in these two characteristics of the image formed.

CBSE Question 26, Set 21-B 2018

NCEA Level 1

(d) During the 450 m fall, the parachutist's gravitational potential energy was reduced by 283 500 J. Calculate the parachutist's downward speed (vertical) at 450 m, assuming energy is conserved.

GCSE

Plutonium-238 is used in spacecraft to provide heat to power generators.

One of these generators contains 925 g of plutonium-238 when it is manufactured.

One gram of plutonium-238 has a power density of 0.54 W/g.

Plutonium-238 has a half-life of 87.7 years.

Calculate the average energy released per second by the generator after 263 years.

(4)

Question 4, Pearson Edexcel GCSE Sample Paper 3 Physics

Structured experimental questions

Similarities and differences were identified in reviewing experimental questions set across the papers which include this type of questions. Experimental planning questions typically begin with "how would you plan…", "prepare" or "devise an experiment".

Where experimental questions are included in the CBSE papers, it is observed that a number of these questions relate directly to experiments CBSE students would have encountered previously in the NCERT textbooks. For example, the questions below a good assessment of the student's understanding of the stages involved in the experiments covered, although require less application of knowledge to new contexts as the contexts of testing for hydrotropism and preparing a leaf peel to show stomata have been covered in the NCERT textbooks:

Figure 71: CBSE Examples

CBSE

What is hydrotropism? Design an experiment to demonstrate this phenomenon.

In the experiment ''To prepare a temporary mount of a leaf peel to show stomata'', glycerine and safranin are used. When and why are these two liquids used? Explain.

CBSE 2019 31-5-3 Question 25

Whilst questions in the IGCSE and GCSE may similarly ask candidates to plan/devise an experiment, contextual changes / novel elements are often introduced to more effectively assess the candidate's ability to apply existing experimental knowledge in a newly introduced, unfamiliar scenario. For example, the question below asks the candidate to plan an experiment to develop magnesium sulfate crystals from an acid, with supporting equations for the processes involved:

Figure 72: Example GCSE Question

Salts of metals can be made by reacting one of the metal's compounds with the appropriate acid.

Plan an experiment to prepare pure, dry crystals of magnesium sulfate, MgSO4, by reacting a suitable magnesium compound with a suitable acid. You may use equations if you wish.

GCSE Sample Paper 4 Chemistry Question

As developing magnesium sulfate crystals is not explicitly in the GCSE syllabus list of required practicals, the student has to apply his/her knowledge from conducting textbook experiments focusing on the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide and produce new equations based on their understanding of the chemical composition of magnesium and associated reactants from elsewhere in the syllabus. The question, therefore, challenges students to make connections within and between topic areas, applying their existing practical knowledge to a new situation.

Other scientific planning questions, such as the example question given below, may include more familiar contexts thereby requiring consideration not only of experimental procedures but also of variables and controls to address the specific hypothesis presented in the question:

Figure 73: IGCSE Example Question

(b) A student stated:

"The activity of the enzyme amylase is greatest at 40 °C."

Describe an investigation using the reagent you have named in (a) to test whether this statement is correct.

Question 1, IGCSE Paper 5 2018

Experimental observation type questions are commonly included across some the GCSE, IGCSE, NCEA Level 1 and SPM papers. A number may also be found in the CBSE, as for example below:

Figure 74: CBSE Question Example

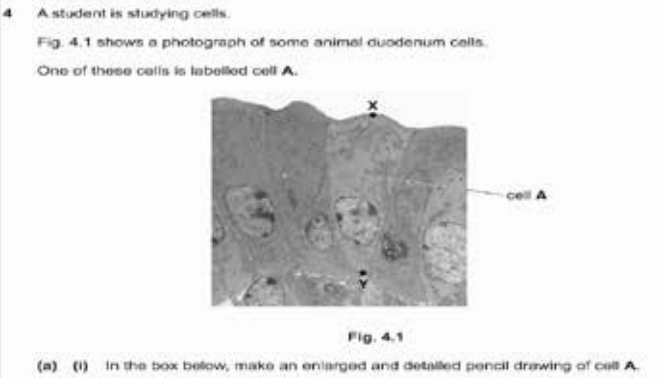
A student is viewing under a microscope a permanent slide showing various stages of asexual reproduction by budding in yeast. Draw diagrams of what he observes.

(in proper sequence) (2)

31-3-3 2018 CBSE Question 26

The above CBSE observational question draws on knowledge and understanding of experimental approaches to investigating asexual reproduction, although the above task, as with those observed in other questions relates directly to a procedure found in the NCERT textbooks and relies heavily on the procedures given in the textbooks. When comparing the observational questions in the CBSE to those, for example in the IGCSE Papers 5 and 6, there is more emphasis on responding to a novel scenario presented in the exam as opposed to recalling experimental procedures from memory:

Figure 75: IGCSE Example Question



Question 4, IGCSE Paper 6 2018

In the above example, from an IGCSE past paper, the candidate is similarly expected to draw a diagram, although the question places greater demands on application and interpretation skills in order to accurately identify and reproduce the structures in the unseen microscope image presented in the question.

Further sub-parts to experimental questions may involve identifying variables (control/ constants) following the description of an investigation. This type of task occurs in the GCSE, IGCSE, SPM experimental questions although is not typically found in the CBSE papers. The questions seek to assess the candidate's understanding of the scientific method, and how best scientific objectivity and reliability can be maintained during experimental procedures:

Figure 76: GCSE Example Question

Dieting can reduce the effects of cardiovascular disease.

A scientist is planning to test a new diet for weight loss.

She selects 40 obese people to take part in the test.

All the obese people are between 20 and 30 years of age.

(b) (i) State two other factors the scientist should control when selecting the people.(2)

GCSE Sample Paper 1 Biology Question 6

A number of questions in the GCSE may also ask the candidate to identify limitations and suggest improvements to the accuracy of experiments, while other tasks may ask the candidate how to modify methods to investigate an alternative / adapted research question:

Figure 77: GCSE and IGCSE Example Questions

(iv) The scientist counted the number of bubbles produced by the Cabomba plant. Another scientist stated that this was not the best method of measuring the volume of gas produced.

Explain how you could improve the method to measure the volume of gas released more accurately.

Sample GCSE Biology Paper 2 Question 3

d) Describe how the experiment could be modified to obtain a more accurate value for the time it takes the train to travel around the track.

Question 6, IGCSE Paper 6 2018

(e) A student wanted to find out if the rate of this reaction depends on the concentration of the reducing agent in solution B.

Suggest how the student should modify the experiment that you have carried out to investigate this.

IGCSE Paper 5 2018

The above type of question, whilst not observed in the CBSE papers examined, in the GCE and IGCSE papers, assesses further the student's understanding of limitations of experimental designs and to evaluate how improvements can best be made to enhance reliability/validity of procedures. Questions of the final type seen above assess how experimental design can be modified to investigate alternative variables in the context of a new/further research question.

Extended questions

Single, stand-alone extended questions are included in the GCSE and NCEA Level 1, intended to assess higher order thinking skills of analysis and evaluation. Whilst CBSE includes five mark questions, it was found that a majority of these questions include separate tasks albeit sometimes merged within the same question rather than presenting a single analytical question that involves devising a structured response, assessing skills of analysis and

synthesis as is the case in the following examples taken from the GCSE Sample assessment materials:

Figure 78: GCSE Extended Questions

*(c) Explain how the changes in the trends for smoking may affect the occurrence of cardiovascular disease. (6)

*(b) The order of reactivity of chlorine, bromine and iodine can be determined by carrying out displacement reactions. Explain how displacement reactions can be used to show the reactivity of these three elements. (6)

GCSE Sample Assessment Materials

Appendix 4: The CEFR and its Relevance for the CBSE Standard X

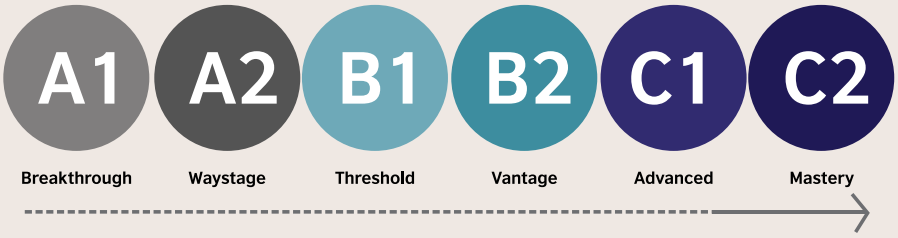
The CEFR was developed by the Council of Europe in Strasbourg throughout the 1990s as a response to the perceived need for a common framework to facilitate mutual recognition of language proficiency within Europe, but with ultimate application across multiple modern languages globally. The development of the CEFR was motivated by the wish to 'facilitate the mutual recognition of qualifications gained in different learning contexts,'[60] and to support communication among professionals working in modern languages;[61] both aims with clear application to the Indian context across both English and Hindi.

The key findings outlined in its publication in French and English in 2001: '*Common European Framework of Reference for Languages: Learning, Teaching, Assessment*',[62] arose from a consultative process with key industry stakeholders. The original framework is now available in forty languages, and includes a number of aims such as to:

- Contribute to competence building in the area of linking assessments to the CEFR
- Encourage increased transparency on the part of examiner providers
- Encourage the development of both formal and informal national and international networks of institutions and experts.[63]

Proficiency levels are described on a six-point scale, from A1 at the lowest level to C2 at the highest:

Figure 79: the CEFR levels



60
Council of Europe (2001), Common European Framework of Reference for Languages: Learning, teaching, assessment.

61
Ibid.1

62
See further https://rm.coe.int/16802fc1bf

63
Ibid 2001,1

Global descriptors for each level outline the general competencies expected:

Table 30: CEFR Global descriptors for A1-C2

Proficient User	C2	Can understand with ease virtually everything heard or read. Can summarise information from different spoken and written sources, reconstructing arguments and accounts in a coherent presentation. Can express him/herself spontaneously, very fluently and precisely, differentiating finer shades of meaning even in more complex situations.
	C1	Can understand a wide range of demanding, longer texts, and recognise implicit meaning. Can express him/herself fluently and spontaneously without much obvious searching for expressions. Can use language flexibly and effectively for social, academic and professional purposes. Can produce clear, well-structured, detailed text on complex subjects, showing controlled use of organisational patterns, connectors and cohesive devices.
Independent User	B2	Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
	B1	Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. Can produce simple connected text on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.
Basic User	A2	Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.
	A1	Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

2009 saw the publication of the CEFR Manual: *Relating Language*

2009 saw the publication of the CEFR Manual: 'Relating Language Examinations to the Common European Framework of Reference for Languages: Learning, Teaching, Assessment', which aimed to 'help the providers of examinations to develop, apply and report transparent, practical procedures in a cumulative process of continuing improvement in order to situate their examination(s) in relation to the Common European Framework.' The Council of Europe outlines the construct and approach of the CEFR, stating that the CEFR:

- Adopts an action-oriented approach, describing language learning outcomes in terms of language use;
- Has three principal dimensions: language activities, the domains in which they occur, and the competencies on which we draw when we engage in them;
- Divides language activities into four kinds: reception (listening and reading), production (spoken and written), interaction (spoken and written), and mediation (translating and interpreting);
- Provides a taxonomic description of four domains of language use – public, personal, educational, professional – for each of which it specifies locations, institutions, persons, objects, events, operations, and texts.[65]

The current version of the CEFR has been informed by a number of other organisations and the descriptors of language proficiency that they have developed. These frameworks and descriptors include for example, 'can-do' statements by ALTE (the Association of Language Testers in Europe),[66] and the CEFR-J which increased the CEFR original six levels to twelve and contextualised can-do statements to the Japanese context.[67] Such approaches underpin the competency and outcomes-based approach in the CEFR, resulting in a framework by which to measure an individual's acquisition of language within a communicative and authentic context. This aims to site speakers within an 'action-oriented' context as 'social agents' who need to accomplish tasks and activities within specific situations and constraints.[68] Language is conceived in terms of competences required within specific contexts to undertake activities using certain strategies and processes with real-life application.

Contexts of use and guiding principles for qualification design

One of the key factors that needs to be considered in qualification design is the needs that the language user has. The CEFR Framework (2001) provides a list of overarching questions that can support understanding of these and guide qualification design. A few of these questions are replicated below:

- What tasks will they have to accomplish? (in English)
- What sort of people will they have to deal with?
- Under what conditions will they have to act?
- What skills will they need to have developed?
- If I cannot predict the situations in which the learners will use the language, how can I best prepare them to use the language for communication without over-training them for situations that may never arise?

64

Available at https://rm.coe.int/1680667a2d. Last accessed June 2020.

65

See further https://www.coe.int/en/web/portfolio/the-common-european-framework-of-reference-for-languages-learning-teaching-assessment-cefr- Last accessed June 2020

66

https://www.alte.org/resources/Documents/All%20Can%20Do%20English.pdf

67

http://cefr-j.org/

68

Council of Europe (2001), Common European Framework of Reference for Languages: Learning, teaching, assessment, 9.

- What can I give them that will be of lasting value, in whatever different ways their careers may later diverge?[69]

At a higher level, the CEFR considers something it describes as 'the context of language use' to emphasise that communication needs, desires and content vary according to a particular situation. This has significance for qualification design as it is clearly not possible to cover all contexts of language use so, as the questions above indicate, the qualification designers' duties are to ascertain which contexts are important and need to be taught and engaged with and which ones do not need to be. The CEFR breaks the concept of contexts of use down into different aspects to support this further:

These aspects are grouped as in the table below:

Table 31: Aspects of contexts of language use

Aspect of context of language use	Specific areas	Example Guiding Questions
Domains (the area in which social life is organised)	Personal (the person as a private individual, focused on home life with family and friends) Public (the person as a member of the general public or an organisation) Occupational (operating in his/her job) Educational (the person is engaged in organised learning, possibly in an educational institution)	In which domains will the learner need/be equipped/be required to operate?
Situations (within each domain)	Each domain includes a number of situations and these can be described in terms of: • Locations • Institutions or organisations • People • Objects • Events • Texts.	What are the situations that the learner will need/be equipped/be required to handle? In which locations, institutions / organisations, persons, objects, events and actions will the learner be concerned?[70]

69
CEFR 2001, 44

70
See further CEFR 2001, 48 for an extensive list of locations, institutions, people, objects, events and texts that relate to different situations.

Conditions and constraints (the external conditions which impact communication)	These conditions and constraints may be physical (e.g. background noise); social (e.g. social relationships between communicators) or reflect time pressures (e.g. will the students need to use English under immediate pressure in improvised use (responding in a business meeting) or pre-planned (writing a report)	How will the physical conditions under which the learner will have to communicate affect them?

With domains, it may be that more than one domain is covered at the same time (e.g. for a teacher the domain will be both occupational and educational). It is also important to recognise that for a CBSE student, for example, these areas are likely to change; so whilst their focus may be primarily personal and educational, it will also be important to consider to what extent the CBSE Standard X prepares them also for the public and occupational domain they will move into at a later stage or need to build on for Standard XI and XII.

Within each domain are 'situations' which can be described through aspects such as locations; institutions; persons; objects; events; operations performed; texts etc. So, for example, in the educational domain the language user will operate in locations such as a classroom, they may be a member of a specific institution such as a school or university. They will interact with a number of people such as teachers, lecturers, library staff. They will interact with objects such as computers or audio-visual equipment. There will be different events such as sports day, parents' evenings; they will have different things to do such as lessons, homework, engaging in discussions in class, and they will access texts such as reference books, dictionaries, readers. The critical question when focussing on these aspects is, of course, to what extent the language user currently needs or is likely to need to be able to handle this *in English* or *in Hindi* – e.g. in the target language to be acquired. If a language user is never likely to need to know how to follow health and safety notices on a factory line in English then it is not something that should be considered important in a course of study.[71]

All these aspects, and the guiding questions, can support careful qualification design which reflects closely the needs of the students, which can then underpin aspects such as programme, course, or assessment aims and objectives.

Competences, strategies and subskills

Within these broader aspects, different communicative tasks and purposes are relevant. So, for example, in the educational domain, a student may need to write an assignment on a topic from a class he/she is following. The CEFR suggests that to understand these in more detail it may be useful to conduct a needs analysis of likely tasks that the target demographic will need. This could be undertaken with reference to different stakeholders- but the CEFR provides some examples of typical tasks as a starting point.[72]

71

Noting also, for the school context, that predicting this for every student is firstly impossible and secondly unhelpful as all students will take different paths in life, the focus should then be on the key aspects which are mostly likely to be needed by most students. So, for example, in the modern day, it is likely that most students will need to be able to use the internet in English.

72

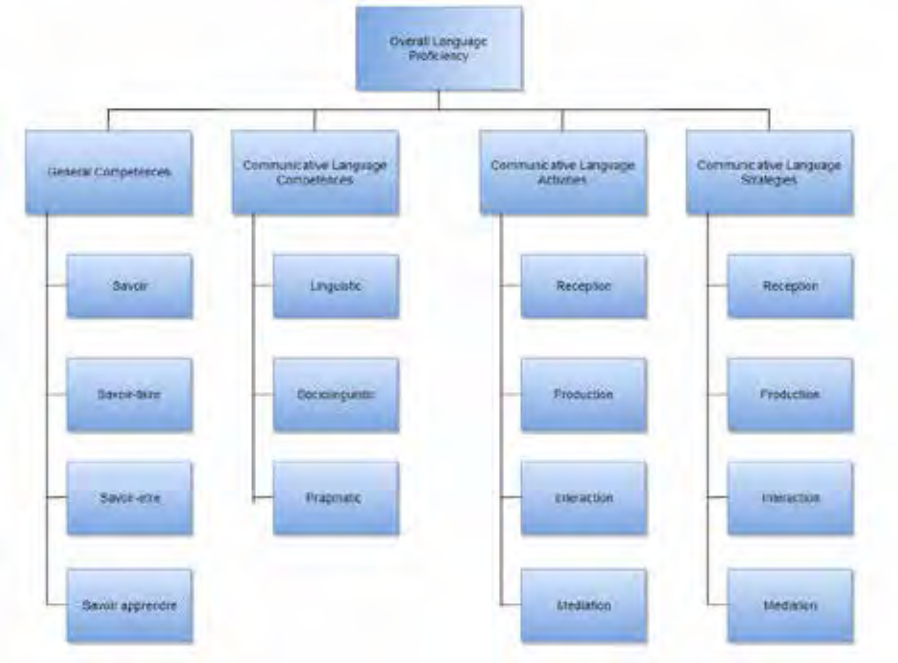
CEFR 2001, chapter 4

So, in a job context, the person may need to read and respond to emails in English for example. To carry out these tasks, language learners will need to use certain strategies and approaches (so, for example, to write the email, the language user may need to be able to structure, to ask questions, to request information etc) across reception, production, interaction and mediation areas (definitions provided below). These strategies and approaches are what can be taught in a language syllabus, (and the teaching methodologies which best fit this), and for example, which texts best reflect the real-life situations that students are being prepared for.[73]

The CEFR model of language proficiency

As a whole, then, the CEFR conceptualises overall proficiency as a combination of general competences (which can apply across multiple learning domains, not only language acquisition), as outlined in the figure below:[74]

Figure 80: The structure of the CEFR descriptive scheme



The CEFR is thus constructed across competences, activities and strategies. In terms of competences, these are divided into general competences and communicative language competences, including linguistic, sociolinguistic and pragmatic.[75] With communicative language strategies and activities, these then combine to form an individual's language proficiency.

Within the CEFR design, these strategies can be understood in the following way:

- "Reception" refers to the learner's comprehension of a written, audio or audio-visual text, whether listening or reading for gist, specific information or in-depth understanding.
- "Production" is where the candidate is producing an output (output text). In written production, this encompasses activities such as writing reports,

73

See CEFR 2001, 95 for a range of different text types that learners may need to familiarise with.

74

Adapted from CEFR 2018 Companion Volume with New Descriptors https://rm.coe.int/cefr-companion-volume-with-new-descriptors-2018/1680787989 30

75

General competences: 'Savoir' refers to declarative knowledge, e.g. the formal knowledge someone has gained from academic learning. 'Savoir faire' refers to skills and the ability to carry out certain activities or processes. 'Savoir-être' refers to existential ability or skills, relating to an individual's personality and attitudes. 'Savoir apprendre' refers to knowing how to learn, and how to integrate new knowledge into an existing knowledge base. These are general learning competences which have informed this report, as they may impact on learning or examination strategy, but they do not specifically reflect English language competency. Communicative language competences, as outlined in terms of linguistic, sociolinguistic and pragmatic competences inform all areas of the analysis where relevant, and are not restricted to one particular skill or question type. Linguistic refers generally to the key features of a language, including phonology, syntax, lexicon and morphology. Sociolinguistic refers to the social dimensions of language, such as the cultural conditions of language use e.g. politeness or register. Pragmatic refers to the functional use of language in specific situations, e.g. delivering a presentation, participating in a discussion. The analysis of reception, production, interaction and mediation are more specifically outlined in the following section.

articles or letters; or creative writing. In the case of spoken production, activities may include giving a speech or presentation, reading a written text aloud.

- "Interaction" also involves producing a text: in spoken interaction tasks, the individual would be expected to alternate as the speaker and listener, for example, as part of a formal or informal conversation, discussion or transaction. In written interaction tasks, there would usually be two or more people communicating in writing, for example, exchanging notes or emails or working collaboratively on documents (e.g. proof-reading or otherwise negotiating content).
- "Mediation" is where the learner is summarising, paraphrasing, translating or interpreting text as an intermediary between two speakers or readers (typically between speakers of different languages).

A wide range of competences are included within the linguistic areas- so, for example, a language learner would need lexical (word/vocabulary-based) knowledge – such as knowing a fixed expression (such as 'Dear Sir or Madam'), or knowing collocations (e.g. 'take a break' not 'make a break). He/she would also need grammatical knowledge, such as to know conjugations of a verb (I am, he is, they are), and what a 'noun' is. The table below provides an overview of some of these competences:[76]

Table 32: Competences leading to overall language proficiency, as in the CEFR[77]

Linguistic	**Sociolinguistic**	**Pragmatic**
The knowledge of aspects of language such as use of words, grammar, meaning	The knowledge and skills for the social dimension of language use	The knowledge of principles by which things are organised, structured, sequenced and used for different functions
`Lexical competence – knowledge of and ability to use the vocabulary of a language **Grammatical competence** – understanding and using phrases and sentences according to a language's 'rules' and principles (not memorisation) **Semantic competence** – being aware of and able to control how to organise meaning **Phonological competence** – being able to understand and produce the sound units of a language including aspects such as word stress, rhythm, intonation	**Linguistic markers of social relations** – e.g. knowing how to use greetings, or addressing people, how to turntake **Politeness conventions** – e.g knowing how to use please/thank you, how to flout conventions e.g. being blunt, showing interest in others	**Discourse competence** – the ability to arrange sentences in a logical coherent order e.g. through topics, time, cause/effect, rhetorical effectiveness ec. **Functional competence** – knowing how to use texts for particular functions e.g. informing, reporting, expressing emotions etc.

76
For a more detailed breakdown of these individual competences, see CEFR 2001, 110.

77
For technical and fully comprehensive definitions see CEFR 2001, 109 onwards

Orthographic competence – being able to produce the symbols and writing systems of a language including spelling, punctuation

Orthoepic competence – being able to take the written form and speak it, e.g. knowing how punctuation can change intonation or phrasing

Expressions of folk wisdom – knowing proverbs, idioms, expressions, slogans

Register differences – understanding differences in formality levels

Dialect and accent – being able to recognise markers of region, social class, ethnicity, through a person's phonology/ use of grammar/use of words

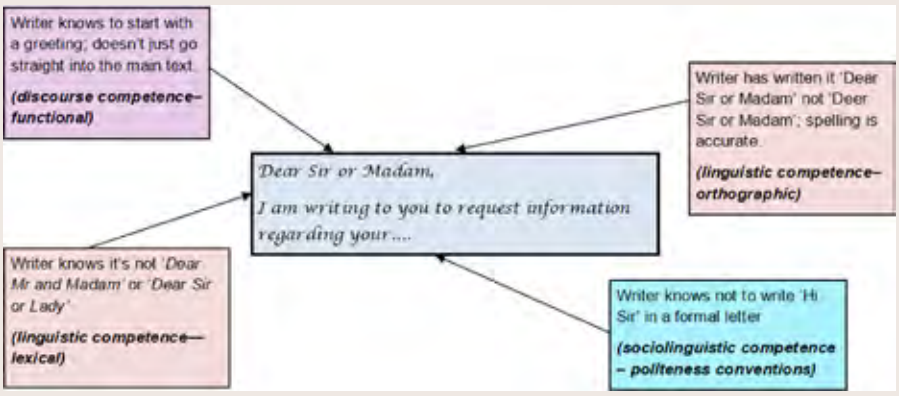
78
CEFR 2001, 131

Nevertheless, although the focus of this research is specifically on 'competency-based' education it should be noted that in the case of the model of language acquisition of the CEFR this would only partially cover the overall language proficiency achieved (as per the flowchart above). Without the strategies to put these competencies into action, then it is not easy to test a language user's development of the language. It is important, as noted in the CEFR, to consider:

- What the necessary competencies are for the language learner,
- The language learner's ability to put these competencies into action, and
- Their ability to employ strategies to bring these competencies into action.[78]

Thus throughout this report, we consider the competences (as above) alongside the wider strategies that learners need to use in order to activate the competences and thus to provide tangible evidence of their knowledge of the competences in a testing context (e.g. a learner could demonstrate their ability to understand politeness conventions – a sociolinguistic competence – through their ability to use productive strategies such as writing a formal letter. These strategies also may allow other competences to be demonstrated. This can be seen in the image below:

Figure 81: Competences demonstrated through strategy use (production)



The output of a letter, then, consists of a tool by which the language user can demonstrate their competences. So, for example, a language learner who starts their formal letter using words such as 'Dear Sir or Madam' demonstrates sociolinguistic competence (knowing that this is the correct politeness convention for a formal letter); linguistic competence (the lexical competence of knowing the fixed expression 'Dear Sir or Madam' is correct, rather than 'Dear Mr or Madam' for example), the orthographic competence of knowing how to spell it correctly, and to leave a line before the next sentence, and the overall pragmatic competence of using a greeting – a functional competence within the correct structure (a discourse competence). In this way, then, the language demonstrates their competences through their use of language strategies (reception, production, interaction, mediation). Because the competences have to be recognised through their use, the competences and strategies are best understood together in order to understand the overall model of language proficiency and acquisition.

A key aspect of course design is to understand which of these competencies are useful (given the contexts of use, relevant domains, and needed communicative tasks as outlined above) and then to understand at what proficiency level (beginner/intermediate/advanced) that these areas need to be acquired. The descriptors of proficiency provided across CEFR levels Pre-A1-C2 (most recently in the updated CEFR 2018 volume) can support the development of course objectives, learning outcomes and individual item design by providing concrete language proficiency statements which allow progression to be measured and mapped. The descriptors are considered to be relevant to 'the description of actual learner achievement in lower and upper secondary...education,' and 'can be exploited flexibly for the development of criterion-referenced assessment.' In this sense, then, the CEFR has clear potential application to the CBSE English and Hindi syllabus and assessment development and delivery. The below is an exemplar descriptor which outlines the development across the proficiency levels for reading comprehension:

Figure 82: Exemplar CEFR descriptor for reading comprehension

WRITTEN RECEPTION	
OVERALL READING COMPREHENSION	
C2	Can understand virtually all forms of the written language including abstract, structurally complex, or highly colloquial literary and non-literary writings. Can understand a wide range of long and complex texts, appreciating subtle distinctions of style and implicit as well as explicit meaning.
C1	Can understand in detail lengthy, complex texts, whether or not they relate to his/her own area of speciality, provided he/she can reread difficult sections. Can understand a wide variety of texts including literary writings, newspaper or magazine articles, and specialised academic or professional publications, provided that there are opportunities for re-reading and he/she has access to reference tools.
B2	Can read with a large degree of independence, adapting style and speed of reading to different texts and purposes, and using appropriate reference sources selectively. Has a broad active reading vocabulary, but may experience some difficulty with low-frequency idioms.
B1	Can read straightforward factual texts on subjects related to his/her field and interests with a satisfactory level of comprehension.
A2	Can understand short, simple texts on familiar matters of a concrete type which consist of high frequency everyday or job-related language. Can understand short, simple texts containing the highest frequency vocabulary, including a proportion of shared international vocabulary items.
A1	Can understand very short, simple texts a single phrase at a time, picking up familiar names, words and basic phrases and rereading as required.
Pre-A1	Can recognise familiar words accompanied by pictures, such as a fast-food restaurant menu illustrated with photos or a picture book using familiar vocabulary.

