

REPORT ON THE COMPARABILITY OF SGCSE AND CAMBRIDGE IGCSE: MATHEMATICS SUB-THEME: USE OF ASSESSMENT IN DECISION-MAKING

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Key words: equivalence, demand and awarding standard

The Examinations Council of Eswatini (