79

More support for the development of course aims and teaching/learning objectives can be found in CEFR 2001, chapter 6.

80

Council of Europe (2018), Common European Framework of Reference for Languages: Learning, Teaching, Assessment: companion volume with new descriptors

81

Council of Europe (2001), Common European Framework of Reference for Languages: Learning, teaching, assessment, 16.

82

Council of Europe (2001), Common European Framework of Reference for Languages: Learning, teaching, assessment, 30.

83

Council of Europe (2001), Common European Framework of Reference for Languages: Learning, teaching, assessment, 30.

84

CEFR 2001, chapter 6.

National adoption of the CEFR

The CEFR has been adopted at a national level both by European and non-European countries as a framework of reference to reflect competency development in language education. Implementation and take-up of the CEFR varies across different countries: research in Europe conducted on behalf of the European Parliament reviewed a number of European countries including Sweden and the Netherlands, Austria, Hungary, France, and the UK to look at foreign language proficiency levels. Their findings indicate that whilst some countries only loosely refer to the CEFR, others anchor CEFR-related learning outcomes in law, and for many it informs assessment. Across the countries reviewed, the CEFR generally informs textbook development, particularly where the CEFR is integrated into curriculum development and guidance (in particular, national curriculum). Students' first modern foreign language is typically targeted at CEFR B2, and the second at CEFR B1 (the intermediate levels). The extent to which the CEFR informs pre- and in-service teacher training also varies, though there is more use of the CEFR in in-service teacher training with five out of the six countries reviewed integrating the CEFR.[85]

Beyond Europe, the CEFR has informed national language policy in contexts as diverse as Argentina, Taiwan, Japan - which developed the 'CEFR-J'; a set of CEFR-informed proficiency standards applicable to the Japanese context as discussed above[86] - Vietnam, in its National Foreign Language 2020 Project,[87] and Malaysia, which is currently integrating the CEFR as part of its

Users of the Framework may wish to consider and where appropriate state:

- *which of the types of assessment listed above are:*
  - *more relevant to the needs of the learner in their system*
  - *more appropriate and feasible in the pedagogic culture of their system*
  - *more rewarding in terms of teacher development through 'washback' effect*
- *the way in which the assessment of achievement (school-oriented; learning-oriented) and the assessment of proficiency (real world-oriented; outcome-oriented) are balanced and complemented in their system, and the extent to which communicative performance is assessed as well as linguistic knowledge.*
- *the extent to which the results of learning are assessed in relation to defined standards and criteria (criterion-referencing) and the extent to which grades and evaluations are assigned on the basis of the class a learner is in (norm-referencing).*
- *the extent to which teachers are:*
  - *informed about standards (e.g. common descriptors, samples of performance)*
  - *encouraged to become aware of a range of assessment techniques*
  - *trained in techniques and interpretation*
- *the extent to which it is desirable and feasible to develop an integrated approach to continuous assessment of coursework and fixed point assessment in relation to related standards and criteria definitions*
- *the extent to which it is desirable and feasible to involve learners in self-assessment in relation to defined descriptors of tasks and aspects of proficiency at different levels, and operationalisation of those descriptors in – for example – series assessment*
- *the relevance of the specifications and scales provided in the Framework to their context, and the way in which they might be complemented or elaborated.*

85 The Implementation of the Common European Framework for Languages in European Education Systems, passim.

2015-2025 Roadmap for English Language Education Reform, following a baseline study by Cambridge English in 2013. In Malaysia, the perceived advantages of adopting the CEFR are around a common international understanding of standards which allows comparison with other systems, supporting alignment of curricula and opportunity for calibration, whilst also providing a measurement of 'modern paradigm' proficiency through placing value on the model of communicative language competence.[88]

Nonetheless, there are some challenges in the direct application of the CEFR to a specific context which need to be kept in mind if it is considered a useful tool to inform the Indian Standard X context. These challenges can be outlined as below:

- The CEFR is (intentionally) language-neutral and therefore must be interpreted for a specific linguistic context
- The CEFR is intended to be 'descriptive' and not 'prescriptive': this is beneficial in terms of flexibility but more problematic in terms of standardisation and quality monitoring
- The framework covers all aspects of language knowledge: not all of these are appropriate to the specific school language education context (e.g. a descriptor which refers to formal interpretation or translation, which may be outside the scope of secondary education). This places the burden on the test or course developer to reflect on which areas to include and which to exclude in terms of desired outcomes.
- The construct of the CEFR itself is complex and challenging for those who are not linguistic experts, and may need breaking down to support successful integration amongst stakeholders
- Some aspects of the CEFR may be seen as Euro-centric due to its genesis as part of the Council of Europe
- There has been criticism levied at the 'jump' between different levels: for example, the progression between CEFR B1 and CEFR B2 is often cited as being challenging for learners. It may thus be appropriate for the plus or intermediary levels to be developed noting, however, that these may be less well recognised internationally.

The comparative analysis provides some case study examples of where the CEFR has been integrated into different courses, qualifications and tests, such as in Estonia, in the GCSE, the IGCSE, and in selected international English language tests.

86

http://cefr-j.org/

87

See further e.g. https://www.britishcouncil.vn/en/teach/work/english-teaching Last accessed June 2020

88

Ministry of Education Malaysia English Language Standards and Quality Council English Language Education Reform in Malaysia: The Roadmap 2015-2025

Appendix 5: Stakeholder Engagement Findings – Site Visit March 2020

Five schools were visited, one KV school, a private school, a government school, a government school of excellence and one private military school. Trends in the teacher, student and principal responses have been found across different school types.

Principals

In summary, the overarching research questions included the following:

- To what extent has competency-based learning and delivery been implemented on a school level?
- What are the key challenges in implementing competency-based approaches from a management perspective?
- What is the general perception of Standard X? How well does it prepare students for progression, and for the workplace?

Observations can be summarised as follows:

- Principals recognise the value of competency-based approaches in design, delivery and assessment of the curriculum at Standard X and most have taken steps to encourage teachers to use such approaches in their lesson planning and delivery of the curriculum, which varies from general encouragement to specific training (in the private school visited for instance).
- Variations were reported from the management perspective in how well / widely understood and used competency-based approaches are used in lesson planning and delivery in classrooms. A number of principals agreed with the observation from one that "learning outcomes" and "competency-based education" are referred to as buzz words, without widespread understanding of how they are used in practice to deliver and develop teaching and learning in classrooms. It was noted that as NCERT learning outcomes have only recently been introduced, time was required for new approaches, in particular, lesson planning at classroom level to reflect changes to curriculum design.
- Practical challenges to implementing competency-based approaches include class sizes which often impede interaction and active participation as well as practical work. The class sizes coupled with the broad spectrum of student background and abilities are considered to impact the teachers' ability to differentiate students based on ability and learning style.
- Further challenges identified on a country-wide level relate to current mind-set of teachers, many of whom were trained to deliver teacher-centred style of curriculum. Support in terms of capacity building, sharing of best practices, workshops, online training and ready-made teaching plans are suggested solutions.
- A key observation relates to the teachers' approach to delivery which is often reportedly dictated by the requirements of the assessment, and if changes are made to assessment this is frequently followed through in the delivery, with heavy emphasis placed on preparing students for their Standard X examinations.
- There was acknowledgement of the need for curriculum and assessment development to take place in close parallel so that NCERT curriculum standards are closely reflecting the demands of the assessment. Ideally, to enable far-reaching changes, teacher training needs to be addressed at a national level to facilitate a more embedded approach to competency-based education.

Teachers

Focus group questions to teachers varied by subject. Overall the research questions can be summarised as follows:

- To what extent are teachers using competency-

based approaches in the classroom teaching and learning?

- What are the key challenges currently in delivering student-centred and competency-based learning?
- How far does the current curriculum and assessment allow for competency development and evaluation at Standard X?
- What changes could be made to the Standard X curriculum and/or the assessment to facilitate competency-based approaches, overall coherence and progression?

Responses from the teachers in general were very open across all the schools and provided full and comprehensive answers to the questions posed. Some clear patterns were observed in the responses, irrespective of school type.

2.1 Reading (English and Hindi)

English

- Feedback suggests that most teachers follow the CBSE and NCERT textbooks closely, with most beginning to use learning outcome approaches advocated by NCERT in their updated curricula materials.
- In general, although the diversity of the content was thought to be a positive, overall it is felt that the CBSE English programme is very content heavy with perhaps too much emphasis on reading of literature and accumulating associated factual knowledge of texts and insufficient emphasis on standard English usage in practical situations in the Standard X curriculum. With close adherence to the curriculum and restrictions of the timetable, this inevitably leads to less time being spent on active English speaking interaction, with teachers indicating a range from 5 to 15 minutes being spent on average per lesson as a maximum.
- Significant variations were reported in relation to how well students generally cope with classroom interaction, with some teachers reporting that most of the classroom interaction occurs in Hindi or the regional language instead of English.
- In terms of assessment, common concerns among teachers were that the exam is not assessing the use of English in real-world situations but rather factual knowledge and ability to extract factual knowledge from texts which, whilst a skill in itself, does not assess comprehension of the texts in sufficient depth. Writing is assessed predominantly by story writing. A fair amount of predictability and limitation in range of topics was reported by teachers.
- Some teachers drew attention to limitations in the way in which the CBSE exam is structured and marked, with an emphasis on marking according to set answers with little flexibility allowed for deviation, potentially limiting the scope for creativity particularly impacting on more extended responses. Criterion-based approaches to marking that can allow evaluation to encompass a wide variety of responses to tasks in English currently appear to be limited. Some highlighted that if a student missed a 'key word' found in the answer key he or she would be penalised, despite an otherwise correct answer.
- Some scope for assessment of speaking and listening is provided via the internal assessment, although this relies heavily on teacher judgement and as such, demonstrates a high degree of variability across schools.

Hindi

- Perceived strengths of the current Hindi curriculum include the balance of poetry and prose, creative writing and values-based education. Some teachers felt that additional topics on the history of Hindi and woman's education could be beneficial.
- Many teachers felt that the values-based education was particularly relevant to students' lives.
- A number of teachers indicated that they would also like to see more modern writers included in the curriculum and that they found some of the older texts more difficult to make engaging and relevant for the students.
- In terms of delivery, lessons are predominantly delivered in Hindi, although it was reported that a fair amount of interaction occurs in the regional language.
- In relation to assessment, it was felt that the element of optionality should be reduced in the paper, particularly on the grammar section as there are often disagreements on the comparability of optional questions.

Maths and Science

- The Maths curriculum, in general, was seen to be reasonably broad covering an appropriate and range of topics to the level and stage of education,

although a significant majority of teachers agreed that more practical mathematical topics such as compound interest and tax could be added at Standard X. Teachers would also like to see more emphasis within the curriculum on real-world applications of mathematics.

- Responses varied on the use of calculators, with some teachers advocating their use in preparing students for more complex work while the majority value the emphasis on mental maths and arithmetic, with mark scheme flexibility for method marks.
- The feedback on the science curriculum was that the content generally fit for purpose, with appropriate coverage of practicals, although links to real-world application are not always apparent in the NCERT textbooks. The extent to which students can conduct the practicals themselves between schools according to resource availability and class size.
- In sciences, teachers reported significantly less emphasis on planning, experimental data analysis and evaluation at Standard X and this was identified by a number of teachers as a key area for further development within the CBSE Standard X curriculum and assessment for science. One exception to this was the private school, which reportedly made greater provision outside of the scope of the CBSE/NCERT curriculum for experimental planning, data handling and analysis.
- As a general observation in terms of delivery and lesson planning across all schools and subjects is that teachers follow the CBSE/NCERT curriculum very closely. While NCERT provides a useful foundation and prescribed learning outcomes for each topic area, teachers reported limited scope (resources and time) to include material outside of the set curriculum. Preparation for board exams is a priority in Standard X with significant focus and class time spent on revision and completion of past papers.
- A majority of the maths and science teachers interviewed valued the integration of HOTs (Higher Order Thinking Skills) based questions in the exam weighted at 10%. These are seen to be useful in assessing student's conceptual understanding, application and critical thinking skills. Although most agreed that 10% was appropriate, some teachers felt that it would not necessarily be beneficial to significantly increase the number of some of these questions which involve case studies, given the demands on reading and language on students (particularly in the science and maths papers). Teachers in a focus group at a government school, in particular, highlighted the challenge they posed to less able students. One suggestion was to offer an extension paper with a higher proportion of such questions.
- The introduction of the Basic Maths was generally seen to be a positive development, allowing less able maths students to take a more accessible paper. Teachers at two of the selected schools identified a challenge with perception – that the reference to "Basic" on the Standard X transcript may indicate a lower grade qualification. A number of teachers also highlighted the potential value of a "Basic" paper in the sciences.
- It was acknowledged that the was a fair amount of perceived predictability in the CBSE assessment questions, and "recycling" of questions used from one sitting to the next, potentially leading to over-rehearsal and rote memorisation approaches to exam preparation.
- The internal assessment was generally agreed to be of continued benefit, allowing students to be assessed on wider transferrable skills in addition to subject knowledge. Scope for further guidance on assessing students' practical ability in science was identified. There was some debate over whether further standardisation / moderation would be beneficial, with some teachers citing the increase in workload and practical resources required for external moderation as a potential barrier.

Students

- In English, when asked about what they would like to change regarding the curriculum, it was suggested by a number of students that more time be spent on speaking and listening, reflective of the limited time allocated to such activities.
- Students generally considered English to be an 'easy' subject.
- In science, practical demonstrations were thought to be useful, although the students confirmed that little actual practical work is undertaken by the students themselves and the demonstrations may have limited relevance to daily life.
- The students mirrored the teacher responses in highlighting the extensive preparation and close adherence to the Standard X curriculum and test. In general, memorisation was thought to be a

major challenge and required for good performance in the Standard X exam.

- When asked what they would like to change about the exam, students from one focus group highlighted a greater inclusion of questions requiring practical use of English in the board exam, echoing the feedback from the English teachers.
- As highlighted by the teachers, across all subjects most students commented that the gap between Standard X and XI is significant both in terms of topics and conceptual understanding required.

Class observations

Class observations, mainly focusing on Classes 7-9, indicated limited integration of competency-based learning in some subjects, but not others. In some cases, this integration occurred but could be strengthened further. However, it is acknowledged that UK NARIC did not have the opportunity to observe Grade 10-12 classes due to scheduling around examinations and as such the class observations, although useful contextually, are of less value when considering competency-based approaches in Standard X.

5. CBSE and other stakeholders

An interview was also held with the Director of CBSE in order to gain an insight into the CBSE vision and strategy for competency-based learning and assessment. The main points relevant to the research questions can be summarised as follows:

- The CBSE general definition of what constitutes competency-based learning incorporates various components. The application of skills in real-world situations appears to be at the forefront, as are critical thinking skills and HOTs (Higher Order Thinking Skills). Allied to this, there has been research into key initiatives like 'Joyful Learning' within which CBE appears to be sited more widely, but also includes holistic education and citizenship.
- Starting with grades 6-10, the CBSE vision is to implement competency-based learning approaches across a time-span of 5-8 years with one of the main aims being to facilitate comparability of student outcomes with other well-regarded secondary systems and to facilitate student performance in PISA.
- So far, limited progress has been reported in terms of student performance on competency-based assessment, poor performance, in particular, was cited in the National Mathematics and Reading (only 35% passing from the top students).
- In terms of assessment, CBSE aim is to increase the number of questions focused on critical thinking and higher order thinking skills in the Standard X by 10% each year, with increased emphasis on these questions to eventually include 60% such questions by 2025. The overall intention is to move from knowledge-based mastery towards a more skills-based assessment of student competencies.
- A key challenge in implementing these changes is seen to be resistance from schools, in particular principals, teachers and parents, while students appear to have embraced the developments.
- Some initiatives have nevertheless assist schools in preparing for this type of assessments, for example, DISHKA is a platform for teachers where they can discuss and adapt learning outcomes, share assessment items and key concepts in each subject.
- CBSE management also face challenges in making changes to the exam development process, in particular the reported conflict between paper setter and subject expert need for autonomy and resistance to change, and the identified need of CBSE and the CBE strategy to review, innovate and standardise approaches to developing questions and papers.

5.1 CBSE Director of Assessment and subject experts

A focus group was held with CBSE subject experts, involved in developing the Sample Question Papers as well as an interview with the Director of Assessment who manages the development of the final exams based on the SQPs. A summary of overarching research questions for the Assessment Management Team were as follows (more specific questions focused on subjects were posed):

- What are the current approaches to assessment development?
- What approaches, if any, are currently used to integrate competency-based assessment?
- What aspects of validity and reliability are currently monitored in assessment design? How is construct and content validity currently measured?

- What do they see as the potential challenges/ barriers to question development process in implementing CBL across subjects?

Feedback from the subject experts and Director of Assessment can be summarised as follows:

- Subject experts indicated broad design principles are used to guide the design of SQP papers, including different sections with distinct question types (Sections A short answer, Section B application, C and D to longer evaluation type questions) and mark allocations. 10% of the marks are allocated to competency-based questions. Questions are developed according to type and exam section rather than specifically assigned a difficulty level. Subject experts did indicate that they refer to a taxonomy of command words when developing questions although these are not assigned specific marks/ranges of marks.
- Questions are developed by groups of experts then moderated, finally, a set of questions is selected by paper setters from the sample to form the SQP paper. Questions are designed to link to specific outcomes in the syllabus, and weightage of each topic area in the syllabus to ensure a representative spread of questions. The mark scheme is developed following the paper, with guidance on step-wise marking for maths and science.
- The Director of Assessment talked us through the development of the final exam papers which follows a similar process as that for the SQP papers, using the SQP paper and blueprint as a guide for its development.
- In terms of marking and moderation, a number of checks and balances are reportedly in place to ensure the marking is accurate and reflects the mark scheme, with a proportion of scripts double marked to ensure adherence to the mark scheme. Marks are calculated and reported on a percentage basis, with minimal standardisation or adjustment of threshold levels, taking into account variations in difficulty level of each exam.
- Paper and item analysis takes place internally, enabling quantitative comparisons to be made on the performance of paper sections, whole papers and individual questions. It is unclear, however, whether this is also supported by qualitative analysis of question demand, there is no officially published examiner's report on exam performance, providing in-depth analysis of student performance.

5.2 NCERT

A meeting was also held with representatives from NCERT, the national council responsible for the design of national curriculum standards, curriculum planning and development of textbooks. The meeting provided useful contextual information on the development of an outcomes-based curriculum, and overview of national level initiatives intended to integrate 21st-century skills into the curriculum for Classes 1-8 and now 9 and 10 and initiatives to build the capacity of teachers focusing on student-centred learning.

6.Limitations and areas for further research

6.1 School visits

Although they provided useful information on the integration of competency-based approaches, some key limitations were identified in running the focus groups which are borne in mind for the development and delivery of the surveys and for reporting of stakeholder findings in the final report:

- The size of some of the focus groups organised for the team can be identified as a limitation. A number comprised 15 or more which led challenges in managing and coordinating the responses to the questions as well as recording discussions. In some cases, the large group size impacted the depth of participation as well as leading to prestige bias.
- A limitation in the student focus groups was evident in that some of the student focus groups also had teachers present potentially due to communication issues between parties, impacting the objectivity of student's views and feedback. Some students struggled to respond in English, which may also have implications for the survey.
- In most cases, the Hindi teachers were unable to understand or at least respond in English. This may have implications for the teachers' survey.
- Currently, UK NARIC has had no interaction with students from Standard X, as they were undergoing examinations during the visit period.
- It is acknowledged that differences in provision are evident between school types, which can be further investigated in the student, teacher and principal surveys.

6.2 CBSE stakeholder interviews

- The CBSE subject experts focus group only involved experts from the academic unit involved in the SQP paper development, not the final exam development which is managed by a separate assessment development team.
- A key challenge in evaluating the monitoring processes in place is the absence of a quality assurance handbook, documenting the processes for assessment development, marking and moderation (standard setting) procedures. As such the review of quality assurance and monitoring will be solely based on anecdotal evidence obtained from an interview with the Director of Assessment.
- Absence of examiner reports also presents a challenge in evaluating the monitoring and evaluation of reliability and validity in assessment design.

Appendix 6: Detailed overview of international case studies for English

1. Estonia – Riigieksamid

According to national curriculum regulations,[89] students in Estonia study a foreign language from primary school. In the first year of upper secondary schooling, those students following a foreign language stream must take compulsory courses in two foreign languages, with an expected outcome of CEFR B1 or B2 proficiency level. All students, however, continue to study a foreign language. To graduate from upper secondary and attain the Riigieksamid state examination, they must pass exams in Estonian language and literature or Estonian as a second language; a foreign language which may be English, French, German or Russian; and Mathematics. Many students elect to take two foreign language examinations.

The CEFR informs the Estonian national curriculum for both home languages (Estonian, Russian) and foreign languages.[90] All learning outcomes are specified in relation to the CEFR. The national curriculum states that 'as a foreign language is primarily a means to obtain information and to transfer it in communication, the learning of languages focuses on content areas that facilitate development of communicative competence,' informing learning outcomes across the four skills of reading, writing, listening, and speaking.[91]

Competency-based objectives can thus be seen as integral to the qualification at the top level. The overarching aims below (applicable to any foreign language subject) indicate that expectations go beyond language proficiency to include cultural awareness and skills for lifelong learning:

Table 33: Aims of a foreign language subject for the Estonian State Examination Certificate

Estonia State Examination - Foreign language
'It is expected that, through foreign language education, upper secondary school graduates will: • Communicate purposefully, both orally and in writing, by following relevant cultural practices; • Understand and interpret the content presented in foreign languages; • Have acquired knowledge of different cultures, understand the similarities and differences between cultures and value them; and • Have acquired the motivation and skills required for lifelong learning.'[92]

89 https://www.hm.ee/en/activities/estonian-and-foreign-languages/foreign-language-learning-estonia

90 https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf Page 2

91 https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf Page 2-3

92 https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf . Note that in addition, similar learning objectives are outlined in 2.2.1 with the addition of the expectation that students will be able to take part in varied international projects. See further p.12.

Learning outcomes

Learning outcomes are divided into two CEFR levels, one at B1 and one at B2 for a foreign language (e.g. English or Estonian as a foreign language).[93] The following table reproduces both with areas of similarity highlighted:

Table 34: Learning outcomes at B1 and B2 for the Estonian State Examination Certificate

Estonia State Examination - Foreign language with B1 and B2 level of language proficiency	
Graduates of upper secondary school:	
B1	**B2**
1. Understand everything that is important to them on familiar or interesting themes; 2. Can generally manage in everyday communication with people speaking the language they are learning; 3. Describe their experiences, events, dreams and goals, and explain and elaborate on their positions and plans in brief; 4. Compile simple texts on familiar themes; 5. Take into account the cultural norms of the country of the language they are learning; 6. Are interested in the cultural life of the countries whose languages they are learning, read literature in foreign languages, watch films, TV programmes and theatre performances and listen to the radio; 7. Use reference sources in foreign languages (e.g. translation dictionaries and the Internet) to seek necessary information in other areas as well; 8. Set learning goals and assess their achievement and are able to select and change their learning strategies if necessary; and 9. Integrate the knowledge they have acquired with their knowledge in foreign languages and other areas.	1. Understand the essence of complex texts or discussions on abstract or concrete themes; 2. Communicate with native [...] speakers spontaneously and fluently; 3. Create coherent and logical texts on different these; 4. Explain their viewpoints, assess their weaknesses and strengths and are able to generalise and summarise; 5. Take into account [...] cultural norms and practices; 6. Are interested in [...] social and cultural life, read literature and printed media in Estonian, watch films, TV programmes and theatre performances an listen to the radio; 7. Use reference sources (e.g. dictionaries and the internet) [...] to find necessary information on different topics; 8. Have acquired a command of the language that enables them to make public presentations; 9. Set learning goals and assess their achievement and are able to select and change their learning strategies if necessary; and 10. Integrate the knowledge they have acquired with their knowledge in foreign languages and other spheres of life.

93 Note that the learning outcomes for Estonian as a first language differ

Content areas

There is an explicit focus on the development of communicative competence, alongside worldview, self-esteem, and value-based behaviour.[94] More widely, it is expected that general competencies will also be integrated. These include:

- cultural and value
- social and citizenship
- self-awareness
- learning to learn
- communication
- mathematics, natural sciences and technology
- Entrepreneurial competence.

Culture and value competence relates to the application of generally applicable moral standards and ethics including valuing cultural heritage in different contexts, human diversity and tolerance and cooperation. Social and citizenship competence encompasses the appropriate application of sociolinguistics, but also more widely the conduct and social practices of a linguistic context. Self-awareness competence relates to the use of activities in foreign language, such as role plays or discussions, which support a learner to e.g. assess their own strengths and weaknesses, or analyse their behaviour. Learning to learn competence supports students in developing learning strategies, recognise links, and apply the contents of learning to different situations. The European Language Portfolio plays a key role in the development of this competence.[95] Communication competence encourages students to develop their self-expression and (text-based) creativity. 'Mathematics, natural sciences, and technology competence' develops students' abilities to understand a range of texts (such as information graphics), in order to support students to see the impact of science and technology on everyday life, to develop media literacy, and to use digital tools. Entrepreneurial competence reflects confidence and courage developed by students through foreign language acquisition and the wider world that opens up to them to be creative, problem-solve, and innovate, due to the addition of another language.

Competency-based education within Estonian foreign language instruction is thus a broad approach, expanding beyond specific communicative language competencies related to reading, writing, listening, speaking and vocabulary/grammar acquisition. The construct of the CEFR lends itself to this broader approach to language proficiency. Although competencies such as Entrepreneurial or mathematical skills are not a clear feature, it should be noted that concepts such as plurilingualism, the use of technology, or mediation activities (including e.g. explaining numerical data; encouraging conceptual talk) are integrated into the CEFR. This indicates that the CEFR itself goes beyond language competences to include areas such as knowing how to learn, knowing how to do (e.g. using skills), wider knowledge, and existential competence. Plurilingualism is a critical feature underpinning the CEFR, and reflects a wider mission to improve cultural awareness and tolerance of difference achieved through sociolinguistics, but also the sort of competences outlined above such as value, social, and citizenship.

94

https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf Page 3

95

See further https://www.coe.int/en/web/portfolio Last accessed June 2020. The European Language Porfolio was developed by the Council of Europe as a tool for individuals to record their language learning progress and to support development of learner autonomy. It has clear application to the wider concepts of self-assessment and 'learning to learn' competences.

In addition, within the National Curriculum for foreign languages, cross-curricular areas with some clear relevance for 21st Century skills are integrated: these areas are developed through relevant source texts and activities around those. The matrix of topics and themes can be seen below:

Table 35: Thematic areas included in subject fields

Thematic areas	Subject Field				
	Education & Work	The Individual & Society	Environment & Technology	Estonia & the World	Culture & Creation
Lifelong learning & career planning	✓	✓			
Environment & sustainable development		✓	✓		
Civil initiative & entrepreneurship	✓	✓		✓	
Cultural identity		✓		✓	✓
Information environment		✓	✓		
Technology & innovation		✓	✓		
Health & safety		✓	✓		
Values & morality	✓	✓	✓	✓	✓

This cross-curricular approach is further discernible in the individual learning content information, found in section 2.2.3.2; topics include the Estonian state and people; Estonian language and the way of thinking; literature and fine arts; technology (including linguistic technology); sustainable development; education; and work life. The following table outlines the content areas of the Estonian national curriculum for foreign languages:

Table 36: Content of the Estonian Foreign languages curriculum

Estonian State Examination – Foreign languages
1. Estonia and the world
Estonian state and people:
1. Independent statehood, being a citizen and national defence;
2. Geographical location and climate;
3. Population: main nationality, other ethnic groups and new immigrants; and
4. Multicultural society
Estonian language and the Estonian way of thinking:
1. National identity;
2. Cultural traditions; and
3. Local lore

Estonia and other countries:

1. Estonia as an EU Member State: EU Member States and organisation of the EU; and
2. Place of Estonia in the word: international cooperation.

2. Culture and creation

Culture as a form of creativity:

1. Creativity: literature, fine arts, music, architecture, applied arts and handicrafts, etc;
2. Historical cultural memory of people;
3. Development of creative thinking through experience; and
4. Factors facilitating or interfering with the creative process (e.g. surrounding circumstances, family, social order and traditions).

Cultural traditions and customs:

1. Folk tales, legends, fairytales, proverbs and sayings as representing folk wisdom; and
2. Some of the cultural traditions, customs and beliefs of different nations.

3. The environment and technology

Geographical environment:

1. Relations between the environment and people, environmental awareness; balance in nature, untouched nature; industry and culture, reserves; sources of pollution;
2. Dangers arising from imbalances in nature between the environment and people; climate and climate change; and
3. Sustainable development of the environment

Learning environment:

1. Living conditions in regions with different climate and population concentration;
2. Social benefits and their availability (e.g. medical care, pensions, state benefits and funds, allowances and benefits for disabled persons);
3. Sustainable way of life;
4. Social environment: multilingual and multicultural society or a society where one nation dominates; closely neighbours.

Technology:

1. Scientific and technological achievements and their implementation in everyday life;
2. Information environment: information seeking and sharing;
3. Applications of linguistic technology in everyday life: electronic dictionaries, language learning materials, computer-based language learning, computer-assisted translation software etc.; and
4. Biotechnology in everyday life: household chemicals, cosmetics and the food industry, etc.

4. Education and work

Family and upbringing

1. Family; family relations good relationships between children and parents and caring for one another;
2. Upbringing: rules of politeness and good conduct, formation of value judgements, tolerant attitudes, etc.

Education

1. Public and private educational institutions and further training;
2. Compulsory education and self-teaching;
3. School environment and traditions; youth organisations;
4. Opportunities for further education in Estonia and abroad; and
5. Lifelong learning

Work life

1. Knowledgeable self-realisation; career choices and career development;
2. Getting a job: drafting a CV, employment contract and job interview;
3. Jobs as a source of living; earning money (e.g. income and expenses, prices); unemployment;
4. Responsible attitude to one's work; regard for oneself and others;
5. Rights and liabilities of employees and employers, trade unions, probation period, full or part time job and rest time;
6. Relations at work; pleasant and informal atmosphere, highly motivated employee;
7. Prerequisites for coping with one's work; and
8. Work for the disabled.

5. Individual and society

Human beings as part of nature:

1. Cycle of life: birth, life and death;
2. Balance between nature and mankind (e.g. green way of life and respect for nature); and
3. Way of life or manner of existence (green and philanthropic and healthy).

Human beings as individuals:

1. Nature and conduct of human beings and getting into conflict;
2. Uniqueness of every individual;
3. Value judgements and views on life an society;
4. Human relations: personal, emotional and social; and
5. Different people and nations (differences in culture and language, rules of conduct and moral norms).

Communication between people:

1. Means of communication: natural language and body language (word choice, gestures and facial expressions); and
2. The media as a channel and means of communication.

Society as a composite of different aspects of life:

1. Economic life: rises and falls and the welfare state;
2. Social sphere, living standard and charity; and
3. Unhealthy ways of life and crime.

Delivery

At National Curriculum level, it is outlined that teaching should be learner-centred and include active participation, use of materials of interest to students, use of a range of interaction patterns such as pair and group work, with teachers assuming the role of guiders rather than 'intermediaries of knowledge' and expected to refer to versatile study materials adapted to meet student needs.[96] This reflects an aim for learning to be student-centred and engaging with a clear implication that a communicative based learning approach is favoured, as emphasised by the statement in 2.2.2 of the National Curriculum that 'instruction follows the principles of communicative language learning and is based on active learning methods. The emphasis is in interactive learning and practising the language studied. Pair and group work are implemented…students are encouraged to use the language outside of lessons.'[97] Crucially, it is emphasised that 'knowledge of the language is not an aim in its own right, but a means for achieving a better command of the language. The structure of language is studied in context,'[98] indicating a rejection of approaches such as the grammar-translation method.

Suggested learning activities are also included which further reflect the communicative and student-centred approach:

- Using media and authentic audiovisual materials
- Independent reading and listening
- Compiling consumer texts
- Creative writing
- Compiling and presenting reviews and/or research reports
- Development of argumentative skills
- Role-plays and communication games
- Project work
- Finding information from varied reference sources in foreign languages.

Integration of the CEFR into learning outcomes

Learning outcomes are specified at both the B1 and B2 level, reflecting the different proficiency levels that students study for within foreign languages. Outcomes across the four skills are outlined clearly across A1.1-C1 levels of proficiency.[99] Although not identically worded to the CEFR descriptors, the outcomes have clearly been informed by CEFR and specifically reference the CEFR in footnotes. The table below indicates some examples of similarities and differences with the CEFR at the B1 and B2 levels.

96 https://www.hm.ee/sites/default/files/est_upper_secondary_nat_cur_2014_appendix_2_final.pdf Page 3

97 Ibid. Page 12.

98 Ibid. Page 12.

99 Note that the Estonian National Curriculum divides each CEFR level from A1-B2 into two sub-categories (e.g. A1.1 and A1.2 with the second indicating a higher degree of proficiency).

Table 37: Estonian B1 descriptors for reading and how they compare to CEFR B1 descriptors

Level	Estonian Descriptor	Similarities with CEFR Competences
B1.1	Read and understand fact-based texts on several pages with simple wording (e.g. letters, online texts, brochures and usage instructions). Understand the main idea in narrative text and can follow the plot. Can find necessary information in reference sources and online. Can use bilingual translation dictionaries.	Can read straightforward factual texts on subjects related to his/her field and interests with a satisfactory level of comprehension. [Overall Reading Comprehension, p.60] Can find and understand relevant information in everyday material, such as letters, brochures and short official documents. [Reading for Orientation, p.62] Can recognise the line of argument in the treatment of the issue presented, though not necessarily in detail…can identify the main conclusions in clearly signalled argumentative texts….can recognise significant points in straightforward newspaper articles on familiar subjects…can understand the main points in descriptive notes such as those on museum exhibits and explanatory boards in exhibitions. [Reading for Information & Argument, 63] Can follow the plot of stories, simple novels and comics with a clear linear storyline and high frequency everyday language, given regular use of a dictionary. [Reading as a Leisure Activity, p.65] Can follow a line of argument of the sequence of events in a story, by focusing on common logical connectors…and temporal connectors. [Identifying Cues and Inferring, p.67] Can summarise in writing the main points made in spoken or written informational texts on subjects of personal interest, using simple formulations and the help of a dictionary to do so. [Processing Text in Writing, p.230].[100]

100

Note that although this descriptor does not directly relate to the Estonian descriptor, the ability to use dictionaries is implied.

As can be seen from the colour coding, there is close alignment in terms of the reader being able to understand the main points of texts which are fact-based and linguistically straightforward. Although there is no immediate parallel for the Estonian descriptor 'can find necessary information in reference sources and online', the subskill overlap is clear through the ability to identify the main points and find relevant information in everyday texts.

The Estonian B2 descriptors have a similar overlap with the CEFR B2. The example below indicates this through colour coding for speaking.

Table 38: Estonian B2 descriptors for speaking and how they compare to CEFR B2 descriptors

Level	Estonian Descriptor	Similarities with CEFR Competences
B2.1	Present clear detailed descriptions on themes of common interest. Can explain and defend their positions. Can participate in discussions and make statements. Use diverse expressions and have wide vocabulary. Use more complex sentence structures but may make mistakes in them. Speech pace is quite stable even in longer speech passages; make few pauses in order to find words and choose morphological forms, which do not interfere with communication. Intonation is natural in most cases.	Can give clear, detailed descriptions and presentations on a wide range of subjects related to his/her field of interest, expanding and supporting ideas with subsidiary points and relevant examples [Overall Spoken Production, p.69] Can engage in extended conversation on most general topics in a clearly participatory fashion [Conversation, p.85] Has a sufficient range of language to be able to give clear descriptions, express viewpoints and develop arguments without much conspicuous searching for words, using some complex sentence forms to do so. [General Linguistic Range, p.131] Has a good command of simple language structures and some complex grammatical forms, although he/she tends to use complex structures rigidly with some inaccuracy [Grammatical Accuracy, p.133] Has a good range of vocabulary for matters connected to his/her field and most general topics. [Vocabulary Range, p.132] Can generally use appropriate intonation [Phonological Control, p.136] Can produce stretches of language with a fairly even tempo; although he/she can be hesitant as he/she searches for patterns and expressions, there are few noticeably long pauses.

There is considerable overlap with the CEFR here, indicating the degree to which CEFR, and competency-based language acquisition, is embedded into the Estonian National Curriculum for foreign languages.

Assessment format

Assessment is intended to be across diverse forms, such as presentations, written, and practical work across all aspects of language proficiency. Self and peer assessment methods are integrated, in order to provide a basis for the development of weaker areas and to recognise their accomplishments.

Exam questions aim to correspond to CEFR levels,100[101] and cover topics such as voting, technology, artificial intelligence, pollution and contamination; primarily through input texts with candidates expected to engage with these specific lexical sets but in output (e.g. written texts). Students may also be required to provide their opinion on an area, such as on cultural issues, or to extrapolate analysis from numerical data, indicating that these competencies are also reflected in assessment.

The following section contains some examples of competency-based examination questions in the Estonian state foreign language exams, accompanied by analysis.

Table 39: Assessment format

	Estonian State Examination - English
Number and type of assessments each examination series	Paper-based examination
Duration	Writing – 90 mins Listening – 40 mins Reading – 90 mins Speaking – 15 mins
Type(s) of question	Writing • Writing aimed at a specific reader (e.g. semi-official letter) 120 words • Opinion text (e.g. essay or report (200 words) Listening • Multiple-choice task • Gapfill • Matching Reading • Matching • Multiple-choice • Gapfill

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Type(s) of question	• Word formation • Error correction • Speaking • Description of images / compare contrast • Monologue on a given topic • Conversation
Total marks available	Writing - 25 marks Listening – 25 marks Reading – 30 marks Speaking – 20 marks = 100 marks
Grading	B1 is awarded when the total grade is 50-74% B2 is awarded when the total grade is 75-100% Award of B1/B2 is conditional on no subskill being at 0 points.

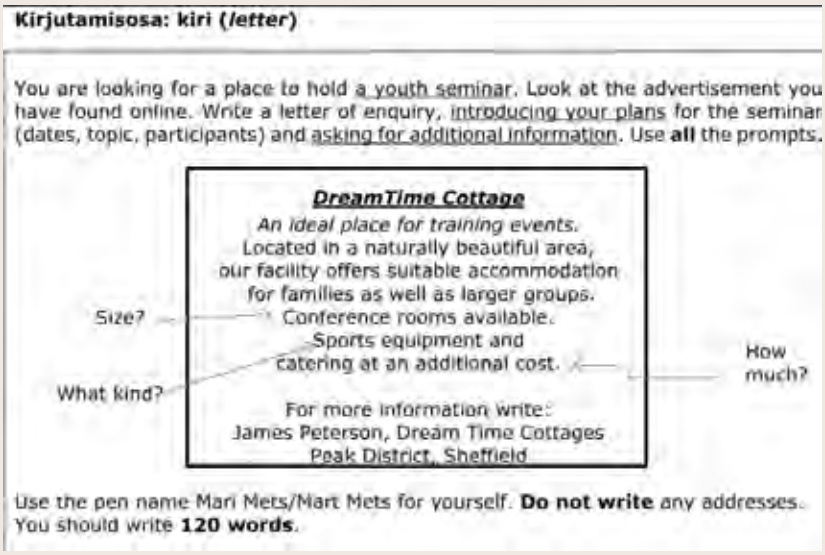
Question types and examples

The following section will explore different question types used in the state examination.

Writing

As seen in the table above, candidates are expected to produce different text types, such as a letter, report, or essay. The following is a typical question:

Figure 85: Estonian state exam writing task exemplar- letter



Listening

In the listening test students have various question types to respond to, including matching questions, multiple-choice, and gap fill. A typical question is reproduced below:

Figure 86: Estonian state exam listening task exemplar- matching

Kuulamisosa: sobitamine (väide ja kõneleja)

You are going to hear people talk about school uniforms. You will hear the recording **twice**. Before you listen, read the statements below. While you listen, match the statements to the speakers and write letters **B–H** in the table given. There are **two extra statements** you do not need to use. *An example (0) has been done for you.* You now have **30 seconds** to read the statements.

Uniforms...

A	*give students a feeling of belonging.*
B	are comfortable.
C	provide support in maintaining order.
D	make students equal.
E	are suitable for younger students.
F	restrict students' self-expression.
G	have no effect on discipline.
H	have lost their importance.

0.	***Example 0***	*A*
1.	**Speaker 1**	
2.	**Speaker 2**	
3.	**Speaker 3**	
4.	**Speaker 4**	
5.	**Speaker 5**	

Reading

Gapfill questions, multiple-choice, error correction, and headline matching are typical question types in the reading section of the examination. Texts are drawn from a variety of difference sources and are of differing lengths. The following is a typical question from the reading examination:

Figure 87: Estonian state exam reading task exemplar- gap fill from four options

Lugemisosa: pangaga lünkülesanne

Read the text and decide which word (**A, B, C** or **D**) best fits each gap (**1–9**). Write the letter in the gap. *An example (0) has been done for you.*

In a bad mood?

When people are in a bad mood, they are ***(0)*** __*B*__ likely to actively search social networking sites like Facebook to find friends who are doing even worse than they are, a new study suggests.

These findings give more context to recent studies that found that people who spend a lot of time on Facebook tend to be more frustrated, angry and lonely — probably **(1)** _____ of all the happy updates from friends that make them feel less confident. Generally, most of us look for the positive on social media sites. But if you are feeling vulnerable, you will look for people on Facebook who **(2)** _____ a bad day or who are not as good **(3)** _____ presenting themselves positively, just **(4)** _____ yourself feel better.

Overall, the researchers **(5)** _____ that people tended to spend more time on the profiles of people who were rated as successful and attractive. "However, if you need a confidence boost, you're going to look at people **(6)** _____ off than you," Knobloch-Westerwick, co-author of the study and professor of communication at the Ohio State University, said. "You're probably **(7)** _____ going to be looking at the people who just got a great new job or just **(8)** _____ married. One of the great appeals of social network sites is that they allow people to manage their moods by choosing who they want **(9)** _____ themselves to."

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0.	**A** *not*	**B** *more*	**C** *less*	**D** *getting*
1.	**A** despite	**B** in spite	**C** regardless	**D** because
2.	**A** has had	**B** are having	**C** were having	**D** has
3.	**A** as	**B** in	**C** at	**D** for
4.	**A** making	**B** to make	**C** make	**D** don't make
5.	**A** found	**B** find	**C** had found	**D** were found
6.	**A** worse	**B** better	**C** worst	**D** well
7.	**A** unhappy	**B** mostly	**C** -	**D** not
8.	**A** have	**B** never	**C** got	**D** get
9.	**A** compare	**B** to be compared	**C** being compared	**D** to compare

Speaking

All students undergo a speaking assessment: this is for approximately 15 minutes and within this time period typical tasks include describing images, giving a monologue on a prescribed topic, and conversation. The task reproduced below reflects a typical 'monologue' question from the examination:

Figure 88: Estonian state exam speaking task exemplar- monologue


Suuline osa: monoloogikaart

MONOLOGUE

Read the topic below and prepare to speak about it. Use the questions given to help to plan your monologue.

Some people say that more technology at home does not mean more free time.

Why do you think they say that? Do you agree? Give reasons.

2. International GCSE (IGCSE)

The IGCSE is a two-year international qualification provided by Cambridge Assessment International Education, part of the University of Cambridge. The typical demographic is aged between 14-16 years old. The grading system is either the A*-G, or may follow the newer 9-1 grading system. A number of modern foreign language qualifications are offered: this review focusses on English as a Second Language.

Students achieving grade C and above on the English as a Second Language IGCSE are considered by Cambridge to be at a level equivalent to CEFR B2. The qualification is offered at different tiers: Core and extended. Candidates taking the Core option are eligible for grades C to G. Candidates taking the Extended option are eligible for grades A* to E. Reading, writing and listening are tested and, in addition, candidates can take an optional separate 'Speaking Endorsement' in syllabus 0510, or it is 'counted in' to the final grade in syllabus 0511. This review will focus on syllabus code 0511 where the speaking is included and informs the overall grade, and will focus on the Extended option, pitched at CEFR B2. The IGCSE articulates aims at a syllabus level as below:

Table 40: Aims of the IGCSE in English as a Second Language (0511)

Aims of the IGCSE in English as a Second Language (0511)
The aims are to: • Develop learners' ability to use English effectively for the purpose of practical communication • Form a solid foundation for the skills required for further study or employment using English as the medium • Develop learners' awareness of the nature of language and language-learning skills • Promote learners' personal development

As indicated in these aims, language proficiency development is, of course, a key element. Nevertheless, other areas are also included such as learners' personal development, and elements related to lifelong learning in English.

Content areas

The key content of the IGCSE is outlined across the four skills of reading, writing, listening and speaking as in the table below:

Table 41: Content per skill area

IGCSE- Content per skill area
Reading
• Understand factual information, abstract ideas and arguments from a range of texts, e.g. leaflets, articles, blogs and webpages
• Identify relevant information and select correct details from a wide range of texts
• Identify ideas, opinions and attitudes from a wide range of texts and understand the connections between them
• Understand what is implied but not directly stated, e.g. gist, purpose and intention
Writing
• Communicate factual information, abstract ideas and arguments with good expansion
• Select and organise relevant information and ideas into coherent paragraphs and use a range of appropriate linking devices
• Respond to a written stimulus and use appropriate register and style/format for the given purpose and audience, e.g. a summary, an informal email, an article, a report and a review
Listening
• Understand factual information, abstract ideas and arguments from a wide range of sources, e.g. recorded phone messages, announcements, dialogues, informal conversations, interviews and formal talks. A variety of voices and accents will be heard in recordings to reflect the various contexts presented.
• Identify relevant information and select correct details from a wide range of sources
• Identify ideas, opinions and attitudes from a wide range of sources and understand the connections between them
• Understand what is implied but not directly stated, e.g. gist, purpose and intention
Speaking
• Communicate factual information, abstract ideas and arguments with good expansion
• Organise and link ideas with a range of appropriate linking devices
• Engage in a conversation on a wide range of topics, e.g. natural environment, arts, science and global issues
• Produce responses with a wide range of language structures (i.e. grammatical and lexical)
• Produce responses that show good control of pronunciation and intonation

Assessment objectives

Assessment objectives are expressed across each skill area. There are some clear overlaps with CEFR descriptors at B2 level, as indicated in the colour-coding in the table below:

Table 42: Assessment Objectives per skill area, respective weightings across the qualification and similarities to CEFR B2 descriptors

Skill & Relative Weighting in qualification (%)	Assessment Objective(s)	Similarities with CEFR B2 descriptors
AO1 Reading **30%**	R1 Identify and select relevant information R2 understand ideas, opinions, and attitudes R3 show understanding of the connections between ideas, opinions and attitudes R4 understand what is implied but not directly stated, e.g. gist, writer's purpose, intention and feelings	Can scan quickly through long and complex texts, locating relevant details (Reading for Orientation) Can recognise when a text provides factual information and when it seeks to convince readers of something (Reading for Information and Argument). Can recognise different structures in discursive text: contrasting arguments, problem-solution presentation and cause-effect relationships (Reading for Information and Argument). Can understand articles and reports concerned with contemporary problems in which the writers adopt particular stances or viewpoints (Reading for Information and Argument).
AO2 Writing **30%**	W1 Communicate information/ideas/opinions clearly, accurately and effectively W2 Organise ideas into coherent paragraphs using a range of appropriate linking devices W3 use a range of grammatical structures and vocabulary accurately and effectively W4 show control of punctuation and spelling W5 use appropriate register and style/format for the given purpose and audience	Can write clear, detailed texts on a variety of subjects related to his/her field of interest, synthesising and evaluating information and arguments from a number of sources. (Written Production) Can produce text that is generally well-organised and coherent, using a range of linking words and cohesive devices. (Coherence and Cohesion) Can structure longer texts in clear, logical paragraphs. (Coherence and Cohesion) Spelling and punctuation are reasonably accurate. (Orthographic Control) Has a good range of vocabulary for matters connected to his/her field and most general topics. (Vocabulary Range) Lexical accuracy is generally high, though some confusion and incorrect word choice does occur without hindering communication. (Vocabulary Control) Has a sufficient range of language to be able to give clear descriptions, express viewpoints and develop arguments without much conspicuous searching for words, using some complex sentence forms to do so. (General Linguistic Range) Can express him/herself appropriately in situations and avoid crass errors of formulation. Sociolinguistic Appropriateness)

AO3 Listening 20%	L1 identify and select relevant information L2 understand ideas, opinions and attitudes L3 show understanding of the connections between ideas, opinions and attitudes L4 understand what is implied but not directly stated, e.g. gist, speaker's purpose, intention and feelings	Can understand the main ideas of propositionally and linguistically complex speech on both concrete and abstract topics delivered in standard speech, including technical discussions in his/her field of specialisation. Can follow extended speech and complex lines of argument provided the topic is reasonably familiar, and the direction of the talk is sign-posted by explicit markers. (Overall Listening Comprehension) Can identify the main reasons for and against an argument or idea in a discussion conducted in clear standard speech. (Understanding Conversation Between Other Speakers) Can follow complex lines of argument in a clearly articulated lecture provided the topic is reasonably familiar. Can recognise the speaker's point of view and distinguish this from facts that he/she is reporting. (Listening as a Member of a Live Audience) Can understand most radio documentaries and most other recorded or broadcast audio material delivered in the standard form of the language and can identify the speaker's mood, tone etc. (Listening to Audio-Media and Recordings)
AO4 Speaking 20%	S1 communicate ideas/ opinions clearly, accurately and effectively S2 develop responses and link ideas using a range of appropriate linking devices S3 use a range of grammatical structures and vocabulary accurately and effectively S4 show control of pronunciation and intonation patterns S5 engage in a conversation and contribute effectively to help move the conversation forward	Can give clear, systematically developed descriptions and presentations on a wide range of subjects related to his/her field of interest, expanding and supporting ideas with subsidiary points and relevant examples (Overall Spoken Production) Has a sufficient range of language to be able to give clear descriptions, express viewpoints and develop arguments without much conspicuous searching for words, using some complex sentence forms to do so. (General Linguistic Range) Has a good range of vocabulary for matters connected to his/her field and most general topics. (Vocabulary Range) Shows a relatively high degree of grammatical control. Does not make mistakes which lead to misunderstanding. (Grammatical Accuracy) Lexical accuracy is generally high, though some confusion and incorrect word choice does occur without hindering communication. (Vocabulary Control) Can generally use appropriate intonation, place stress correctly and articulate individual sounds clearly; accent tends to be influenced by other language(s) he/she speaks, but has little or no effect on intelligibility. Can adjust to the changes of direction, style and emphasis normally found in conversation (Flexibility)

	Can initiate, maintain and end discourse appropriately with effective turn taking. (Turntaking) Can interact with a degree of fluency and spontaneity that makes regular interaction with speakers of the target language quite possible without imposing strain on either party. (Spoken Fluency) Can engage in extended conversation on most general topics in a clearly participatory fashion. (Conversation) Can produce text that is generally well-organised and coherent, using a range of linking words and cohesive devices. (Coherence and Cohesion)

It can be seen that the CEFR closely informs the IGCSE assessment objectives, thus underpinning them with competencies across all four skills.

Assessment format

The table below provides information about the assessment format across the Extended syllabus with the count-in speaking (e.g. syllabus 0511):

Table 43: Assessment format of the IGCSE English as a Second Language 0511: Extended

	IGCSE – English as a Second Language (0511): Extended
Papers	Paper 2 Reading and Writing Paper 4 Listening Component 5 Speaking
Duration	Paper 2 – 2 hours Paper 4 – approx. 50 mins Speaking – 10-15 minutes
Type(s) of question	Reading & Writing - multiple matching, note-making, summary, writing continuous prose, writing a report/ review/article Listening - short answer, gap fill, matching, Speaking - conversation, test card
Total marks available	Paper 2: Reading and Writing – 80 marks Paper 4: Listening – 40 marks Component 5: Speaking – 30 marks
Weighting toward overall qualification	Reading and Writing 60% Listening 20% Speaking 20%
Grading	A*-G (U as Ungraded)

Candidates taking the Extended syllabus with the 'count in' speaking are thus tested across all four skills, with an integrated reading and writing paper which takes around two hours, a separate listening paper of just under an hour, and a separate speaking test of around 15 minutes. The reading and writing paper is 60% of the overall qualification, with listening and speaking both weighted at 20%.

Question types and examples

Reading and Writing

The task below is a typical reading to writing task from the IGCSE. The first stage is an input text which candidates then draw information from to take notes for a simulated talk they will do in class.

Figure 89: IGCSE Reading and writing exemplar task

Exercise 4

Read the article about loggerhead turtles, and then complete the following notes.

Tracking turtles

Following the movements of turtles through the ocean, a process known as tracking, is not an easy job. Researchers have even tried swimming behind baby turtles for their first few hours to see where they go, but it proved too difficult to keep up with them. Now, thanks to tiny solar-powered devices, or 'tags' that can be followed by satellites, researchers are discovering more about a species of turtle called a loggerhead.

When baby loggerhead turtles hatch out of their eggs, they head to the ocean from their nests in sandy beaches. This happens at night, when there is less chance of them being eaten by other animals before they reach the ocean. However, when they get to the open sea, a growing problem that turtles face is mistaking plastic floating in the sea for food. When turtles become adults they return to the same beaches years later, but unfortunately for these turtles, some nesting beaches are threatened by expanding tourism development. The fact that turtles choose to nest on a beach, however, is good for the natural environment because the eggshells provide nutrients for plants that help to keep the sand in place, making it less likely to wash away.

In order to successfully track adult turtles, researchers can fix equipment to their shells. However, baby turtles grow so quickly that whatever device is attached usually falls off as the shell gets bigger. A breakthrough came when a team of biologists tried tiny solar-powered tags, originally designed for tracking birds. These tags are much lighter, whereas the heavy batteries used before seriously affected the turtles' movements. To attach the tags, a liquid called acrylic was painted onto a small area of the turtles' shells, to which the tags were stuck with strong glue. This allowed some movement. Researchers had previously attempted to allow for expanding shells by using an elastic belt around the turtles that expanded as the turtles grew. However, the belts still damaged the shells, whereas fixing the solar-powered tags using acrylic did not cause any damage.

Researchers put solar-powered tags on young turtles, and placed them on a type of seaweed floating in the ocean off Florida in the USA. Sea currents in this area move in a big circle. Previously, it was thought that turtles swam around the circle on these currents, before returning to the beach to lay eggs. However, satellite data from the tags showed that many turtles travel into the centre of the circle where large amounts of seaweed are found. The temperature readings are higher in the centre than in the surrounding water, and researchers think that the seaweed keeps turtles warm, helping them grow. From this information, researchers have identified climate change as a potential danger – this can alter the ocean's currents, meaning turtles are unable to reach the safety of the seaweed.

Worryingly, numbers of loggerhead turtles are decreasing. Turtles provide habitats for other creatures, and adults grow large enough to carry tiny plants and animals around on their backs. Their large size, however, means that they are sometimes caught in fishing nets, which reduces their numbers. This decrease in population has a negative effect on the health of a marine plant called sea-grass. Sea-grass is an important part of the marine ecosystem and by eating it, turtles encourage the growth of this essential plant, and therefore have a key environmental role.

You are going to give a talk about loggerhead turtles to your class.

Prepare some notes to use as the basis for your talk.

Make short notes under each heading.

Problems with the tracking equipment the researchers have used:

- .....
- .....
- .....

Threats to loggerhead turtle populations:

- .....
- .....
- .....
- .....

Why the turtles are important:

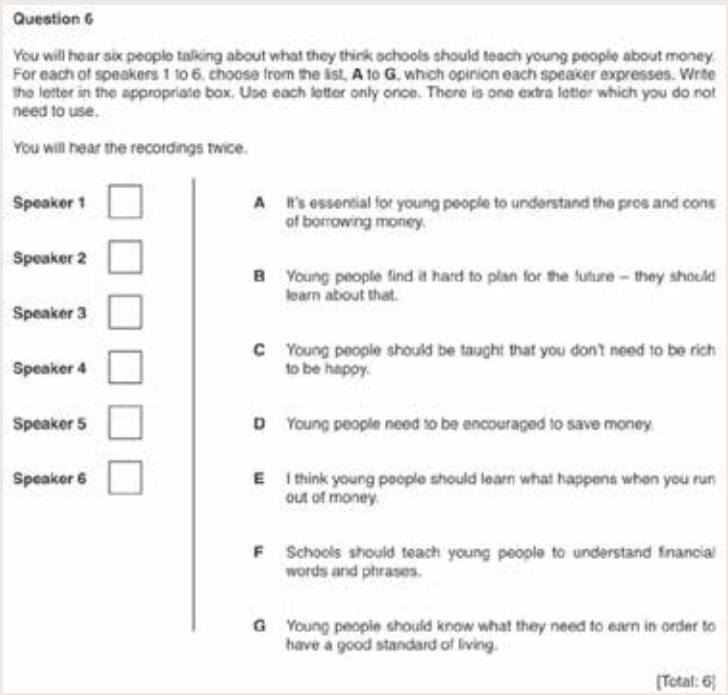
- .....
- .....

[Total: 9]

Listening

Candidates listen to a number of different recordings and respond with short answers, such as matching, multiple-choice, or gap fill questions. The question below is a typical matching question, where candidates need to listen to different speakers' opinions and choose the matching option. The question includes a distractor (an additional letter which is not needed).

Figure 90: IGCSE Listening task exemplar- matching



Question 6

You will hear six people talking about what they think schools should teach young people about money. For each of speakers 1 to 6, choose from the list, **A** to **G**, which opinion each speaker expresses. Write the letter in the appropriate box. Use each letter only once. There is one extra letter which you do not need to use.

You will hear the recordings twice.

Speaker 1 ☐

Speaker 2 ☐

Speaker 3 ☐

Speaker 4 ☐

Speaker 5 ☐

Speaker 6 ☐

A It's essential for young people to understand the pros and cons of borrowing money.

B Young people find it hard to plan for the future – they should learn about that.

C Young people should be taught that you don't need to be rich to be happy.

D Young people need to be encouraged to save money.

E I think young people should learn what happens when you run out of money.

F Schools should teach young people to understand financial words and phrases.

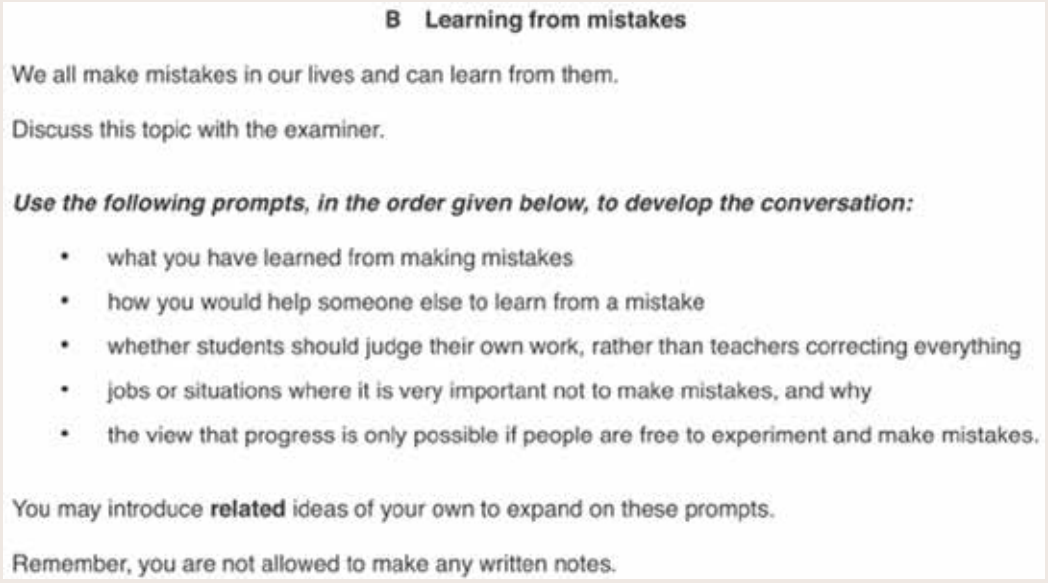
G Young people should know what they need to earn in order to have a good standard of living.

[Total: 6]

Speakig

The following task is an example of a typical speaking task in the 'count-in' speaking. The candidates are given an unseen topic and some prompts to support the discussion.

Figure 91: IGCSE Speaking task exemplar- conversation



B Learning from mistakes

We all make mistakes in our lives and can learn from them.

Discuss this topic with the examiner.

Use the following prompts, in the order given below, to develop the conversation:

- what you have learned from making mistakes
- how you would help someone else to learn from a mistake
- whether students should judge their own work, rather than teachers correcting everything
- jobs or situations where it is very important not to make mistakes, and why
- the view that progress is only possible if people are free to experiment and make mistakes.

You may introduce **related** ideas of your own to expand on these prompts.

Remember, you are not allowed to make any written notes.

3. GCSE

The General Certificate of Secondary Education, or GCSE, examinations are typically taken by school leavers in England, Wales and Northern Ireland. English is often a compulsory subject for students in schools, with many students taking either GCSE English Language, GCSE English Literature, or both, alongside a number of other GCSE subjects. The GCSE is an Ofqual regulated qualification. Historically, the GCSE was awarded from A*-G, but recent reforms changed this to 9-1 (9 as highest).

The overall aims and objectives are as below:

Table 44: GCSE English Literature aims and objectives

Pearson Edexcel Level 1/Level 2 GCSE (9-1) English Literature
To enable students to: • Read a wide range of classic literature fluently and with good understanding, and make connections across their reading • Read in depth, critically and evaluatively, so that they are able to discuss and explain their understanding and ideas • Develop the habit of reading widely and often • Appreciate the depth and power of the English literary heritage • Write accurately, effectively and analytically about their reading, using Standard English • Acquire and use a wide vocabulary, including grammatical terminology, and other literary and linguistic terms they need to criticise and analyse what they read.

Content areas and learning outcomes

The qualification consists of two externally examined components. The first one is entitled 'Shakespeare and Post-1914 Literature'. The second is entitled '19th-Century Novel and Poetry since 1789.' The table below provides an overview of the content and learning outcomes for these two components:

Table 45: GCSE Content and learning outcomes per component

Content and learning outcomes for Component 1 and Component 2
Component 1: Shakespeare and Post-1914 Literature • Study a Shakespeare play and a post-1914 British play or novel[102] • Develop skills to analyse how the language, form, structure and context of texts can create meanings and effects. • Develop skills to maintain a critical style and informed personal response.
Component 2: 19th-Century Novel and Poetry since 1789 • Study a 19th-century novel and a poetry collection from the Pearson Poetry Anthology.[103] • Develop skills to analyse how the language, form, structure and context of texts can create meanings and effects. • Develop skills to maintain a critical style and informed personal response. • Develop comparison skills.
Learning Outcomes **1.1 and 2.1** **Literal and inferential comprehension** – students will understand a word, phrase, sentence or whole text in context; explore aspects of plot, characterisation, events and settings; distinguish between what is stated explicitly and what is implied; explain motivation, sequence of events, and the relationship between actions or events.
1.2 and 2.2 **Critical reading** – students will identify the theme and distinguish between themes; support a point of view by referring to evidence in the text; recognise the possibility of and evaluate different responses to a text, use understanding of writer's social, historical and cultural contexts to inform evaluation; make an informed personal response that derives from analysis and evaluation of the text.
1.3 and 2.3 **Evaluation of a writer's choice of vocabulary, grammatical and structural features** – students will analyse and evaluate how language (including figurative language), structure, form and presentation contribute to quality and impact; use linguistic and literary terminology for such evaluation (such as, but not restricted to, phrase, metaphor, meter, irony and persona, synecdoche, pathetic fallacy)

102 Shakespeare text choice includes Macbeth, the Tempest, Romeo and Juliet, Much Ado about Nothing, Twelfth Night, The Merchant of Venice. The post-1914 British play or novel is to be selected from An Inspector Calls; Hobson's Choice; Blood Brothers; Journey's End; Animal Farm; Lord of the Flies; Anita and Me; The Woman in Black; The Empress; Refugee Boy; Coram Body; Boys Don't Cry.

103 The 19th-century novel is to be chosen from Jane Eyre; Great Expectations; Dr Jekyll and Mr Hyde; A Christmas Carol; Pride and Prejudice; Silas Marner; Frankenstein, and the poetry collection is from Relationships; Conflict; Time and Place or Belonging.

1.4 and 2.5

Writing – producing clear and coherent text – students will write effectively about literature for a range of purposes such as: to describe, explain, summarise, argue, analyse and evaluate; discuss and maintain a point of view; select and emphasise key points; use relevant quotation and detailed textual references

And, in addition, for Component 2 only:

2.4

Comparing tests – students will compare and contrast texts studied, refer where relevant to theme, characterisation, context (where known), style and literary quality; compare two texts critically with respect to the above.

Assessment objectives

There are four assessment objectives: the details of these and their relative weighting across the GCSE are outlined in the table below:

Table 46: Assessment objectives and weightings of the GCSE English Literature

Assessment Objectives and weightings		
Students must		% in GCSE
AO1	Read, understand and respond to texts Students should be able to: • Maintain a critical style and develop an informed personal response • Use textual references, including quotations, to support and illustrate interpretations	37
AO2	Analyse the language, form and structure used by a writer to create meanings and effects, using relevant subject terminology where appropriate	42
AO3	Show understanding of the relationships between texts and the contexts in which they were written	16
AO4	Use a range of vocabulary and sentence structures for clarity, purpose and effect, with accurate spelling and punctuation.	5
		TOTAL: 100%

The CEFR is a framework intended to cover foreign languages, not native languages, and for that reason, attempting to gauge the CEFR level of literature examinations can be problematic due to the different competencies involved in acquiring language proficiency versus those required in literary analysis - students performing poorly in a literature examination may nevertheless have high proficiency levels in the language, and may be native speakers, but lack the broader skills required to analyse literature and identify specific techniques, for example, aspects such as the impact of literary devices on meaning.

Nevertheless, appreciation of literary texts is a feature of the CEFR, as outlined in the 2018 manual,[104] so can provide a basis to understand the different competencies which may be reflected at different proficiency levels. The CEFR has three descriptive scales which relate to creative texts and literature, which are a useful reference point here. These reflect different 'reactions' or engagement with the texts outlined in the CEFR and replicated in the table below:[105]

Table 47: The CEFR and literature

Reading approaches	Illustrative descriptor	Key concepts within the scale
Extensive reading (e.g. reading for enjoyment, not studying the text specifically nor actively 'interpreting' it)	Reading as a leisure activity[106]	• Length, variety of texts and whether there are illustrations • Type of texts, from simple descriptions of people and places, through different types of narrative texts to contemporary and classical writings in different genres • Topics, from everyday topics, concrete situations to a full range of abstract and literary topics • Type of language from simple to stylistically complex • Ease of reading: from guessing with the help of images, through reading with a large degree of independence to appreciating the variety of texts • Depth of understanding: from understanding the main points to understanding implicit as well as explicit meaning.

104
SCEFR 2018, 51

105
CEFR 2018, 115-6

106
This descriptor is typically less relevant for an examination context which does not reflect 'leisure'

Engagement: giving a personal reaction to the language, style or content, feeling drawn to an aspect of the work or a character or characteristic of it. Interpretation: ascribing meaning or significance to aspects of the work, including contents, motifs, characters' motives, metaphor etc.	Expressing a personal response to creative texts	• Explaining what he/she liked, what interested him/her about the work • Describing characters, saying which he/she identified with • Relating aspects of the work to own experience • Relating feelings and emotions • Personal interpretation of the work as a whole or of aspects of it.
Analysis of features of the text such as language use, literary devices, context, characters, relationships Critical appraisal of technique, structure, the vision of the artist, the significance of the work	Analysis and criticism of creative texts including literature	• Comparing different works • Giving a reasoned opinion of a work • Critically evaluating features of the work, including the effectiveness of techniques employed.

As a result, it is possible to provide some indication of how the GCSE learning outcomes and assessment objectives relate to CEFR. The following table provides references CEFR descriptors from CEFR B2 and above.

106

This descriptor is typically less relevant for an examination context which does not reflect 'leisure'

Table 48: GCSE learning outcomes and assessment objectives compared to CEFR descriptors at B2-C2

	Relevant CEFR descriptors B2-C2
1.5 and 2.1 Literal and inferential comprehension – students will understand a word, phrase, sentence or whole text in context; explore aspects of plot, characterisation, events and settings; distinguish between what is stated explicitly and what is implied; explain motivation, sequence of events, and the relationship between actions or events. **1.6 and 2.2** Critical reading – students will identify the theme and distinguish between themes; support a point of view by referring to evidence in the text; recognise the possibility of and evaluate different responses to a text, use understanding of writer's social, historical and cultural contexts to inform evaluation; make an informed personal response that derives from analysis and evaluation of the text. **1.7 and 2.3** Evaluation of a writer's choice of vocabulary, grammatical and structural features – students will analyse and evaluate how language (including figurative language), structure, form and presentation contribute to quality and impact; use linguistic and literary terminology for such evaluation (such as, but not restricted to, phrase, metaphor, meter, irony and persona, synecdoche, pathetic fallacy)	Can understand virtually all forms of the written language including abstract, structurally complex, or highly colloquial literary and non-literary writings…Can understand a wide range of long and complex texts, appreciating subtle distinctions of style and implicit as well as explicit meaning.(Overall Reading Comprehension – C2) Can compare two works, considering themes, characters and scenes, exploring similarities and contrasts and explaining the relevance of the connections between them….Can give a reasoned opinion about a work, showing awareness of the thematic, structural and formal features and referring to the opinions and arguments of others…Can evaluate the way the work encourages identification with characters, giving examples…Can describe the way in which different works differ in their treatment of the same theme. (Analysis and criticism of creative texts including literature – B2). Can critically appraise a wide variety of texts including literary works of different periods and genres…Can evaluate the extent to which a work meets the conventions of its genre…Can describe and comment on ways in which the work engages the audience (e.g. by building up and subverting expectations). (Analysis and criticism of creative texts including literature – C1).

1.8 and 2.5

Writing – producing clear and coherent text – students will write effectively about literature for a range of purposes such as: to describe, explain, summarise, argue, analyse and evaluate; discuss and maintain a point of view; select and emphasise key points; use relevant quotation and detailed textual references

And, in addition, for Component 2 only:

2.4

Comparing tests – students will compare and contrast texts studied, refer where relevant to theme, characterisation, context (where known), style and literary quality; compare two texts critically with respect to the above.

Can give a critical appraisal of work of different periods and genres, appreciating subtle distinctions of style and implicit as well as explicit meaning… Can recognise the finer subtleties of nuanced language, rhetorical effect, and stylistic language use (e.g. metaphors, abnormal syntax, ambiguity), interpreting and 'unpacking' meanings and connotations…can critically evaluate the way in which structure, language and rhetorical devices are exploited in a work for a particular purpose and give a reasoned argument on their appropriateness and effectiveness….Can give a critical appreciation of the deliberate breach of linguistic conventions in a piece of writing. (Analysis and criticism of creative texts including literature – C2).

Can give a clear presentation of his/her reactions to a work, developing his/her ideas and supporting them with examples and arguments…Can describe his/her emotional response to a work and elaborate on the way in which it has evoked this response…Can express in some detail his/her reactions to the form of expression, style and content of a work, explaining what he/she appreciated and why (Expressing a personal response to creative texts including literature- B2)

Can describe in detail his/her personal interpretation of a work, outlining his/her reactions to certain features and explaining their significance…can outline his/her interpretation of a character in a work: their psychological/emotional state, the motives for their actions and the consequences of these actions…can give his/her personal interpretation of the development of a plot, the characters and the themes in a story, novel, film or play. (Expressing a personal response to creative texts including literature – C1).[107]

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Note that there is no descriptor available at C2.

Assessment format

The GCSE is assessed across two exam papers, one for each component, with each paper weighted at 50%. The table below outlines the assessment format:

Table 49: Assessment format of the Pearson Edexcel GCSE English Literature

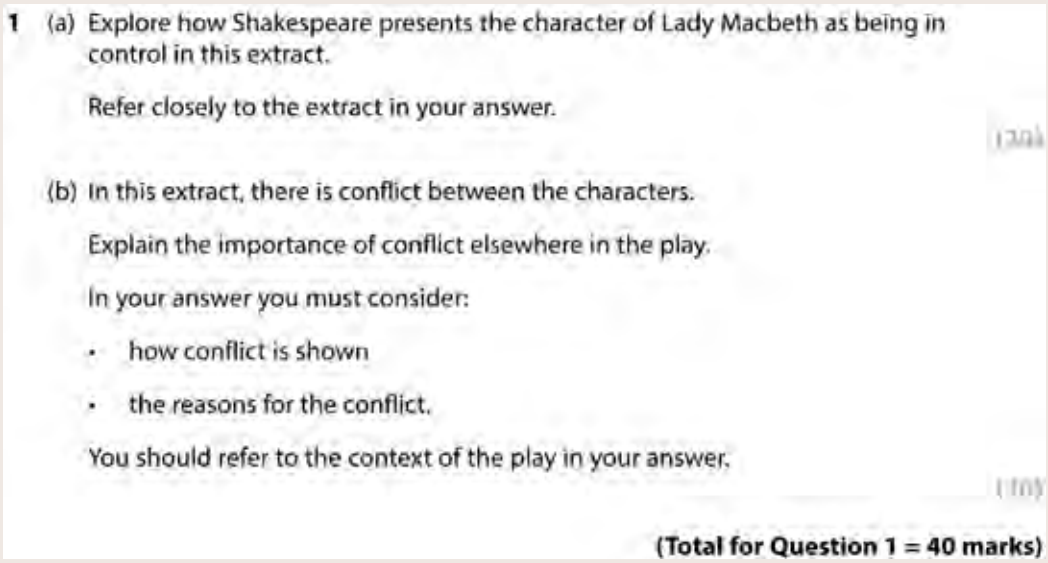
	Pearson Edexcel GCSE English Literature
Papers	Component 1 – Shakespeare and Post-1914 Literature Component 2 – 19th-century Novel and Poetry since 1789 (closed book examinations)
Duration	Component 1 – 1 hr 45 mins Component 2 – 2 hrs 15 mins
Type(s) of question	Component 1 Section A: Shakespeare: a two-part question first task is focused on an extract of approx. 30 lines. The second task is focused on how a theme reflected in the extract is explored elsewhere in the play. Section B: One essay question Component 2 Section A: 19th-century novel: a two-part question, the first part focused on an extract of approx.. 400 words. The second part is an essay question exploring the whole text. Section B: Part 1 – one question comparing a named poem from the Pearson Poetry Anthology to another poem from that collection. Part 2 – one question comparing two unseen contemporary poems.
Total marks available	Component 1 – 80 marks Component 2 – 80 marks
Weighting toward overall qualification	Component 1 – 50% Component 2 – 50%
Grading	9-1 (9 is highest)

Typical questions

Component 1 Section A Shakespeare

In the first section of the Component 1 paper, candidates answer a question on a Shakespearean set text. Around 30 lines of the play are provided as an extract, and then candidates answer two questions, both worth 20 marks. The question below is an example of a question based on Shakespeare's Macbeth. The question is preceded by an extract from Macbeth Act 2 Scene 2, lines 48-69:

Figure 92: Shakespeare exemplar question



1 (a) Explore how Shakespeare presents the character of Lady Macbeth as being in control in this extract.

Refer closely to the extract in your answer.

(20)

(b) In this extract, there is conflict between the characters.

Explain the importance of conflict elsewhere in the play.

In your answer you must consider:

- how conflict is shown
- the reasons for the conflict.

You should refer to the context of the play in your answer.

(20)

(Total for Question 1 = 40 marks)

The questions require extended responses and candidates need to directly reference the text. Content points are additionally provided for support in Question 1b. Specification documents which link each question to the assessment objectives highlight that Question 1a is intended to test AO2 and Question 1b targets AO1 and AO3:

Figure 93: Pearson Edexcel GCSE in English Literature; assessment objectives by component

Breakdown of Assessment Objectives by component

Raw mark distribution

Component	Assessment Objectives				Total
	AO1	AO2	AO3	AO4	
Component 1: Shakespeare and Post-1914 Literature					
Questions 1a to 6a		20			20
Questions 1b to 6b	15		5		20
Questions 7 to 10	16		16	8	40
Component 2: 19th-century Novel and Poetry since 1789					
Questions 1a to 7a		20			20
Questions 1b to 7b	20				20
Questions 8 to 11		15	5		20
Question 12	8	12			20
Total for this qualification	**59**	**67**	**26**	**8**	**160 marks**
Total % Assessment Objectives for this qualification	**37**	**42**	**16**	**5**	**100**

Section B focusses on the Post-1914 British play or novel. Students need to answer one question, assessing AO1, AO3 and AO4. 40 marks are available for this question; general guidance on what competences are assessed is also provided on the examination:

Figure 94: Post-1914 British play or novel exemplar question

SECTION B – Post-1914 Literature – British Play OR British Novel

Answer ONE question from this section, on EITHER a British Play OR a British Novel..

You should spend about 50 minutes on this section.

BRITISH PLAY

***An Inspector Calls:* J B Priestley**

Your response will be marked for the range of appropriate vocabulary and sentence structures, and accurate use of spelling and punctuation.

EITHER

7 **Sybil Birling:** *I must say, we* ***are*** *learning something tonight.*

Explore how learning from experience is important in the play.

You **must** refer to the context of the play in your answer.

(Total for Question 7 = 40 marks (includes 8 marks for the range of appropriate vocabulary and sentence structures, and accurate use of spelling and punctuation))

OR

8 **Sheila Birling:** *But these girls aren't cheap labour – they're* ***people.***

In what ways is Eva Smith exploited in the play?

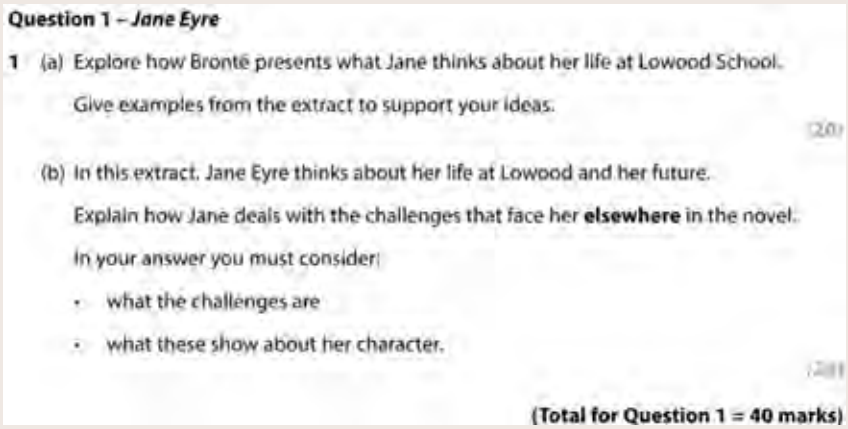
You **must** refer to the context of the play in your answer.

(Total for Question 8 = 40 marks (includes 8 marks for the range of appropriate vocabulary and sentence structures, and accurate use of spelling and punctuation))

Component 2

Component 2, 19th-century Novel and Poetry since 1789, is split into two sections. In Section A, which focusses on the 19th-century novel, students are expected to answer a two-part question which assesses AO1 and AO2. Part One is a language analysis of an extract from a set text (around 400 words) and Part Two is a closer focus on plot, setting, character or theme. In total Section A is worth 40 marks. The question below is an example, from the set text *Jane Eyre*. The question is preceded by an extract of the text from Chapter 10 of the novel.

Figure 95: 19th-century novel question



Question 1 – *Jane Eyre*

1 (a) Explore how Brontë presents what Jane thinks about her life at Lowood School.

Give examples from the extract to support your ideas.

(20)

(b) In this extract, Jane Eyre thinks about her life at Lowood and her future.

Explain how Jane deals with the challenges that face her **elsewhere** in the novel.

In your answer you must consider:

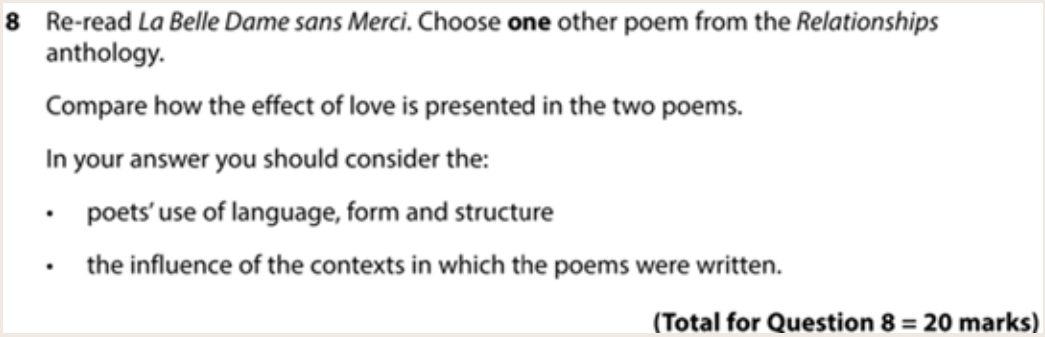
- what the challenges are
- what these show about her character.

(20)

(Total for Question 1 = 40 marks)

Part Two of Section A is based on poetry since 1789. Students are provided with a poem from the anthology which they are familiar with, and compare it with a poem of their choice from the same anthology (both are set texts). The questions focus on language, form, structure and contexts of the poems, testing AO1 and AO2. The following question is an example (the poem *La Belle Dame sans Merci* is provided as an extract in the paper).

Figure 96: Poetry since 1789 question



8 Re-read *La Belle Dame sans Merci*. Choose **one** other poem from the *Relationships* anthology.

Compare how the effect of love is presented in the two poems.

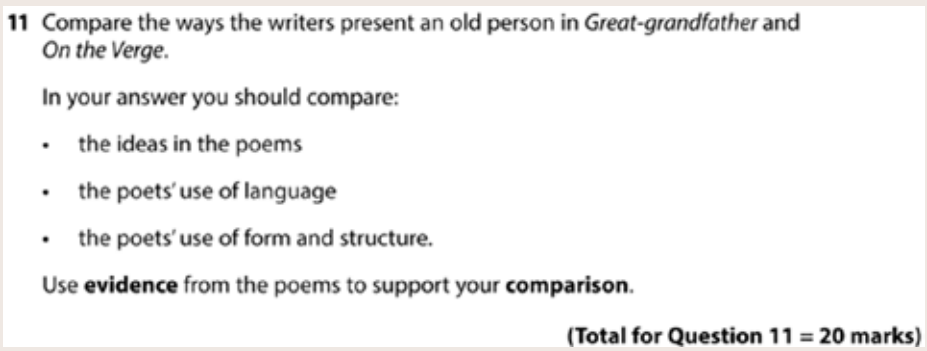
In your answer you should consider the:

- poets' use of language, form and structure
- the influence of the contexts in which the poems were written.

(Total for Question 8 = 20 marks)

The second question focusses on unseen texts: students need to compare two contemporary poems linked by a theme, which are provided on the examination paper, and then focus on use of language, form and structure, testing AO1 and AO2. An example of this question type is provided below:

Figure 96: Poetry since 1789 question



11 Compare the ways the writers present an old person in *Great-grandfather* and *On the Verge*.

In your answer you should compare:

- the ideas in the poems
- the poets' use of language
- the poets' use of form and structure.

Use **evidence** from the poems to support your **comparison**.

(Total for Question 11 = 20 marks)

Appendix 7 Survey Findings

Methodology

Five surveys were designed and disseminated by online link to key stakeholder groups in November 2020. Stakeholder groups were targeted with the following objectives in mind:

Table 50: Key stakeholder groups contacted in the surveys, and the objectives of the engagement

Stakeholder group	Objective(s)
Students of Standard XI (i.e. those who completed Standard X in the previous academic year).	• To understand their experience of the Standard X curriculum and assessment across maths, science, and English; • To understand aspects of the curriculum and assessment that they found to be positive; • To understand if they would like to see any changes to the curriculum and assessment; • To ascertain how well they felt that Standard X prepared them for Standard XI.
Teachers of Standard X maths Teachers of Standard X science Teachers of Standard X English	• To understand their experience of teaching their respective subject Standard X curriculum and assessment; • To understand their views on the positive aspects of the curriculum and assessment; • To ascertain whether there are any changes they would like to see in the Standard X; • To consult them on the extent to which competency-based education is integrated into their classrooms, curriculum, and assessment as a whole, in order to build up a picture of 'readiness.'
School management teams	• To understand what support is available for teachers to carry out the teaching and learning around Standard X subjects; • To identify any key challenges or positives that they see in the Standard X curriculum and assessment, and any changes they would like to see; • To understand the extent to which they consider competency-based education to be integrated into current educational practice in their school, and what needs further development, in order to understand the degree of 'readiness'.

108 surveymonkey.com/

All surveys included a focus on competency-based education practices, although in some questions this link was implicit (e.g. asking which learning outcomes teachers used in their planning, and how useful they found them).

Design and dissemination of surveys

Surveys were designed on SurveyMonkey, an online survey design platform.[108] They were designed with non-native speakers in mind, so clarity of language was an important factor. The burden of time was also considered to be an important consideration for all stakeholders - students, for example, may have less immediate interest in the survey having already completed Standard X, so their buy-in may be reduced. Teachers and school management have a number of other commitments, particularly during this time of transition for COVID-19, and so again, time was kept in mind noting that nevertheless that their buy-in may be higher, given that Standard X and CBE in general have a daily impact on their professional lives. Moreover, there were some key questions which were needed in order to answer the research questions of this project. In all cases, survey completion was estimated by the platform to need less than 30 minutes.

Survey URL links were disseminated through British Council and CBSE to schools. There was a relatively high number of responses, following data cleansing:

Table 51: Overall number of respondents by stakeholder group

Stakeholder Group	Number of respondents[109]
Students	• 921
Maths teachers	• 584
Science teachers	• 109
English teachers	• 394
School management	• 197

As can be seen from the table above, the number of respondents across teaching groups varied, with science teachers being the lowest rate of response; nevertheless, the numbers still allow for analysis albeit with the caveat that this is a small number of teachers within the wider context of science teachers delivering the CBSE curriculum nationwide.

Scope and limitations in survey response

Some issues arose during data cleansing: it was noted, for example, that some surveys in the school management survey had been answered by students (e.g. they stated 'student' in a question asking them about their role). As students have insufficient context to respond to questions about school management and policies, and their responses to questions did not yield useful data as a result, those entries were discarded and not taken into account in the wider analysis. As this was not observed frequently, it may reflect an issue with a few individuals using the wrong link for the demographic group. It should be noted that some students had understood that the survey came directly from CBSE as noted in some of the qualitative

109 These numbers reflect the valid responses following data cleansing

110 These have been noted throughout in footnotes.

responses, although introductory text explained the context of the survey.

In some cases, surveys were left incomplete (e.g. a question/questions were skipped, or answers were not fully clear – e.g. where a respondent replied with a single letter, potentially to allow them to skip the question); this is typical for surveys and may reflect situations where buy-in is reduced, where the respondent may not be sure how to answer, or if they experience technical problems in the case of online dissemination. Wherever the incomplete data was useful (e.g. after the initial demographic questions), this has been taken into account in the analysis, noting however that the overall number of respondents to each question may vary.[110] In some cases response rates for an individual question were particularly low, particularly for school management. This may reflect a shortage of time, a lack of interest in the question, or - for questions which asked for further information – no information to add.

The analysis is based on the percentages of those who responded to each individual question. E.g. for a question on school type, 89% of science teachers answered that question (97 individuals out of a total 109 responding to the survey). Of that 89%, 71.13% work at private schools (69 individuals), which is the number reflected in the figure and the analysis. Accompanying footnotes indicate the total response rate per question.

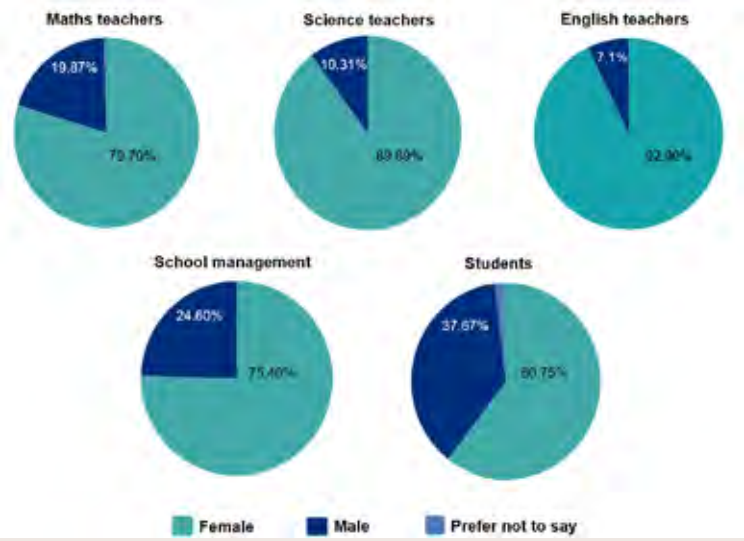
Language barrier and question design

Certain survey responses indicated a potential language barrier, where for some questions respondents seem to have misinterpreted and gave single word answers which then became ambiguous. For example, in response to the question 'are there any changes to the Standard X assessment that you think would be useful?' (student survey) it seems that there was a misunderstanding of 'changes that would be useful' and whether the Standard X assessment itself was useful - a number of respondents replied 'no' – which may potentially be relevant data in that they do not believe any changes are necessary. However, the context of others replying 'yes it was useful' indicated that this data is less clear; does a 'no' mean no changes are necessary, or that they have not found the Standard X assessment useful? Does a single 'yes' mean 'yes changes are needed', or 'yes Standard X assessment is useful?' As this issue did not impact all responses, and a large number of respondents provided qualitative responses which gave more detail, these single 'yes/no/useful' responses have been discounted, with the focus instead on responses which provided more information. This is both a reflection of language barrier, but also of the question design, which may have been better framed alongside a request for students to give examples or a multiple choice with additional comment box. For some respondents, then, this question did not operate well, although a significant number of respondents provided some useful additional details which have supported this analysis.

Respondent demographics

Findings are impacted due to demographic response ratios: for example, as can be seen in the image below, most respondents were female, with English teachers indicating the highest percentage of this (over 92%).[111]

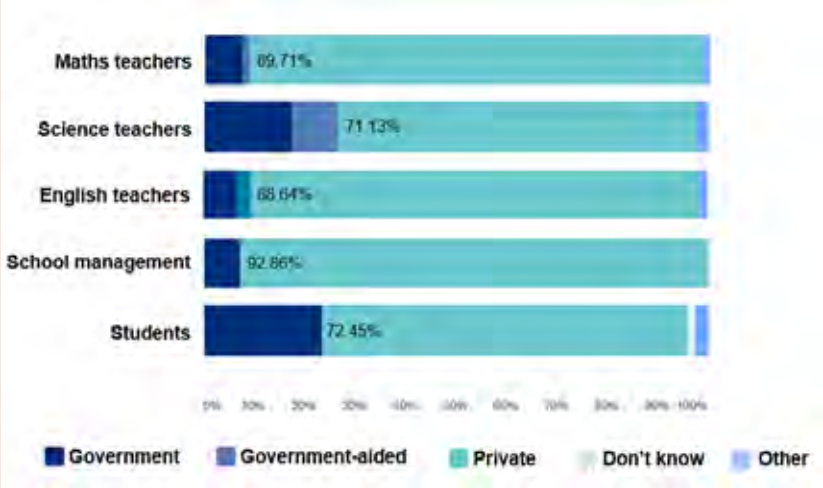
Figure 96: Poetry since 1789 question



It is unknown to UK NARIC as to whether this ratio reflects the on-the-ground situation (e.g. whether approx. 75% of school management personnel are female in schools using the CBSE curriculum), or whether this reflects an unrepresentative sample, although it seems likely that the latter is the case.

Another limitation is the ratio of respondents between private and government or government-aided schools as can be seen in the figures below:

Figure 99: School types[112]



As the figure demonstrates, for some demographic groups very few other school types were represented apart from private schools, with over 92% of school management coming from private schools, meaning that an understanding of institutional policy towards Standard X is less known for non-private schools.

111

Response rates- students 82%; maths teachers 81%; science teachers 89%; English teachers 89%; school management 64%.

112

Response rates – students 82%; maths teachers 82%; science teachers 89%; English teachers 89%; school management 64%. Note that the question for students referred to the school they attended for Standard X rather than their present school.

It was important to disseminate surveys to a range of states in India to strengthen the representativeness of the findings. Respondents came from a range of regions as indicated in the following table:

Table 52: location of respondents

	School management	Maths teachers	Science teachers	English teachers	Students
Bihar					0.13%
Chandigarh	19.84%	17.55%	75.00%	23.08%	53.21%
Chattisgarh				0.28%	0.27%
Delhi					0.13%
Gujarat	8.73%	4.44%	19.79%	4.56%	9.63%
Haryana					1.20%
Karnataka	11.90%	21.99%		30.77%	2.27%
Ladakh					0.13%
Maharastra					0.13%
Odisha					0.27%
Punjab		0.21%	1.04%		2.81%
Telangana	0.79%				0.13%
Tamil Nadu	58.73%	55.60%	4.17%	41.31%	29.41%
International school					0.27%

As demonstrated in the table, the region with most respondents from each demographic group has been highlighted above in red: Tamil Nadu was highest for most demographic groups, but at least four different states were represented in each demographic group, with the students showing the widest range.

COVID-19

Unsurprisingly, additional challenges created by the COVID-19 pandemic have fed into many survey responses, notably from those responding to the school management survey who will have had to oversee significant changes and challenges within their schools. These current concerns may have less bearing in a typical year. Where the references to COVID were clear – respondents referring to the challenges of the pandemic, or e.g. the necessity to transfer teaching to online modes – these were coded in order to highlight that this was a clear reference to the challenges from the COVID-19 pandemic.

Findings

The findings have been structured around some of the key research questions, regarding:

i. The current situation in terms of CBSE Standard X teaching and

learning – including any aspects related to, informed by or likely to impact competency-based education approaches;

ii. A focus specifically on the assessment of Standard X including assessment preparation and opinions on the assessment itself;

iii. The barriers or enablers of the current situation in implementing competency-based education.

Throughout this section, some key quotes from respondents have been added. Whilst these are the comment of a single individual from a much wider sample, they have been selected because they either reflect a wider theme across stakeholder engagement findings or may be particularly different and therefore provide a different perspective.

Top-level findings are drawn together but each subject's findings are also considered separately where differences were found.

The current situation in CBSE curriculum, teaching, and learning

All five demographic groups were asked questions aimed at building up an understanding of the nature of the current situation in delivering the CBSE curriculum and the teaching and learning context.

Teacher training, CPD and levels of experience

89.08% of school management respondents to questions focused on these areas noted that there is training provided to those teaching Standard X.[113] From the 97 school management staff who replied, 27.84% referred to specific training provided by CBSE and 16.49% mentioned workshops around pedagogy and methodology, including in some cases those organised by Centres of Excellence. Other methods of training related to subject specific training (9.28%), capacity building programmes (10.31%), classroom management (12.37%), and assessment training (9.28%). Other training was mentioned but by fewer than five school management respondents.

The results paint a clear picture of a focus on ongoing CPD – this provides a good foundation for the implementation of new initiatives around CBE and an opportunity for progressive development of teacher understanding of CBE, noting that CBSE training is a key part of this. One challenge may be to ensure that there is a consistent message across training provided externally to CBSE whether that be in-school training, or private training.

Some of this training provision reflected some of the main challenges school management staff see in the implementation of the Standard X curriculum, with some management staff flagging issues with recruiting staff at the necessary professional level:

> Since the school is situated in a rural background, the students depend entirely on the teachers and the school. There is no parental support in guiding them in academics. The level of the students is average. Sometimes getting quality teachers is a big challenge.
>
> Dearth of qualified subject teachers. Profession to be professionalized. A pool of subject teachers to be created and registered at Cbse RO level so that school can draw. It should be mandatory.
>
> Teacher's competency (as a challenge).

113 Response rate – 60%

The quality of teaching staff will have a significant impact on the successful integration of CBE approaches – with school management flagging this as an issue in the current context, this may become exacerbated when more complex or abstract pedagogical approaches are developed in line with CBE integration.

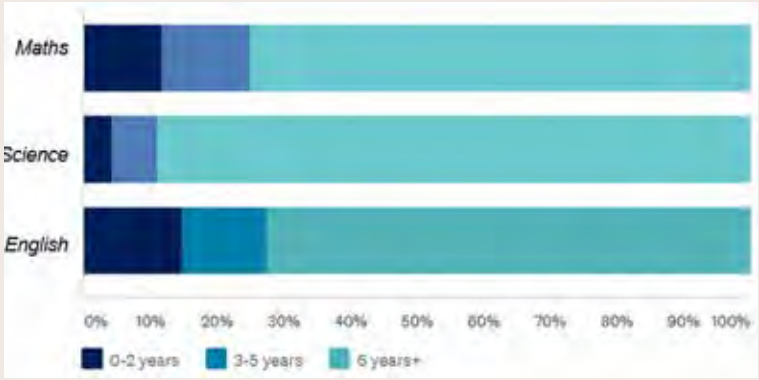
As noted above, there was a large focus by management staff on current challenges in delivering the curriculum due to COVID-19; these were primarily around technological issues or limitations in delivering the curriculum (e.g. understanding learners' progress) and also around teachers' lack of experience and training in these areas, or the need to rapidly upskill teachers in this area, or the challenges in delivering training in general in this context. 40.48% of management staff highlighted the COVID-19 context as a particular challenge:

> Non availability of devices, Internet issues, lack of control in the online classes, teachers not trained properly for online teaching
>
> In this pandemic times, training is little challenging.

In this context, many of the school management staff perceive that teacher training provision is altered or reduced – there may be a greater focus on technology training and some of the more informal training such as peer interaction may be lost. Nevertheless, some management staff report that adjustment has been swift, and that the curriculum is being delivered well. The implementation of CBE approaches in the current situation would need to take this context into consideration- some key factors impacting any current integration would orient around student equitable access to education including internet access, teachers' ability to measure progress, and the complexities of adding further changes to an already unstable situation. In the longer term, it may be found that students' quality of education during this period deteriorates or that it is an unequal experience, such as a divide between those who are able to draw on wider support structures such as parent teaching. This may mean a shortfall in curriculum coverage or understanding which may present some barriers to future implementation of CBE approaches.

The level of teacher experience is worth noting and may also have an impact on the training provision – the majority of respondents from all subjects have been teaching for six years or more, as indicated in the figure below:

Figure 100: Years of teaching experience[114]



114 Response rates – maths teachers 52%; science teachers 82%; English teachers 89%

Overall, whilst the two demographic groups of teachers with fewer than 5 years' teaching experience (0-2; 3-5) typically were closely aligned in results, those teachers with more experience responded differently on some questions. The below figure illustrates this as a typical example – this is regarding the question *'How far do you agree with the following statement? "Students are well prepared in this skill or content area in Standard X English for progression onto Standard XI." '*

Figure 101: Overview of response differences between teachers of different experience levels

This figure demonstrates a difference between teachers with fewer than six years' experience and those with more, with 41.7% of more experienced teachers agreeing with the statement (in turquoise), compared to over 60% of less experienced.

However, the overall trend was that these differences were around the extent of agreement (e.g. different demographic's %'s varied across 'strongly agree' and 'agree', rather than 'agree and disagree'). In the figure below, 'agree' and 'strongly agree' have been combined:

Figure 102: Relative differences between 'disagree' and 'agree'

As can be seen, with this combination, the differences are not significant – 88.89% of teachers with 6 years' or more experience agree (strongly agree/ agree) compared to 90.48% of teachers with 0-2 years and 90.91% of teachers with 3-5 years' experience. Overall, taking this broad overview of those who disagree vs those who agree with the statement, there are no particularly strong differences between teachers with different levels of experience. This was a typical finding throughout the analysis.

Teacher experience levels will be of importance to CBE integration- teachers with more experience are likely to be more confident with subject matter, making the leap to CBE approaches less challenging. Many of them will have seen the benefits to more competency-based education as it has increased in classrooms. On the flipside, however, it may be that some of the more experienced teachers are less open to changes after having worked in a particular way for a period of time, and there may be some resistance.

School management noted other challenges in delivering the Standard X curriculum: these included perceived issues with a lack of resources, the new division between standard and basic maths, motivation of students, and financial challenges. All these present potential barriers to CBE worth taking into consideration as plans for implementation are made, noting however that these are only flagged by small numbers of management staff (fewer than 5).

Differentiation and Inclusion

Differentiation and inclusion on the other hand emerged as a shared challenge across a minority of management staff - 10.71% of all respondents to this question.[115] A challenge which, in some cases, was considered to be exacerbated by the COVID-19 situation:

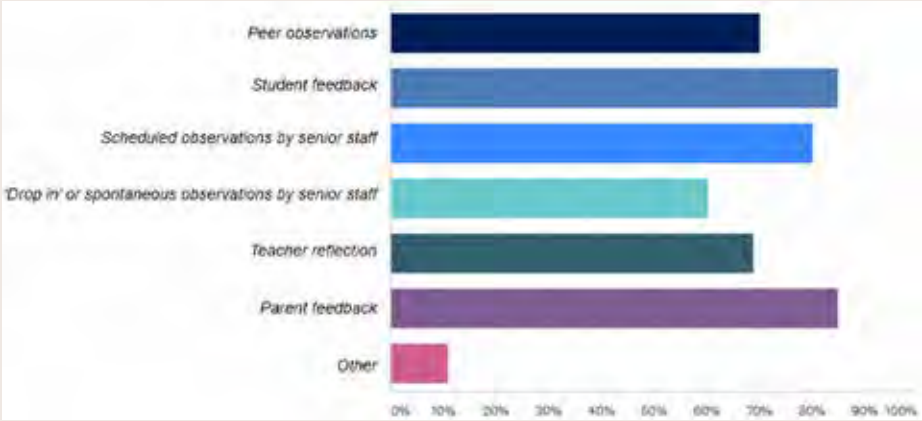
> The main challenge in delivering the curriculum is trying to balance diverse learning needs virtually.
>
> Since the students are diversified in different aspects. Individually we must analysis each student and we have to fulfil as per their needs.
>
> Since it is online class we don't have physical interaction and unable to assess them properly. Another drawback is that we are not able to concentrate and help the slow learners. Regarding the internal assessment we are not satisfied.
>
> The main challenge is Balancing Diverse Learning Needs.

School management and teachers were asked about the ways in which they catered to student needs – a number of methods were mentioned, including parental involvement, the use of remedial classes, adaptation of classroom resources, activities, use of technology, 1-2-1 support in the classroom, or in the form of counselling or mentoring and financial support, although again no clear trend was discernible. Broadly, however, measures around differentiation and inclusion would help to support CBE integration by ensuring that all students have equitable access, and that support and stretch are appropriately used.

Quality of teaching and resources used

School management staff noted that there were measures in place to monitor the quality of teaching. Student and parent feedback were the main approaches used, but observations by different staff also featured:[116]

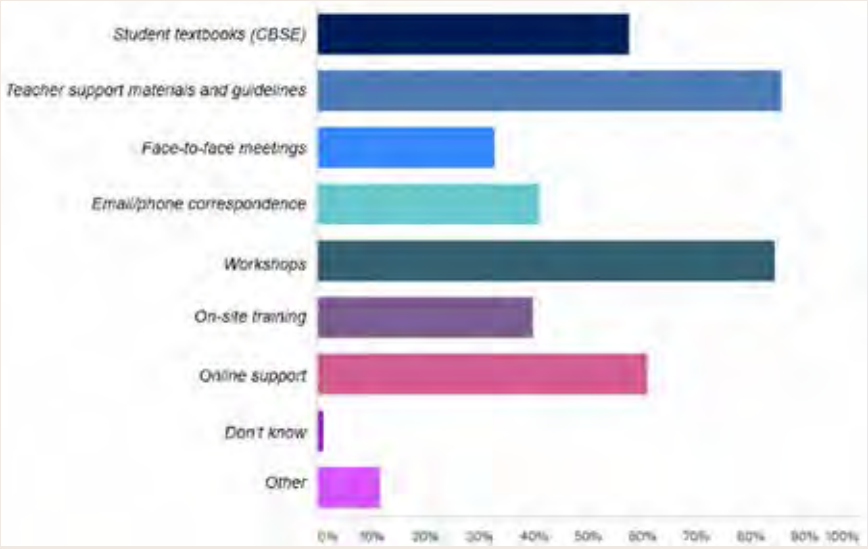
Figure 103: Approaches used to monitor the quality of teaching



This level of monitoring would support implementation of CBE approaches, given that senior staff would be able to guide teachers through feedback on observation, as well as understand parental and student perceptions of CBE integration. Further school inspections or CBSE observations may also provide a mechanism to support integration of CBE approaches.

School management staff report high levels of support from CBSE as can be seen in the image below:

Figure 104: Forms of support from CBSE as reported by school management[117]



115
Noting a low response rate for this question - 43%.

116
41% response rate.

117
Response rate 36%

This consistent and varied support again will support integration of CBE approaches if CBSE aim to align these different support forms to ensure a consistent message and adequate scaffolding for implementation.

Teachers typically draw on the CBSE Standard X syllabus, the NCERT curriculum standards, and the NCERT textbook to support their teaching, complemented by in-school or online resources. It may be worth noting, however, that not all teachers report using these resources. The following table provides the breakdown by subject:

118 Response rate – maths teachers 41%; science teachers 62%; English teachers 45%.

Table 53: % of teachers using different resource types[118]

	CBSE Standard X syllabus	NCERT curriculum standards	Textbooks	In-house resources	Other	No. of respondents
Maths	66.81%	72.27%	59.24%	33.61%	11.34%	238
Science	83.82%	88.24%	79.41%	58.82%	38.24%	68
English	62.71%	64.41%	78.53%	31.64%	6.21%	177

When analysed, the disparities here do not seem to be due to teacher experience levels. However, when segmented into private vs government schools, there were some differences. The figure below demonstrates this for maths:

Figure 105: Private vs government schools' use of CBSE Standard X maths syllabus

Goverment schools

Private schools

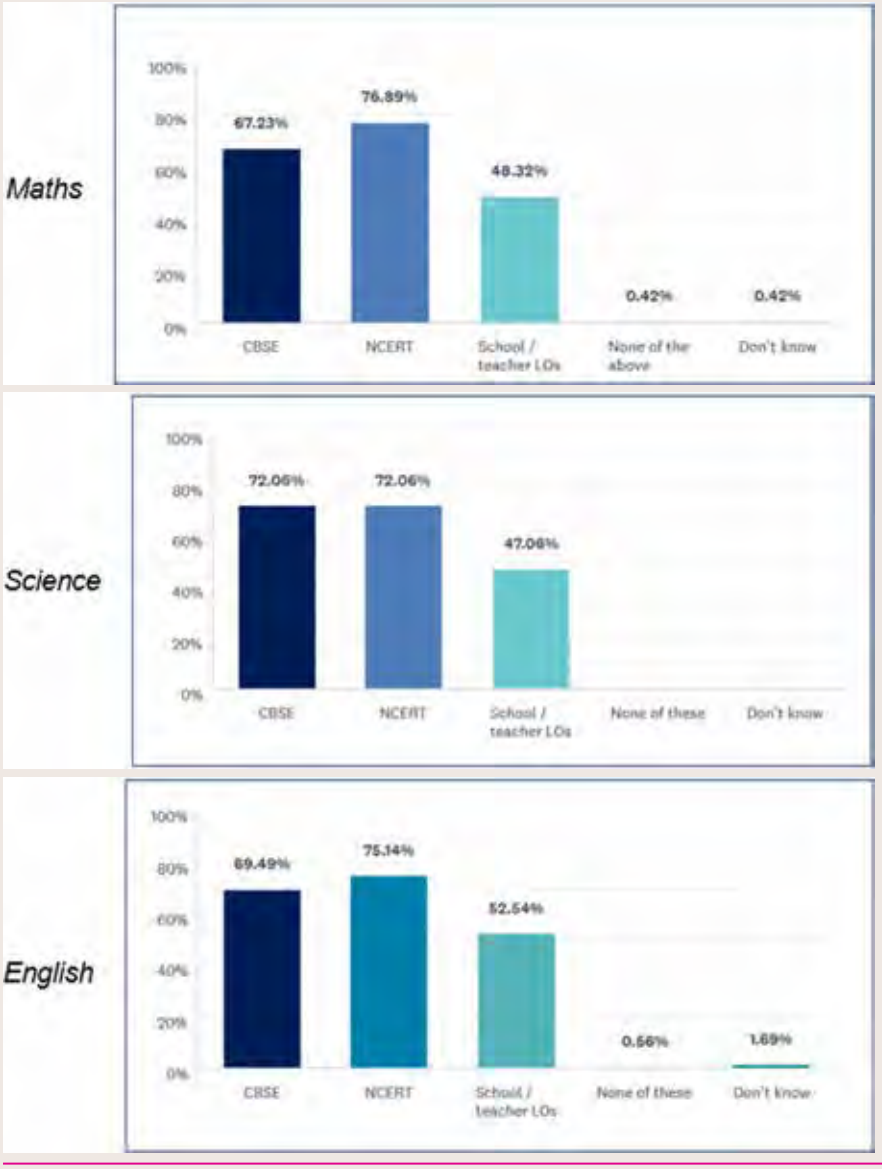
This figure demonstrates quite a significant difference around the use of the CBSE Standard X syllabus, with over 65% using it in private schools, and over 80% using it in government schools. This may reflect a greater degree of autonomy in private schools.

English teachers show the least use of the CBSE syllabus and the NCERT curriculum standards. Data from maths teachers shows a similar number. Science teachers report higher use of these resources, though it is important to keep in mind the lower overall response rate to the survey.

This variation may present a challenge to the integration of CBE approaches- if CBSE resources are not used consistently, or not used by all schools or staff, then a cohesive and scaffolded approach to CBE may be less successful.

In contrast to the use of the CBSE curriculum and NCERT standards, more teachers seem to use the NCERT and CBSE learning outcomes as indicated in the figures below, although overall response rates for this question were low:

Figure 106: Use of learning outcomes by subject[119]

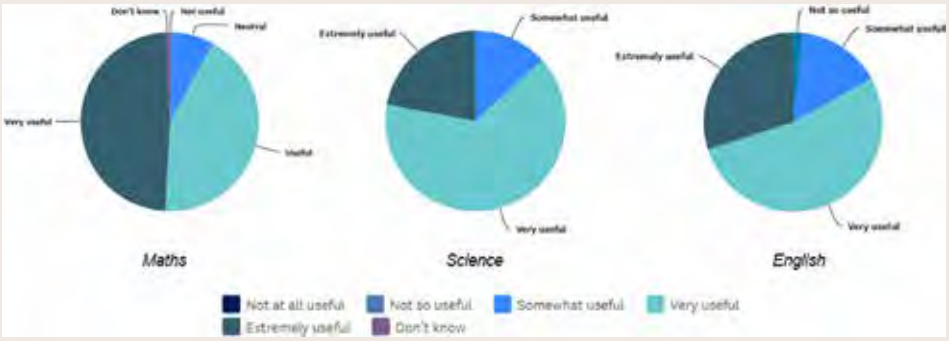


119

Response rate – maths teachers 41%; science teachers 62%; English teachers 45%.

From those who use the NCERT learning outcomes, teachers across all subjects typically responded that they found the NCERT learning outcomes useful, with the majority of respondents to this question stating that they were very, or extremely, useful.

Figure 107: Teachers' perceptions of how useful NCERT learning outcomes are[120]



Teachers typically commented that they found them useful as a platform or basis to develop teaching and learning activities from, to ensure that the content areas were covered appropriately, and to measure student progress:

Learning outcomes provides direction to my teaching process and provide insight into assessment process too.it really helps to cover all the aspects of a topic [science].[121]

The NCERT learning outcomes are very clearly specified [science].

Help to know the progress of the students [maths].

NCERT Learning outcomes have variety of topics that make students confident & builds critical & creative thinking [English].

In contrast, some teachers provided follow-up comments which indicate the contexts in which the LOs may be considered to be less useful, with a general indication that concerns over differentiation or inclusion may be at play:

We couldn't use all learning outcomes. [English].

Learning outcomes are different for every student so already given learning outcomes are not always that appropriate. [English].

They work well as a guideline, but are too basic for students with a reasonable existing command over the language [English].

The extra knowledge required is given as per average standard of the students [maths].

For some extend it is useful but need to add or refers extra resources also [maths].

LllOutcomes of NCERT are very useful for an above average students For extra ordinary students we have to go beside it. otherwise the learning outcomes are catering overall development of a student [science].

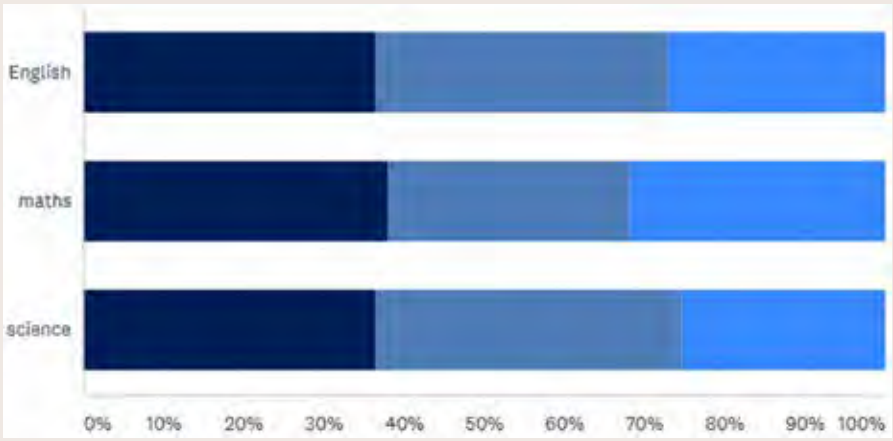
120 Response rates- maths teachers 41%; science teachers 62%; English teachers 45%.

121 Please note that throughout this section, quotations from respondents are given as they are written, e.g. with no change to syntax or other errors. This is considered to preserve the intention of the original comment, given that all are understandable, but also to give some indication of the impact of language barrier throughout the surveys, to reinforce what has been mentioned in the limitations – i.e. that language errors are present, but typically they do not interfere with the message.

Only 1.28% of maths teachers, 0.78% of English teachers, and 0% of science teachers stated that they never include learning outcomes in their lesson planning, and over 85% of teachers use them in every plan. This indicates a widespread use which can support CBE integration, as teachers clearly place importance on them.

The picture from school management provides an additional insight into how the LOs are used and cascaded. The findings per subject indicate that LOs are articulated and decided at a range of different levels including school, departmental, and teacher:

Figure 108: Level of decision-making on learning outcomes by subject[122]



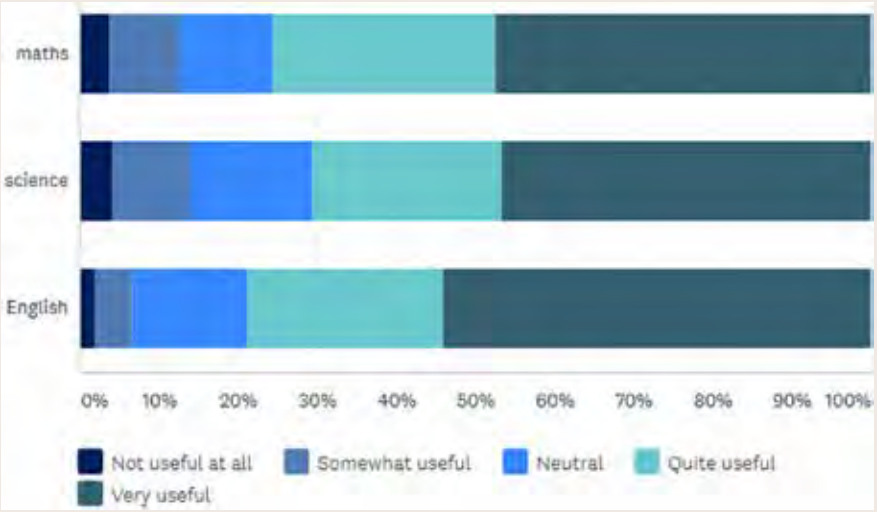
To support CBE integration, training will therefore be important at all levels- CBSE will need to target training not just at management level, but also at individual teacher level to ensure that LOs are consistently applied. Nevertheless, this widespread use of LOs (at any level) will support CBE integration if suitable training is provided in creating them - if the LOs are oriented around competences they should by necessity inform teaching and learning amongst teachers who understand the role they play in classroom planning and execution. It is worth, however, bearing in mind the comments made by teachers who have found the LOs less helpful, particularly where this has been flagged primarily as an issue around differentiation. If some teachers find that the LOs have limited value or application in a practical context, then it may be more challenging to get buy-in on the one hand, but more importantly, to ensure that all students have equitable access to CBE.

The main trend noted in the students' survey was that the majority of students felt that the teaching had been useful in helping them to prepare for the Standard X assessments. 75% of respondents answered the question, and results indicated that across all subjects more than 70% of these respondents found the lessons either quite or very useful, with a

122
Response rate – 32%

small percentage (<5%) saying that the lessons were not at all useful.[123] The figure below shows the results across the three subjects:

Figure 109: Students' perception of how useful the teaching was for Standard X assessment



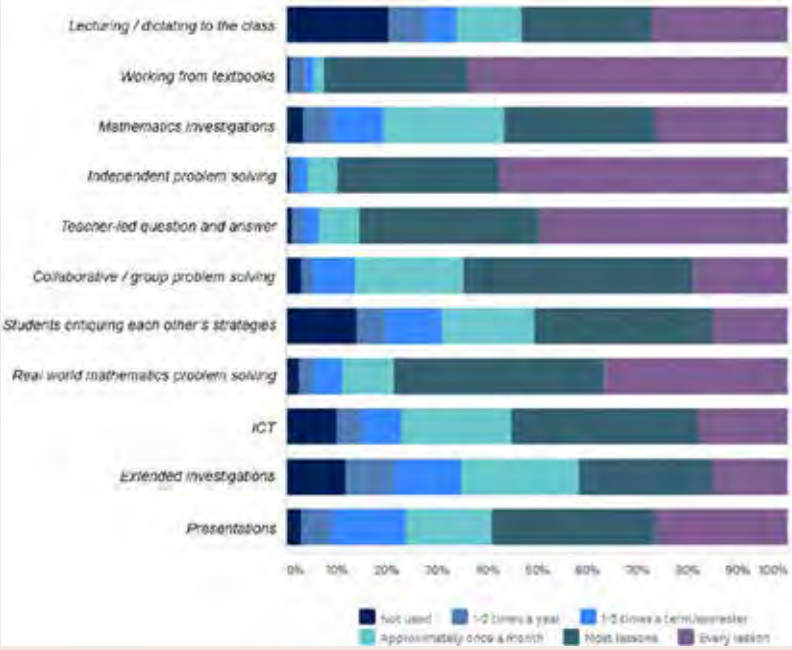
123
Response rate 75%

Findings per subject – Mathematics

Teaching methods

Maths teachers use a range of teaching methods to support development of knowledge and skills in the classroom – the following figure indicates the use and frequency of use:

Figure 110: Teaching methods used in the Standard X maths classroom



Working from textbooks, independent problem solving, and teacher-led question and answer were used every lesson by a majority of teachers, with less emphasis on some other methods which might support CBE such as extended investigations and students critiquing each other's strategies. A significant percentage of teachers state that they use real world mathematics problem solving frequently – with 78.45% using it either in every or most lessons- this frequency of use may support the integration of CBE if the real world problems allow demonstration of HOTS.[124]

Changes to curriculum

For mathematics, fewer than 2% of students indicated that they would like to see some changes.[125] Most of the changes suggested were not statistically significant, particularly given a low response rate to this question. These changes were sometimes reported generically:

'Lessons that aren't helpful should be removed.'

'less syllabus.'

Others were more specific and primarily related to removing specific topics, with geometry, proofs, quadrilaterals, engineering maths, line questions, and trigonometry all mentioned. In contrast, some students indicated that

124 Response rate – maths teachers 41%. The question was designed to allow teachers to select more than one response.

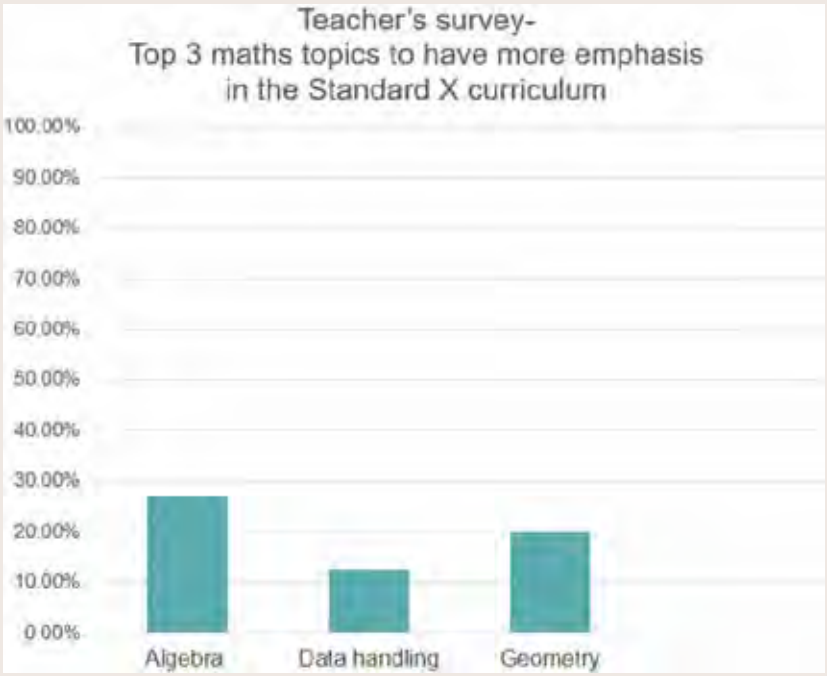
125 It should be noted as mentioned above in the limitations that 'yes/no' responses may have been ambiguous, and so have been removed from the analysis. Response rate- 45%.

they would like to see the addition of some subjects- mental maths, basic calculus, and arithmetic were mentioned. This data however seems reflective of individual preferences, and is not statistically significant, representing the views of 1-2 students only.

Maths teachers were more specific about changes that they would like to see in the curriculum and a greater percentage were in agreement about the changes, compared to students (noting that response rates in total were both low, and lower compared to the student survey).[126] 175 maths teachers responded to this question, with 26.86% stating that they would like to see more algebra in the syllabus; 12.57% would like to see more data handling, which may have some link to a very small number of teachers who wanted to see more statistics (2.29%), and 12% would like to see more focus on measures. In comparison to the student survey, it is possible to see some more consistent trends in this data.

The following figure indicates the top three most commonly mentioned topics requested as additions to the syllabus by teachers- other mathematic topics mentioned were by fewer than 10 teachers:

Figure 111: The three most commonly mentioned maths topics teachers want emphasised more in the Standard X curriculum



Real life application, practical skills, and HOTs

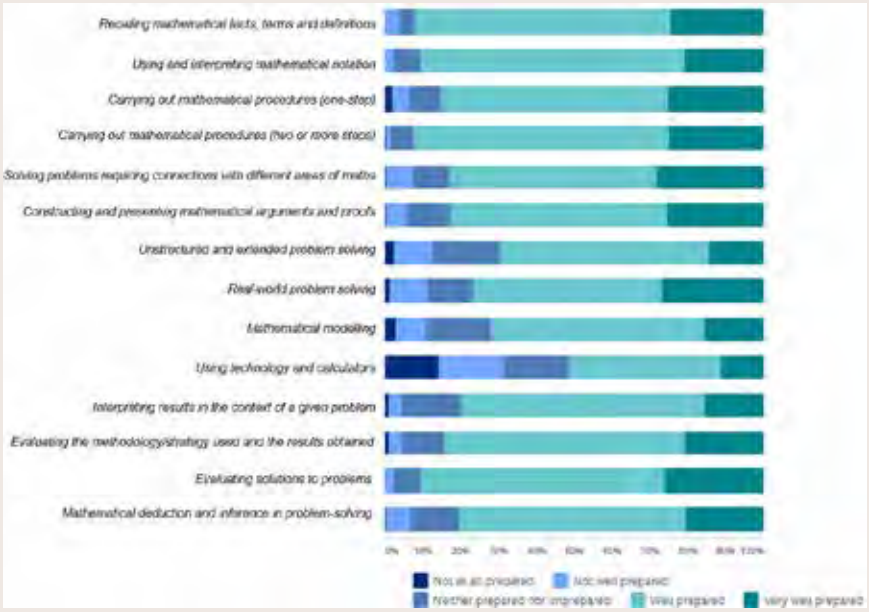
With direct relevance for CBE, 33 student respondents reported that they would like more connection with real life or development of HOTS such as problem-solving or application, but taking into account the number of respondents for this question (360) this is fewer than 0.09% of students and thus cannot be considered representative. It may be, also, that the topics themselves have relevance to real life, but that the student has not been exposed to this directly in the classroom, or that they have not understood

126
Response rate 30%

the connections. It is useful to contrast this finding against the maths teachers who, on average, report that 63% of class time is spent on developing and using practical skills - 18.64% of respondents claim that they spend over 81% of class time on this, whereas at the other end of the spectrum 7.2% say they spend ≤20%.

In a question relating to the use of mathematical skills, mathematics teachers considered that a number of skills were developed through the maths curriculum. Response rate to this question was low, possibly reflecting that it was a more in-depth and lengthier matrix style question, with 214 teachers answering the question.[127] Skills covered related to HOTS areas including problem-solving requiring connection across more than one mathematical area; evaluating a method or strategy used; as well as lower order skills such as recall or one-step mathematical procedures. On the whole, teachers considered students to be well prepared, or very well prepared, though notably more teachers chose 'well prepared' than 'very well prepared' across all areas. The figure below demonstrates these findings in more detail:

Figure 112: The extent to which students are prepared in the following mathematical skill areas by the Standard X curriculum – maths teachers' judgements



Overall, then, it can be seen that teachers largely consider students to be well-prepared across all skill areas, with particular strengths in recall; two or more step mathematical procedures;[128] using and interpreting mathematical notation; and evaluating solutions to problems. Teachers consider students to be less well-prepared in using technology and calculators with just over 51% considering them to be very well, or well, prepared. This may link with the fact that calculators are not allowed in the CBSE Standard X examination.

The above findings indicate that teachers consider some elements with relevance to CBE - skills such as problem-solving, real-world application,

127

Response rate – maths teachers 41%. The question was designed to allow teachers to select more than one response.

128

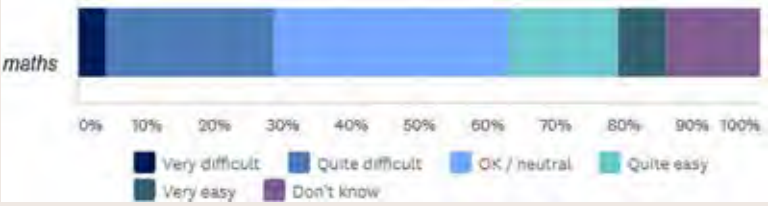
It should be noted as mentioned above in the limitations that 'yes/no' responses may have been ambiguous, and so have been removed from the analysis. Response rate-45%.

interpretation and evaluation - to already form a significant part of the curriculum, learning, and teaching. This indicates a potential degree of readiness in these areas.

Transition

In terms of transition to Standard XI, segmented by those students who moved onto the science stream, students had typically found the transition in maths to be a neutral experience (34.6%), although notably fewer said that it had been easy or very easy - 23.12%, compared to 28.97% who said it had been quite or very difficult. A small number responded that they didn't know, which may reflect the fact that students are still in the early stages of Standard X.

Figure 113: Student opinion on the ease of transition between Standard X and Standard XI maths.

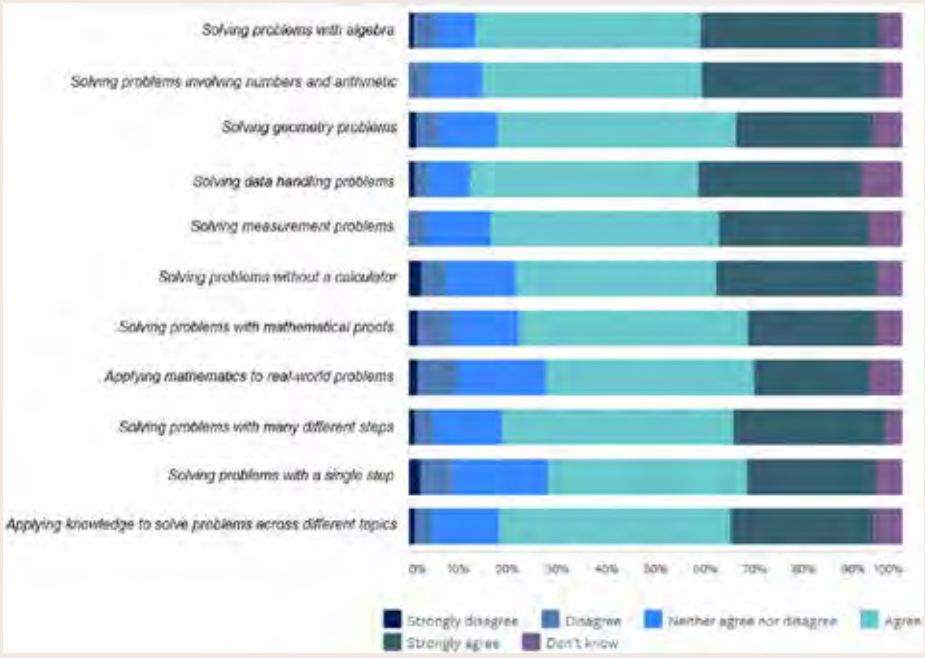


The comment below reflects the typical response of a student- that they were happy with Standard X in general, but did find the transition to Standard XI to be a challenge:

> At over all the contents was good to attend board exam but for class XI it is somewhat difficult to understand at beginning but is manageable.

It is a clear trend that students currently in the science stream felt like they had a solid understanding of Standard X topics to support the transition into Standard XI – most students agreed or strongly agreed with the statement 'Standard X gave me a good foundation to build on this skill for Standard XI' across all skills. The skills that students felt least prepared in were applying mathematics to real world problems (65.25% agreed, or strongly agreed they had a good foundation for this) and solving problems with a single step calculation (66.34%). Stronger skills, with over 80% of students agreeing or strongly agreeing with the statement, were solving problems involving numbers or arithmetic and solving problems with algebra- the latter an interesting comparison with the teachers some of who feel algebra should have more prominence in the curriculum, as noted above.

Figure 114: Students' perceptions of how far they agreed with the statement that Standard X had given them a good foundation for Standard XI across different maths topics



Overall, then, for both teachers and students, there is a perception that the Standard X maths curriculum and teaching allows students to develop some key skills related to mathematics, and, broadly, prepares them well for transition to Standard XI.

Findings per subject – science

A number of interesting findings arose from the science surveys: it should be highlighted, however, fewer teachers responded to the surveys than maths and English. Trends have been noted in the analysis below, but it is important to acknowledge that where a small percentage of teachers responded to a question, this may not be fully representative given the overall response rate.

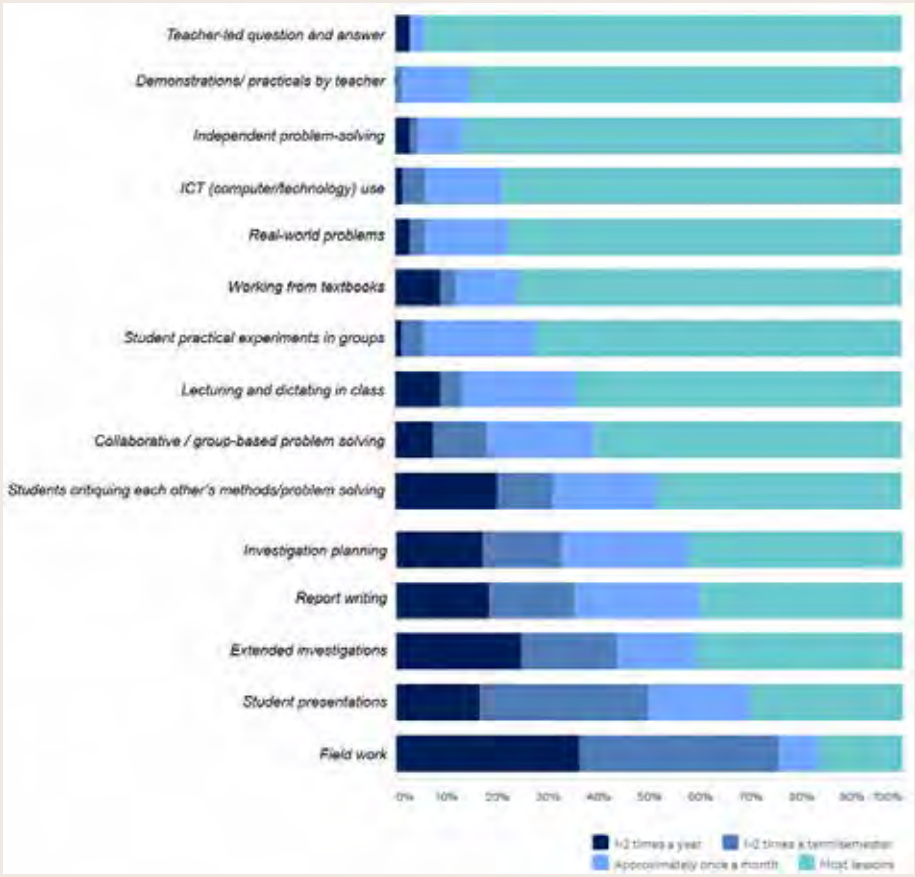
Teaching methods

Science teachers report using a range of techniques and methodologies in class, with use of textbooks, teacher led question and answer techniques, independent problem-solving, practical demonstrations, and solving real world problems reportedly used by over 75% of teachers in most or every class.[129] Less commonly used methods include fieldwork, student presentations, extended investigations and report writing. The reported focus on independent problem-solving and solving real world problems indicates scope for students to develop important scientific competencies, although the reduced focus on extended investigations may reduce opportunity. One anomaly appears, which may be due to language barrier or understanding of what the activity involves either by us or by teachers - it seems unlikely that teachers undertake fieldwork very often, due to the

129
Response rate – 62%

cost and logistics involved: nevertheless, 16.67% of teachers reported that they did it in most or every class.

Figure 115: activities undertaken by science teachers in class, and frequency



Teachers' lessons and planning are informed by a range of factors including learning outcomes – over 70% of teachers use the NCERT and CBSE learning outcomes,[130] with some additionally using in-school or individual teacher learning outcomes. 86.77% teachers found the NCERT learning outcomes to be very, or extremely, useful.[131] In follow-up comments from individual teachers many reiterated how useful the LOs were for directing teaching and measuring progress. Some more varied comments, however, have been included below, which provide a broader picture of the situation:

Since the teacher normally follows CBSE learning outcones which are slightly different from NCERt ones, the NCERT resources are not always relevant or useful.

LllOutcomes of NCERT are very useful for an above average students For extra ordinary students we have to go beside it. otherwise the learning outcomes are catering overall development of a student

My learning outcomes are an extension of NCERT learning outcomes

130
Response rate – 62%

131
Response rate – 62%

The importance placed on LOs by science teachers is further indicated by the indication that 95.59% say that LOs are always included in their lesson plans. This indicates a firm potential foundation for the development of CBE.

Changes to curriculum

As with maths, a large number of students indicated that they saw no need for changes to the science curriculum. However, in contrast to maths, there were some more consistent trends in those who did want to see changes. The majority was linked to a desire for science to incorporate more experiments or practicals, with 15.60% out of a total of 359 respondents to this question raising this.[132] Typical comments are as the below:

> There should be teaching like scientist every topic should be teached by many experimental examples and formulas so that we can implement that learning in our lives so teaching should be in an experimental way.
>
> More and more practical experiments should be held in schools rather than only foccusing on lessons we learn from ncert books.

This can be considered in comparison to the question asking science teachers how much time they spent on developing and using practical skills in the classroom- noting that only 68 teachers responded to this, 38.23% reported to spend less than 50% of classroom time in this way, with the median time being 60%.[133]

Further, the desire for more practicals or experiments was also raised by a number of teachers with 40.22% of the 45 respondents to this question suggesting this as a change.[134]

Some other changes to content were also suggested by a small percentage of students with 2.51% wanting to add something to the curriculum, and 3.65% wishing to reduce it, but patterns on those changes were not statistically significant: suggested additions included more focus on human biology, or on modern scientific theory suggested by one individual. Suggestions for reductions in syllabus also showed no clear trend – for example, two students suggested that the physics content should be reduced, whilst another suggested a reduction of diagrams in biology. A further student suggested that during the pandemic a general reduction in content would be useful. These suggested changes are not representative- as with maths, they are the suggestion of one or two individuals only. Similarly, some teachers suggested some changes such as more focus on data analysis, but whilst as a percentage of respondents this was 6.67% this only reflects the opinion of three individuals.

Real life application, practical skills, and HOTS

As noted above, some students did perceive a gap in the science curriculum between an over-reliance on theory compared to practical skills. For some, this link was particularly made in terms of real-life relevance:

> More practical or real life based questions should be there.

132
Response rate 45%

133
Response rate 62%

134
Response rate 30%

Teachers also flagged this, with 17.17% highlighting a need for the curriculum to have more practical application to real life contexts:

> Application of scientific knowledge which can help them in everyday life situations.

A number of teachers flagged the need for cognitive processes associated with HOTS- one teacher noted that a greater focus was needed on a few areas:

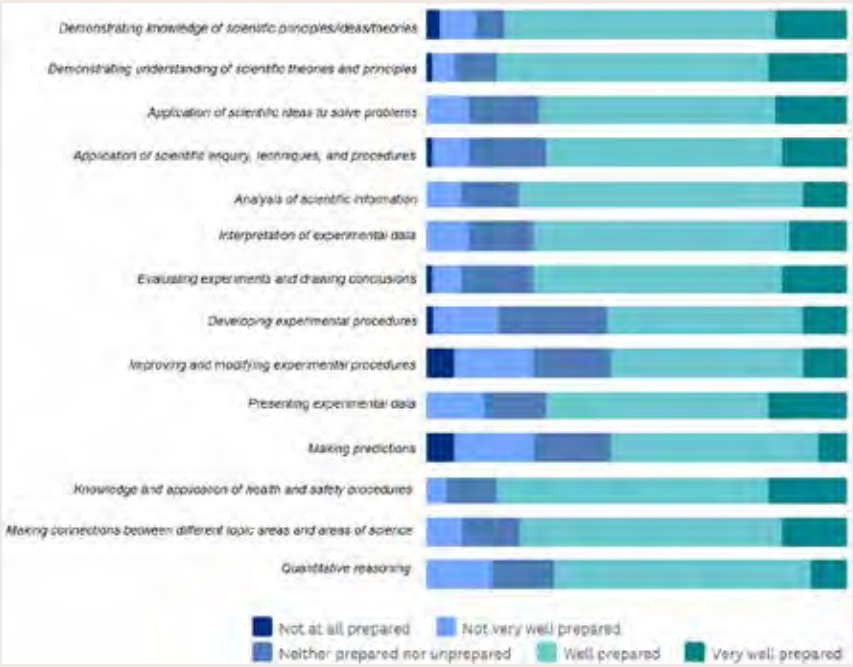
> Interpretation of scientific data and developing experimental procedures and making predictions. If we reach greater depth of a concept students will learn the fundamentals behind design of an experiment and then only they will be able to predict the outcome of an experiment.

Other cognitive processes such as critical thinking, logical deduction, analysis, and inquiry-based learning were indicated as being important by a minority of teachers and currently not given enough emphasis in the curriculum.

Nevertheless, in terms of scientific skills, most teachers considered students to be well prepared in the majority of areas,[135] with over 80% of teachers responding that students were either well prepared or very well prepared in the skills of demonstrating knowledge and understanding of scientific theories and principles, and knowledge and application of health and safety procedures. It is notable, however, that some of the skills more typically associated with HOTS teachers considered students to be less well prepared for – 55.93% of teachers felt that students were prepared for improving and modifying experimental procedures, with only a slightly higher percentage (56.90%) considering students to be prepared for developing experimental procedures- these findings indicate some correlation with the earlier comments from both students and teachers which suggest a perceived need for greater practical or experimental emphasis. Teachers perhaps surprisingly found students to be better prepared in the ability to evaluate experiments and draw conclusions; it may be that this was interpreted in the context of discussing a whole-class teacher-led demonstration rather than carrying out an experiment.

135
Response rate – 54%

Figure 116: Teachers' perceptions of the degree to which students are prepared in the following skills areas



Students were also considered to be less prepared in the ability to make predictions- another HOTS.

Transition

Students studying the science stream found the transition from Standard X to Standard XI in science more difficult than for maths, with over 47.38% finding it quite or very difficult.[136]

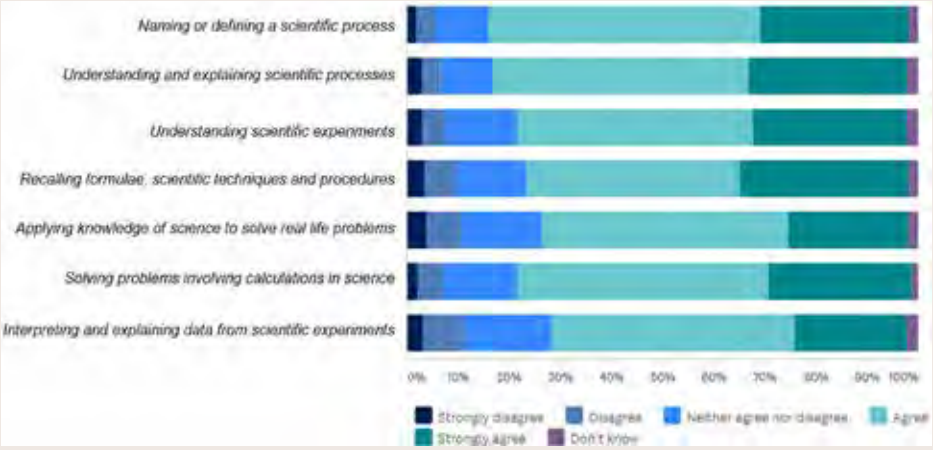
Figure 117: Student opinion on the ease of transition between Standard X and Standard XI science

Nevertheless, the majority agreed or strongly agreed that what they had studied in Standard X had provided a good foundation for Standard XI. There is a loose correlation with what teachers stated around students' level of preparedness, with students also feeling most prepared in naming and defining or understanding a scientific process (82.35%), and less prepared in interpreting and explaining data- noting, however, that 66.51% of students still agreed or strongly agreed that they had a good foundation in this to build on for Standard XI.[137]

136
Response rate 75%
137
Response rate 61%

Figure 118: Students' perceptions of how far they agreed with the statement that Standard X had given them a good foundation for Standard XI across different science topics

138
Response rate – 30%

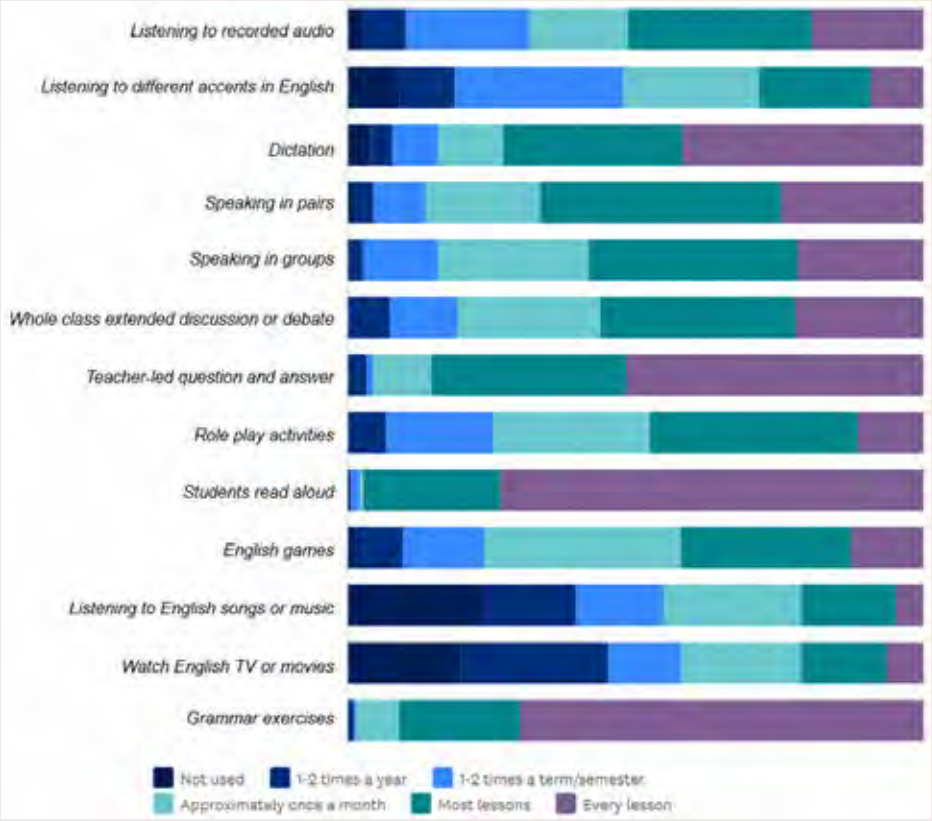


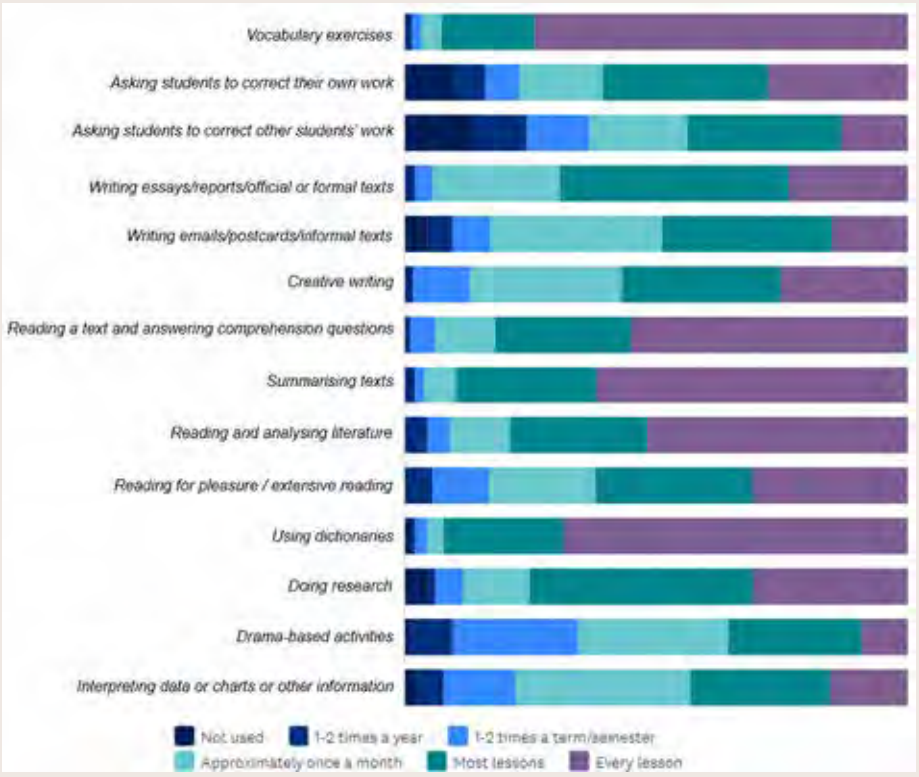
Findings per subject – English

Teaching methods

Teachers report using a range of classroom techniques and methodologies in teaching English. The table below indicates the strategies and frequencies of use:

Figure 119: English classroom techniques and strategies, and frequencies of use





As can be seen, some of the most commonly used teaching approaches include students reading aloud; vocabulary exercises; using dictionaries; and grammar exercises. Less emphasis is placed on listening to English songs or music; drama-based activities (excluding role plays); and English games. Two key activities which might support a more communicative classroom are used, but less frequently – speaking in pairs and groups, and holding extended class discussion, with 13.64% of teachers using paired speaking, and 15.91% using group speaking activities fewer than 1-2 times a semester. Broadly speaking, responses indicate that the classroom is primarily focused on grammar, vocabulary, literature and writing activities, with a lesser focus on speaking and listening.

Changes to curriculum

354 students responded to a question focused on any curriculum changes they would like to see in English with over 90% not specifying any changes.[139] For those that did, a large range of changes were proposed, but for many of these it was the view of 5 or fewer students and generally no clear trends were found across most of these responses with the exception of a higher, but still minor, concentration of students who wanted to see changes around grammar (7.34%), literature (5.65%), speaking (4.80%), and writing (3.95%)- noting that in some cases students considered these to be positive elements of the curriculum and in other cases negative. Typical comments across these areas have been added below:

139
Response rate 38%

more of writing and grammar as compared to literature. since, if i talk about literature there are like 23 chapters and about 10 poems which is i think too much because teachers try to cover the literature section first and in the end we don't get much time to cope up with grammar and writing aspect. so if the number of chapters could be reduced it would be of great help.

the protions on ASL, writing, grammar and vocabulary can be improved and literature can be reduced

Grammar part to be taught in detail

Literature to be taken from more classics around the world with varying diversity , most of my friends agree that we have much more potential for learning far more complex stories and poems compared to what we had in our books, more stories about important life lessons and deeper meanings would be a blessing

Stories that teaches values and lessons and also help us increase our vocabulary

better stories at some point you cant define whether you are studying English or social science

Not only studying English but talking in English would also be useful

Speaking skill and group discussion

Shld involve more emphasis on speaking skills and grammar for effective communication

Need good teachers who are so good in speaking skills too, so that students could gain more ideas and improve their skills

More topics should be included which can improve our writing skills

Focus of speaking skills also, we are just trained to write English only on papers which is of no use

In teachers' surveys, too, only limited trends could be discerned. For example, only 14 teachers stated that wanted to see more HOTS in the curriculum (11.75%), 9 wanted to see more speaking, 8 wanted to see more listening, and 10 wanted to see more extensive reading.[140]
Overall, there is no clear picture of any one specific change that the two demographics would like to see, with the vast number not specifying any changes.

Competences

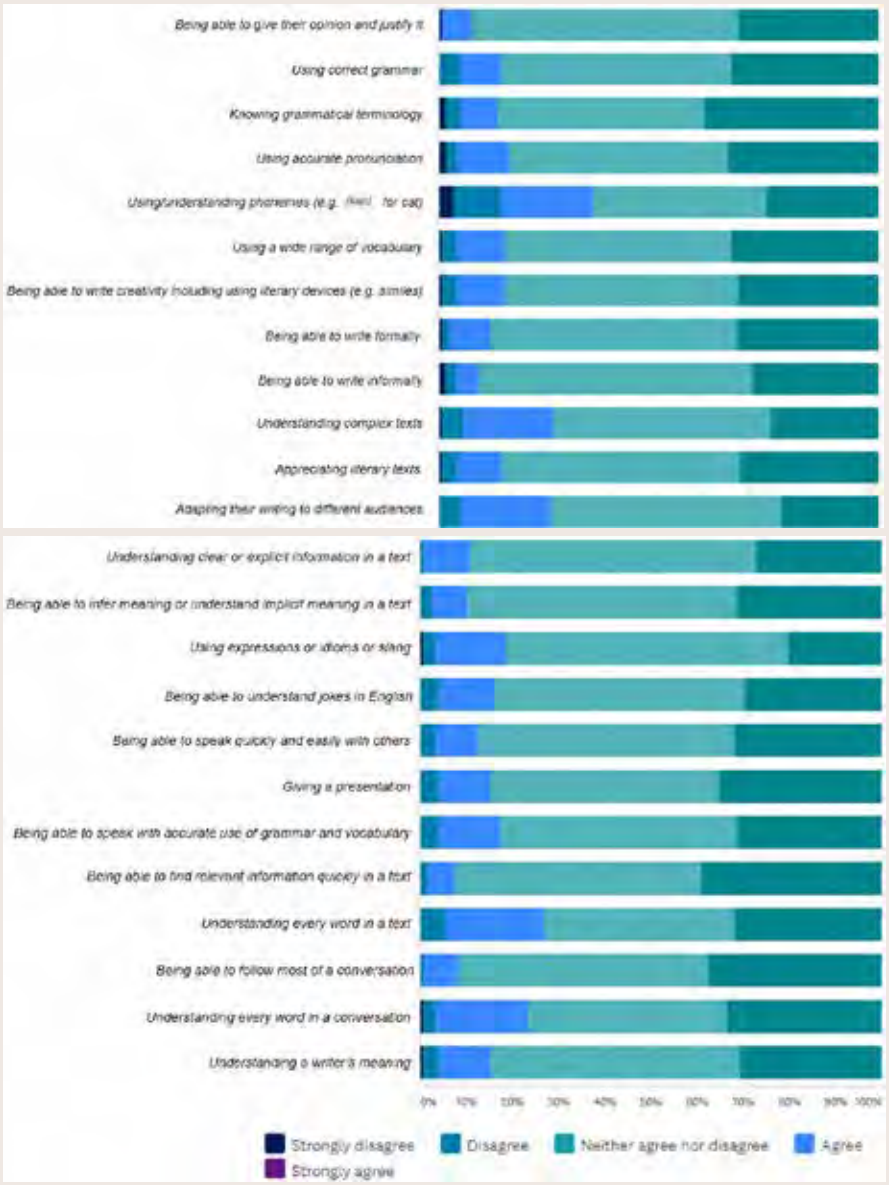
As noted throughout this report, competency-based language acquisition is encapsulated well in the CEFR. These are outlined in descriptors which cover the subskills and competencies which are a part of overall language acquisition. Some of these competences relate to technical use of language (e.g. accurate grammar/correct use of vocabulary), but other areas such as use of the correct tone of language in different social situations, or being able to express opinions are also key areas- this is outlined in more detail in appendix 4.

As a result, questions in the survey were designed around understanding the extent to which some of these competences were already in place in the Standard X classroom and assessment to better understand readiness

140
Response rate – 40%

for CBE implementation. English teachers' responses indicated that the majority of teachers felt that the Standard X curriculum prepared students well across key competences:[141]

Figure 120: English teachers' agreement with the statement 'Standard X develops this skill/competency well.'



Use of phonemes, adapting writing to different audiences, and understanding of complex texts were considered to be areas where students were less well developed, but in these the majority of teachers still agreed or strongly agreed that the Standard X curriculum develops these competences well. Being able to give an opinion and justify it, understanding clear or explicit meaning in a text, finding relevant information in a text, and being able to write informally were considered to be the strongest competences, with more than 90% of teachers agreeing or strongly agreeing that the Standard X curriculum develops these competences well.

141
Response rate 41%

Students typically did not focus heavily on competences, more on specific content, such as a text or specific grammar items as noted above in the section on changes, but a number of comments shine some light on competency use in the English classroom:

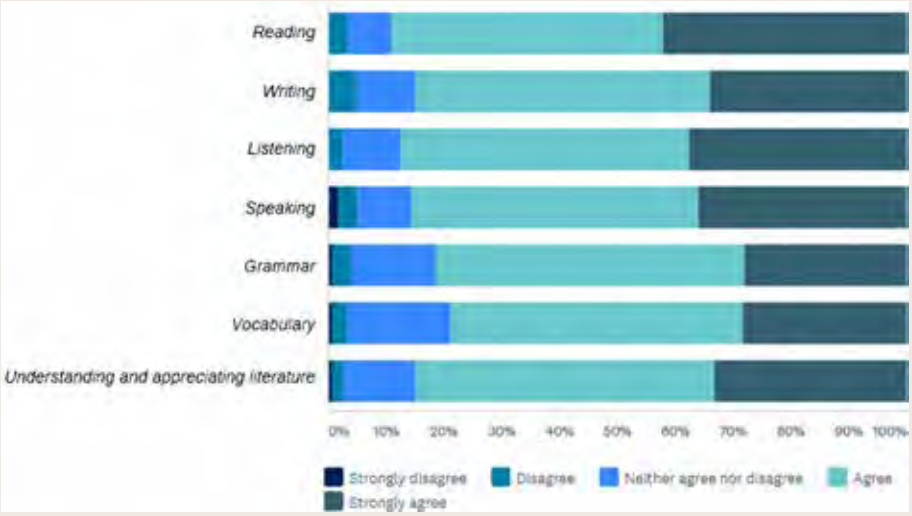
There should be teaching of creativity in each lesson

I would like to suggest that there should be more high depth and high vocabulary texts as shifting from 10th to 11th was like a huge change in the amount of depthness of the text

Progression to Standard XI

Across all skill areas, the majority of teachers considered students to be prepared in Standard X for the transition to Standard XI, with over 80% agreeing this was true across all areas except vocabulary, which was slightly lower, at 78.63% - nevertheless a clear majority.

Figure 121: Teachers' perspectives on the extent to which students are prepared in Standard X in the following skill areas for transition to Standard XI[142]



Some teachers provided follow-up comments which provide more insight:

Appreciation of literature largely depends on the teacher. The curriculum is good, but the knowledge expected at the end of the lesson is very basic and does not require the teacher to go into any depth or nuance

Yes, I strongly agree that students get well prepared in basic skills required for progression onto standard xi

They do not have a good command over language due to lack of exposure at home (no newspaper, magazines etc.)

CBSE X syllabus gives adequate exposure to students in all the above skills, that progression to XI std is easy.

142
Response rate – 41%

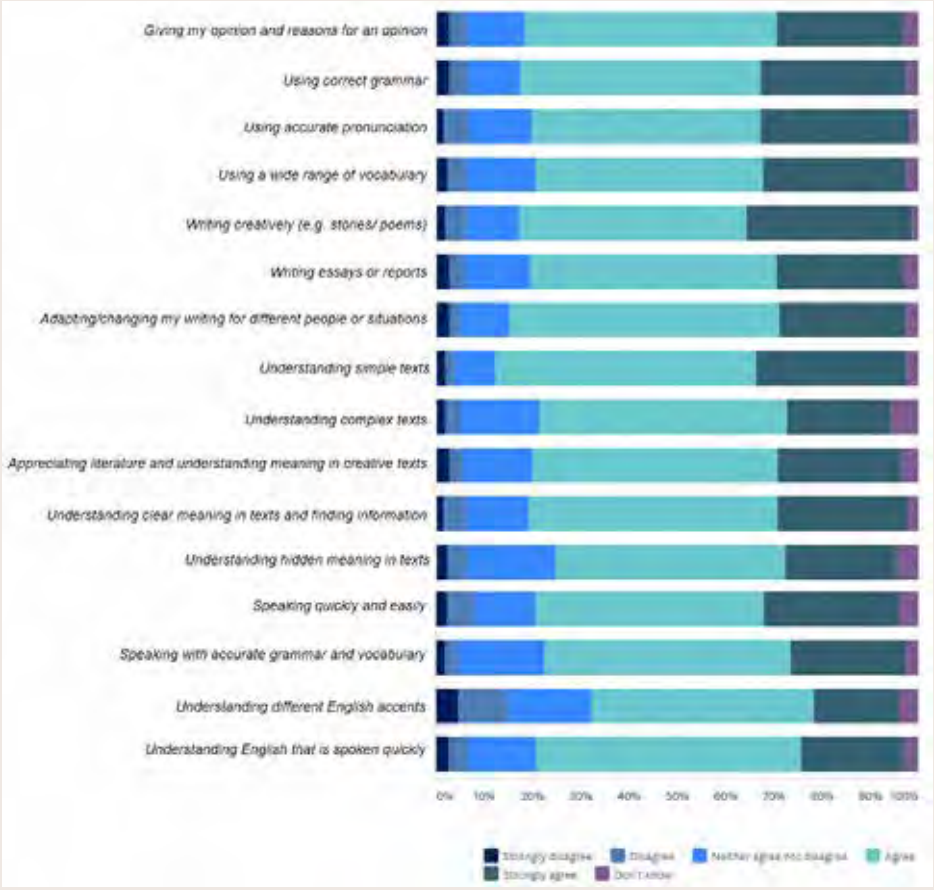
143
Response rate – 75%

Overall, there were mixed findings on how easy students found the transition from Standard X to Standard XI in English – as the figure below indicates, a number of students found it 'ok/neutral' (35.51%) with 50.47% finding it either quite or very easy. In contrast to maths and science, very few students found it very difficult:[143]

Figure 122: Student perceptions of how easy the transition from Standard X to Standard XI English was

When segmented by stream to include students who had continued with English, the following results were found in relation to whether students felt well prepared in different skill or competency areas in Standard X for progression to Standard XI:

Figure 123: Student responses to the statement 'Standard X gave me a good foundation to build on this skill for Standard XI.'[144]



144
Response rate 41%

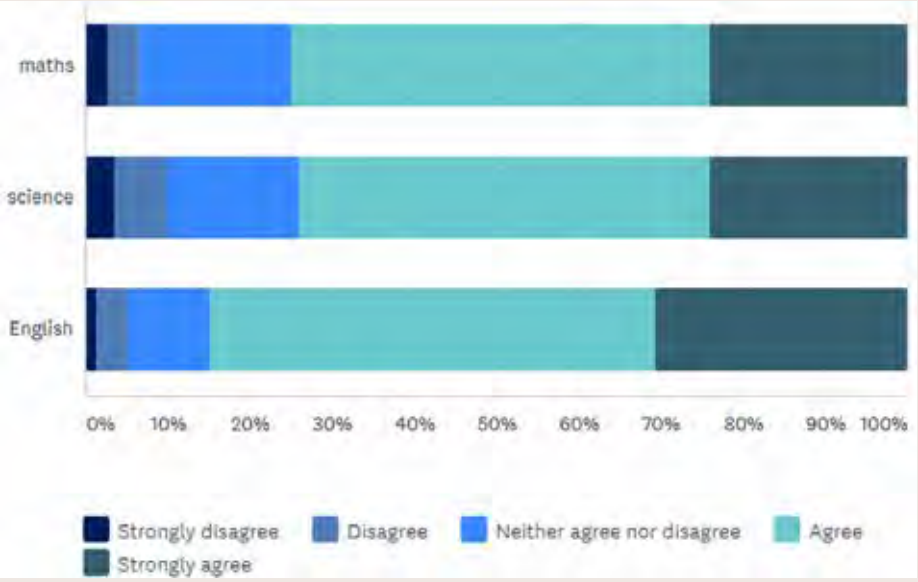
From both teachers and students, then, there is a strong feeling that Standard X prepares students well for Standard XI in English.

The current situation in CBSE assessment

All demographic groups were asked a number of questions around assessment in maths, science, and English, including how easy students had found the Standard X examinations, which resources were used to support revision, similarities between examinations and practice materials, the links between syllabus content and what was assessed, the degree of ease of questions, what their views on the grading system were and the use of internal assessment.

Of note is the relative degree of similarity found in results across all three subjects: differences exist but they are not strongly expressed. For example, the figure below reflects the extent to which students felt that the examinations aligned to what they had been taught in class – as can be seen, minor differences can be seen between the three subjects, but there are some overall consistent trends:[145]

Figure 124: Agreement with the statement that 'my Standard X exam tested the content and skills I studied in my lessons.'

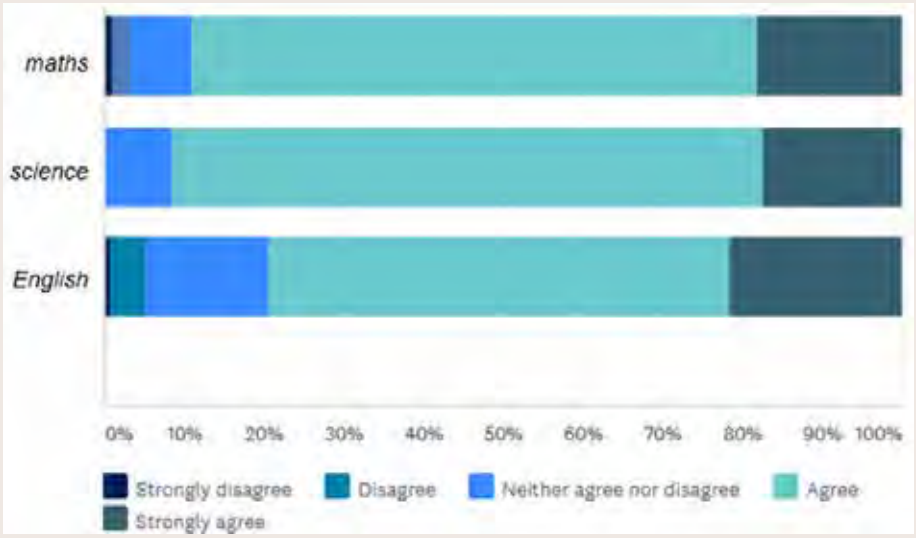


From this figure, we can see that most students across all three subjects consider this to be true (e.g. they agree or strongly agree). Findings for maths and science are very similar - for English more students agreed with the statement (84.82%). These findings indicate that there was a strong perceived correlation between curriculum content and examinations.

To provide a point of comparison between demographic groups, teachers were asked whether they felt that the examinations had tested the content and achievement of skills specified in the syllabus. Findings were similar:

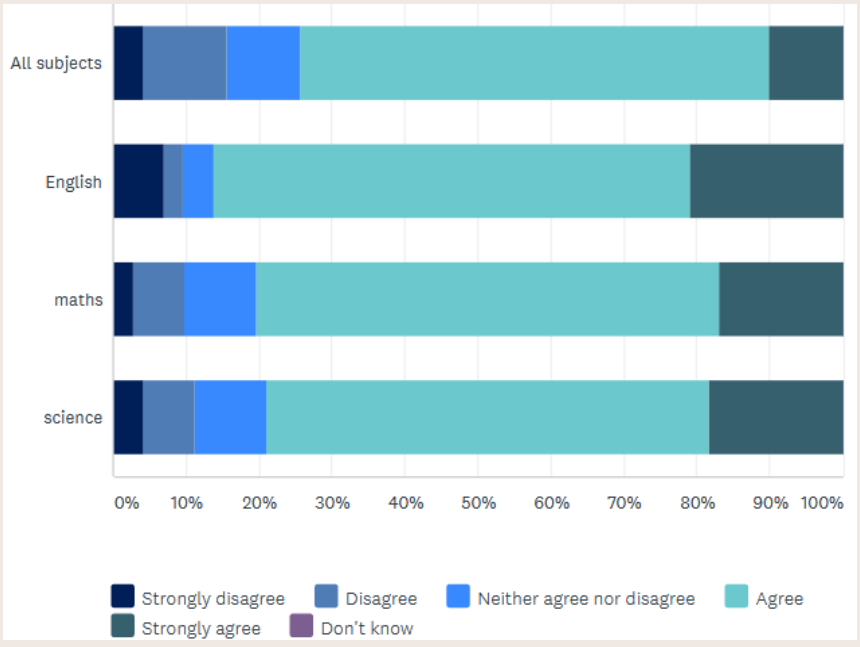
145
Response rate – 65%

Figure 125: Teachers' perception on the statement 'The CBSE (subject) exam assesses students' understanding of the content and achievement of skills specified in the syllabus.'[146]



Management staff were also asked their thoughts on this topic to get an overview of perceptions of the examinations, and were asked the extent to which they agreed with the statement that 'Standard X examinations provide sufficient opportunity for students to demonstrate their skills and knowledge.' Perceptions of this can be seen in the figure below:

Figure 126: Management staff levels of agreement on the statement 'Standard X examinations provide sufficient opportunity for students to demonstrate their skills and knowledge.'[147]



146 Response rate maths – 35%; science teachers - 53%; English teachers – 40%

147 Response rate – 38%

As the figure demonstrates, there is a strong degree of agreement across all subjects with over 75% of school management staff agreeing (agreeing or strongly agreeing) with the statement- with English being the subject which staff most strongly agreed on.

Nevertheless, some criticisms were made, as indicated in some of the comments below:

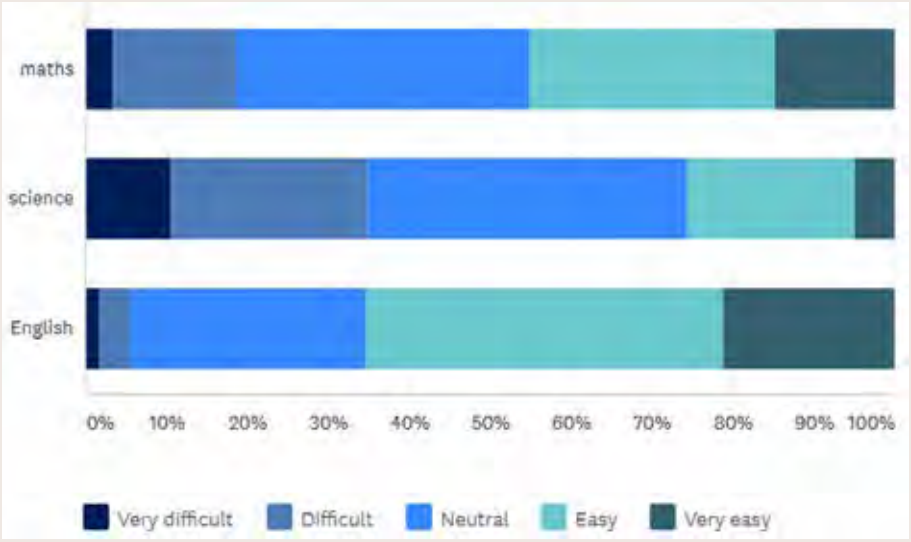
The testing mechanism needs to improve to focus on real learning and understanding and not just rote. More work needs to be done in this area. That is why children who do well in 10 sometimes fail in 11.

Exams are a test of memory rather than skill alone but it does help know the extent of knowledge gained

Across the three levels of demographic groups – students, teachers, and management staff – all groups see a reflection of the skills and knowledge that have been developed through the curriculum in the design of the examination questions.

There are clear differences, however, in how students perceive the difficulty of the different subject examinations as indicated in the figure below:

Figure 127: Student response to a question asking how easy they had found the examinations in each subject[148]



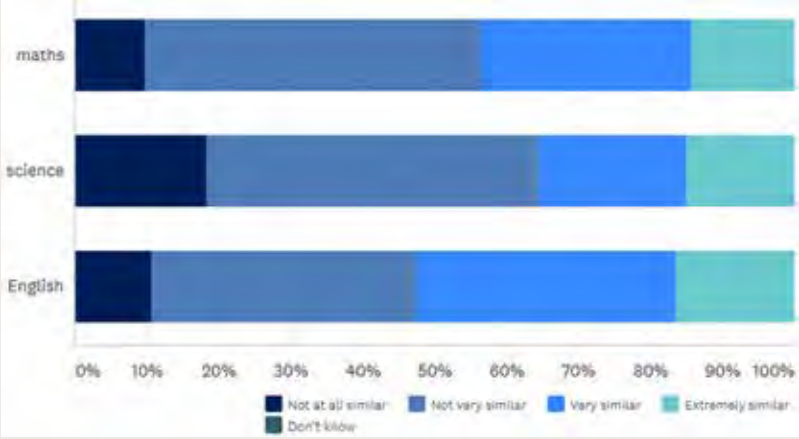
65.33% of students had found English 'easy' or 'very easy'- just under two thirds of all respondents to this question. In contrast, 44.95% of students found the maths examination easy ('easy' or 'very easy'), and 22.55% had found the science examination easy. Science had a notably larger percentage of students who had found the examination difficult or very difficult (35.03%) compared with maths (18.69%) and English – significantly lower at 5.33%. This particular question was answered by 600 students. Part of the reason for this finding might be found in the response to the next few questions, which focused on similarity between the exam paper and the previous sample paper questions (SQPs), the NCERT textbook, and past papers:

148
Response rate – 65%

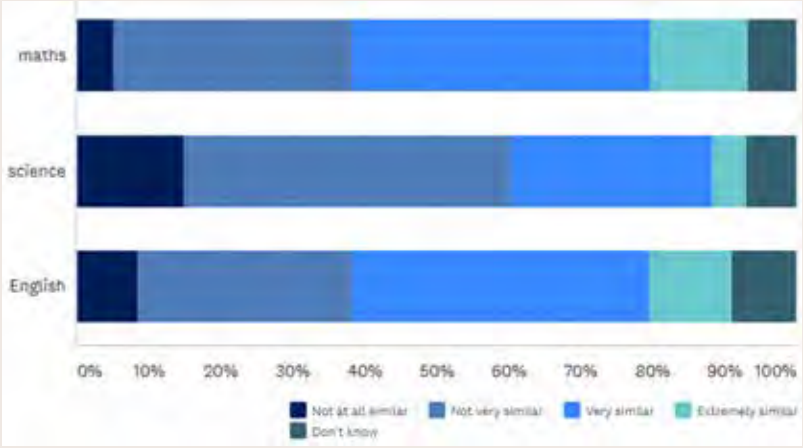
and the previous sample paper questions (SQPs), the NCERT textbook, and past papers:

Figure 128: Student perceptions of similarity between the examinations, and previous questions encountered[149]

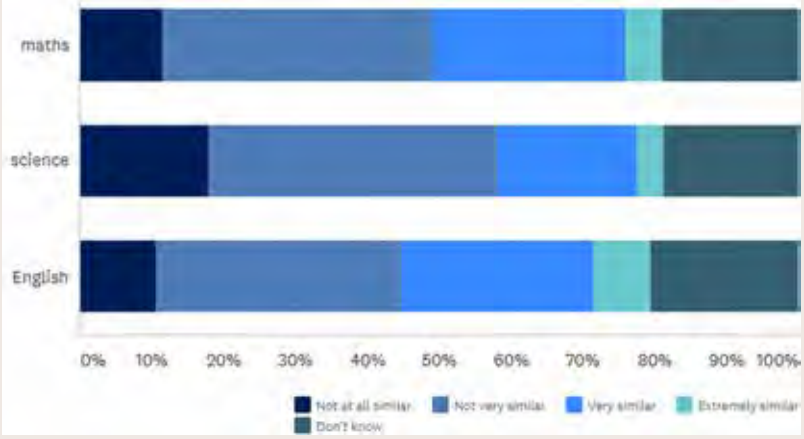
Sample Question Papers (SQPs)



NCERT textbook questions



Past examination papers



149
Response rate – 65%

Across all three questions, science emerges as the least similar- perhaps indicating a correlation between perceived ease of the examination, and the predictability of the examination. The focus on resources used to prepare for examinations as noted by all stakeholder groups seem to indicate that these past questions play a fundamental role in examination preparation – across all demographic groups, the top three resources used to support preparation for examinations were the NCERT textbook, SQPs, and past paper examinations.

These findings are worth keeping in mind- as CBSE develops CBE approaches, examination papers are increasingly likely to diverge from sample question papers, not in terms of structure ('pattern') necessarily, but in terms of predictability as students will need to demonstrate a wider range of cognitive processes. This may cause some challenges and potential resistance by teachers and staff who use these past questions as a foundation to examination preparation.

Students and teachers cited a number of areas in which they would like to see changes to assessment; these are explored below by subject:

Maths

For maths, 7.93% of students wanted to see more questions related to real-life situations, and 5.88% discussed the difficulty of the exam, but this was split between a number who commented that the examination was too easy, and others too difficult. The quotes below provide an insight into some of the views held:

Raising the level of questions helping the students in their 11 class

I would like to suggest that cbse should include more tricky questions as our board exam had simple questions.

Most of the questions were similar o that of question in book. So still they can harden the aptitude of question paper as at as the standards of CBSE were concerned.

The exam was ok . But it was little bit difficult for me . The exam should be set in a way that all the students can attempt it easily .

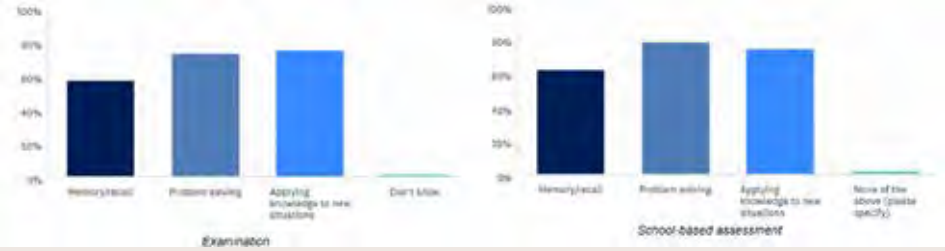
level of the paper should be easy to difficult.

Marking should not be much strict, and not so tricky questions be there

No consistent trends were found in improvements that maths teachers wanted to see, with fewer than 15 teachers agreeing on a specific change. Maths teachers were asked how well they thought some mathematic skills were covered in the examination. 17.34% considered that problem solving was covered well, and 12.14% reported that mathematical application was well-covered. A smaller number considered that HOTS (6.94%) and real-life questions (6.36%) were covered well.

Teachers were asked how well they felt that the following skills were tested within the examination and school assessment:

Figure 129: Teachers' perceptions of the coverage of skills within the Standard X examination and school-based assessment[150]



A significant number believe that applying knowledge to new situations is a key part of the examination, but all teachers considered all three skills to be covered. Problem-solving was considered to be a greater component of the school-based assessment but, given variations due to school autonomy in internal assessment, it is less easy to understand how representative this is as a whole. Across both assessment parts, however, the skills are evidently considered to be an important part. The majority of teachers (74.88%) agreed, or strongly agreed, that the assessment tested students' ability to apply their knowledge to real-life situations, although a small number also considered this to be a gap in the assessment:

More of real life situations and real life mathematics needs to be included so as to develop critical thinking skills

Students should be exposed more to practical data handling and formula application as this will enhance their life better.

Science

Just over 10% of science students (39 individuals)[151] wanted to see changes to the assessment in terms of the use of real life or practical application, with the selected comments below typical of the general responses:

more practical rather than bookish

More daily-life based questions.

More life relevant

Science Questions need to be more related to our everyday life and every question needs to relate with it

I think they need to include some real life questions

Learning in a more practical way

150 Response rate – 65%

151 Response rate – 65%

Other changes suggested also indicate a similar appetite for HOTS – although only raised by 4.18% of respondents:

> More questions which can only be answered by applying what we learnt could be nice also less theory would do some good
>
> Skill and thinking based questions were useful
>
> Application based questions like the cheetah question was tricky, that really tests our understanding capacity. This makes us Apply the knowledge of science in everything we see, and makes us learn more

Science teachers showed little agreement regarding changes they would like to see, with 12 teachers flagging experiments or practicals,[152] more analysis by 6 teachers, and all other comments raised by fewer than 5 teachers.

English

With regard to the assessment of English, a minority of students discussed grammar- most of these wanted an increase in this, whilst others were strongly of the opinion that grammar should be reduced. Nevertheless, the references in some of these comments indicate that, despite the focus of the question, most students had the overall curriculum in mind, rather than the exam specifically. The situation was similar with writing, although some students referenced exam questions:

> General things should be specified more and writing part should be easy
>
> writing section should contain more marks
>
> Comprehensive part and written part should be of more wieghtage because now in +1 +2 these are kinda important

Other changes were mentioned, but by fewer than 5% of the students. A small minority of students referenced speaking (3 students) and none referenced listening, so no clear trend in thought regarding the absence of these skills in the examination can be seen. Teachers wanted to see more writing (11.39%) – and 23 teachers stated that they specifically wanted to see more creative writing, (14.56%)[153] with 8.85% suggesting there should be more grammar.

Given that schools have a degree of freedom in conducting internal assessment, it was important to understand support given to teachers by school management teams and monitoring and standardisation practices. 78 school management staff responded to this question, all of whom stated that some form or multiple forms of support were given:[154]

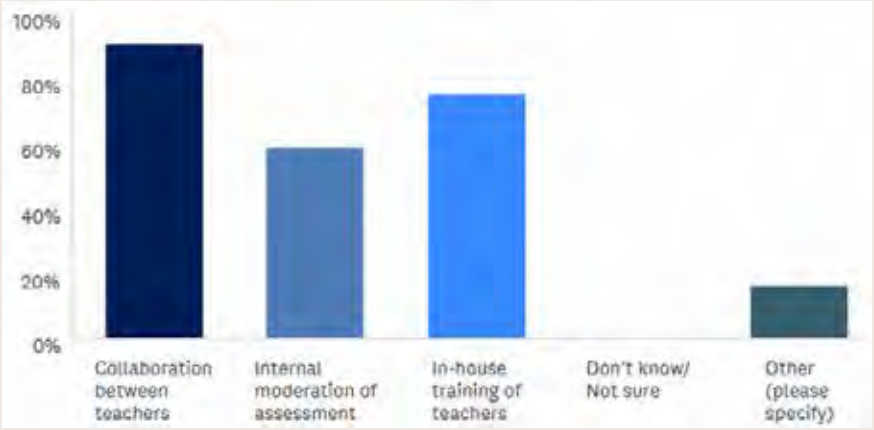
152
Response rate – 44%

153
Response rate – 40%

154
Response rate – 40%

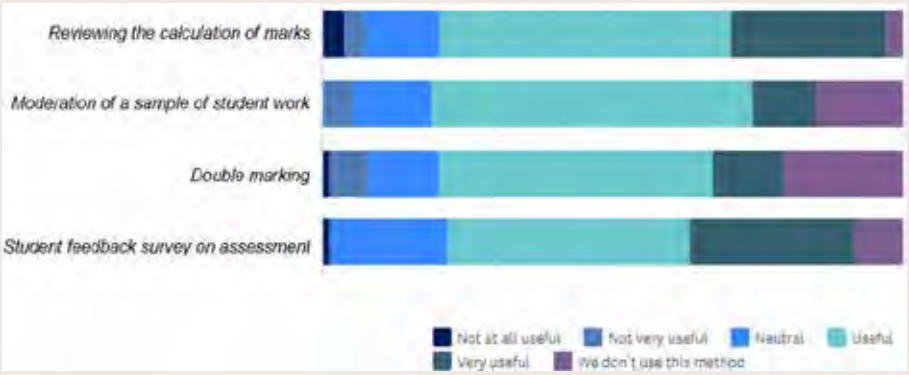
155
Response rate – 40%

Figure 130: Forms of support given to teachers to carry out internal assessment



It is clear that support is in place for teachers in all schools; moreover, school management teams in all schools claimed to do some form of internal monitoring, as indicated in the figure below:[155]

Figure 131: Methods used and perceived value of internal moderation of assessment



The numbers of respondents who stated that they don't use these methods – with double marking as the least used (20.27% schools don't use this) - may present a barrier to ensuring valid assessment at Standard X. One member of the management staff did note, however, this his/her school used an external third-party audit, so it is clear that the picture is not consistent across all schools in terms of monitoring the use of internal assessment. Given the weighting of internal assessment within the Standard X, CBSE may wish to consider how to ensure that internal assessment provides equal opportunity across all subjects for all students, irrespective of school type, through established standardisation, moderation, and quality assurance processes.

School management were also asked for their views on the grading process, and whether they saw the grades achieved as representative of students' abilities: 74 school management staff responded,[156] with the majority (58.11%) agreeing that it was reflective of students' abilities, with 18.92%

156
Response rate – 65%

disagreeing, or strongly disagreeing. Some of the critical comments are reproduced below:

The grading system does not necessarily test the students' abilities as the examination is not totally application or skill based

complete academic year should not be based on 5 days of board exam

Neither students nor parents teachers know where the student stands exactly

Not completely. We need to move into a Holistic Progress Card with development milestones

Competency-based approaches

School management were asked questions around the inherent challenges of using competency-based approaches. Response rates were low (32%- 63 respondents) but some trends could be observed – a number of respondents raised the issue of teacher training or capacity (26.98%) and the second biggest issue raised reflected issues with differentiation (15.87%) noting, for example, that not all students would be able to answer competency-based questions, or that economic situations may mean less support for some. Although these trends are not strong, particularly given the low response rate, these two areas of teacher capacity and differentiation may pose some barriers for CBSE's integration of competency-based education; although differentiation may be a perceived barrier that can be resolved with teacher training. Nevertheless, over 60.32% of respondents to the question believed that introducing or further developing competency-based education would be beneficial across all subjects, with one respondent stating that they were 'excited for these new radical changes,' indicating clear appetite for CBE.

Overall, across all three subjects, perceptions of the Standard X curriculum, teaching, learning and assessment were largely positive. Many of the changes cited were shared only by a minority of respondents. Of particular note is the general consensus between different stakeholder groups.

Appendix 8 – Interview Findings

As a follow up to the second site visit proposed and cancelled due to COVID-19, CBSE requested a number of 1-2-1 interviews to be held with key stakeholders as a source of qualitative data to support the surveys targeted at a wider sample.

Interviews were conducted over Zoom, with most lasting approx. 30 minutes. Those who conducted the interviews had a linguistic background in order to support any potential language misunderstandings. The sample is indicated in the table below:

Table 54: Sample for interviews

Stakeholder Group	Number
Students	**5**
Maths teachers	**5**
Science teachers	**5**
English teachers	**5**
Principals	**5**

Limitations

Interviews were generally conducted successfully, with participants engaging with all questions with few obvious language barriers, and respondents able to expand on points either naturally or with follow-up prompts. One potential limitation was that in some cases it became evident that other people were in the room- for example in one student interview, a teacher was seen in the background. This may cause the student to be more cautious in their responses. This is also a challenge of the interview format in general as opposed to the anonymity of a survey, although in line with data ethics all respondents were reassured that their responses would remain confidential at the beginning of the interview and had the option of not participating- noting that there may have been internal pressure to do so given institutional hierarchies, or that participants may have been chosen on the basis that they would present a positive view. An overall limitation, typical of interview data, is that it may be less representative reflecting the views of a smaller number of people.

Findings – Maths

General reflections on Standard X maths indicated that it was viewed positively by all stakeholder groups, due to its focus on learning such as including experiential learning, activity-based approaches, and fostering of interdisciplinary connections (stated by three teachers, two school management) use of practical work (three students) and that it allowed students to develop real-life skills (four teachers, two students):

> "[there are]...regular opportunities to connect to everyday life situations. Some topics such as trigonometry particularly relevant to solving real world problems, for example calculating heights and elevations. Practical mathematical labs provide opportunities for real-world problem solving. Basic Maths focuses more on applied maths in real life situations" (Maths teacher).

Two teachers stated that Basic Maths was particularly useful in this respect, focusing on applied maths in real life situations (two maths teachers). Some interviewees wanted to see more real-life application or practical work (two maths teachers, three students, one school management) and another suggested more integration of problem-solving (maths teacher), although all maths teachers stated that they already used these approaches:

> "Problems are set for student to solve; students are expected to justify their solutions – they are encouraged to learn at their own pace" (Maths teacher).

Four maths teachers noted that they used inquiry-based approaches including case studies and projects, with some stating that it can be challenging in classes with large numbers of students. Notwithstanding the larger number of students, all maths teachers stated that they used collaborative learning methods, and three students said that they enjoyed this.

> "Group and pair work are encouraged, particularly in the project work activities which form part of the internal assessment" (Maths teacher)

Teachers typically prepared students for assessment using the textbooks, SQPs and quizzes, with students stating the same resources and that they had found the preparation very useful (five students) and as a result had found the examination easy, with one stating that students who hadn't prepared found it more difficult (one student). Two maths teachers noted that in more recent exams the questions had become less predictable, which they viewed as a positive change. Overall, the exam was viewed positively:

"The assessment is a positive – comprehensive allowing for all areas to be tested, also incorporates PISA style questions, problem solving. Well-designed exam, rate it 9/10. Internal assessment particularly beneficial but I think that the board exam should only be 40-60% of the marks. The Basic Maths is positive, providing less able students the opportunity to access mathematics but is not differentiated as well as it could be. The questions have become less predictable with questions included from outside the NCERT syllabus so yes application in new situations is assessed." (Maths teacher).

Some suggestions for improvement to the assessment were made – typically these individual improvements were only mentioned by one interviewee, although a number felt there should be more weighting to internal assessment (three maths teachers, one student).

Some complexities in the transition to Standard XI were discussed with some noting a big jump between X and XI (two maths teachers, four school management):

Maths is the one [subject] which has 'casualties' – biggest jump." (School management).

Science

Teachers agreed that the science syllabus developed real-life and practical skills (five teachers):

"More practical content has been added, including guidance on how to set up practical, calibrate instruments etc. The syllabus also includes activities in Standard X as well as projects that can be completed by students in small groups or individually. A fair amount, although when pressed it appears that most work is the teachers giving demonstrations. Sometimes practicals take place in small groups although individual practical work is difficult due to large class sizes. Students are encouraged to plan and analyse, taking into account "human errors". Some mathematical work is also included, although calculators not used" (Science teacher).

Teachers stated that they used practice-based questions, real-life examples, and tried to make connections between different science disciplines through case studies and projects (four teachers).

A number of teachers stated that they went beyond the curriculum using additional materials or approaches (four teachers), including field trips and experiments. Nevertheless, science teachers were generally positive about the curriculum and syllabus, and could clearly see relevance to daily life (three teachers)- also mentioned very positively by one student:

"Curriculum is very easy, class 9 was difficult but 10 was easy; knows the real-life applications of chapters in textbooks for class 10 e.g. cooking is chemical reactions, lights using electricity. Just amazing. Nothing didn't enjoy! Every chapter is interesting. Learning in labs, using practicals means to demonstrate concepts. Composed lab = class 5-8, shared lab. 20 labs for class 10 for experiential learning." (One student).

However, some teachers and students wanted to see more focus on practicals including experiential learning and competency-based approaches (three teachers, two students), and more interdisciplinary links, with some students highlighting that lessons could be too theory-based and requiring memorisation (three students), and one teacher noting that these needed to be combined better. Issues with differentiation were raised by teachers, with some saying that basic science should be an option, and others wanting to see more extension (three teachers).

Teachers and students both used textbooks and past papers and teachers' demonstrations to prepare for the examination, with one student additionally stating that they used YouTube. The examination was viewed positively by some science teachers who thought it reflected both theoretical and practical skills (three teachers), although others disagreed stating that there was no real assessment of practical skills (two

teachers) and that this should be a change:

"Sometimes exams are helpful testing curriculum knowledge. Students are not assessed in their practical skills and the final assessment is not based on their practical skills. There is practical assessment, but it should be increased to help students. In CBSE assessment 80% assesses students' knowledge of science and not the practical skills" (One teacher).

A number of suggestions were made for improvement of the CBSE Standard X assessment. Four teachers wanted to see more practical assessment and critical thinking:

More MCQs would be beneficial, increased number of HOTS – paper needs to be brought more in line with format of entrance exams which emphasise these types of questions. (One teacher).

It is important to increase conceptual knowledge based and competency-based approaches and this should be implemented more to help students learning and knowledge development. (One teacher).

There was a degree of consensus over the challenges associated with the transition from Standard X to Standard XI science across all interviewed groups (three teachers, three students, four school management), with one teacher estimating that 90% of students found it difficult.

The transition was drastic. Standard 10 was more practical based (physics and chemistry). Standard 11 involved more theory and more application of mathematical (One student).

English

English teachers, school management, and students were asked questions to understand their views on the curriculum and syllabus and assessment for Standard X English, including improvements they would like to see.

Comments regarding the curriculum arose primarily around skills rather than any specific content areas relating to grammar points or literature. The development of listening, writing- including note-taking skills and formal writing to support HE readiness, and communication skills in general were mentioned:

"Developing students' writing skills is really useful; developing note-taking skills is really useful for listening to lectures in college and university; writing letters is also really helpful; writing formal invitations, telling stories as students are interested in discussing social and political issues in English" (One teacher).

"CBSE is giving importance to communication skills in English and the system is improving and they[students] can easily communicate in English" (One school management).

Interviewees expressed positive views about the curriculum (five teachers, one school management), stating that they appreciated its flexibility and student-friendly content, noting that more competency-based approaches were being integrated (five teachers, one school management). As a result, teachers stated that they were trying to focus more on skills and real-life scenarios for activities, including using real-life examples for grammar examples, with some using approaches which reflect the Discovery Method (although this was not explicitly named as such).

Some interviewees noted a move towards more development of speaking and listening, whilst others (four teachers, one school management) wanted to see this developed further. Teachers claimed to use a range of activities to develop speaking in class, including role plays and debating, but noted that some students hesitate to speak in front of others. To improve listening skills, teachers use audios and videos or drilling methods. The introduction of the Assessment of Speaking and Listening skills (ASL) was particularly well-received:

"Speaking and listening skills have been given greater focus in the curriculum. CBSE has made them mandatory, though it would be better for them to be given even greater focus". (One teacher).

Some improvements were suggested, such as use of fewer texts, more collaborative activities, and one teacher suggested the removal of literature to focus on skills, with literature as an optional extra for students who wished to specifically pursue English in their careers.

Students were also generally positive about the curriculum, in particular seeming to enjoy the interactive or collaborative activities and the set

texts. One student raised that he/she would like to do more extensive reading:

> "I wouldn't want to significantly change anything, though more lessons would be useful and/or perhaps supplementary and independent study. A list of books to read independently would be useful. Mandatory extracurricular activities and supplementary classes in arts, music and sports would be good. This would encourage learning and development of transferable soft skills." (One student).

Another said that he/she had found the curriculum too easy, and that the textbooks lacked depth and he/she had to refer to other books to supplement the development of the language.

Assessment was typically viewed positively, with teachers stating that the exams are clearly based on the syllabus and age-appropriate, although some teachers wanted to see some changes to assessment, including more HOTS (one teacher) and real-life application (one teacher). Assessment preparation focused primarily around the NCERT and CBSE materials, including past and sample papers. Most students had found the exam easy, although one raised issues with clarity of rubric, and the allocated time being too short for the quantity of questions. One teacher noted that they tried to bring students above the examination level so that they can find the exams easy. There was no clear consensus on what students typically found more difficult. Some teachers (three teachers) felt that the transition to Standard XI was less easy, due to the new need to apply knowledge:

> "Up to 10th class student learn a base and rules about grammar, vocabulary etc. When they come to 11, students have to apply those rules in a highest standard. From class 6-10 students learn the rules but they do not apply them but coming to 11 class the application of their English knowledge and skills comes. Sometimes students find this difficult, but I try to make the lessons enjoyable to students and ask them to try with me and I try to motivate and encourage them to learn all the time. At 11 class students find it difficult sometimes to cope but I try to help them to come to a high standard. In the beginning of year 11 students find it really difficult and score really low in the unit test and assignments but after 3 months they improve, and they develop their knowledge and skills and they become better" (One teacher).

This challenge in transition was also noted by students, stating that the knowledge, content and vocabulary was harder.

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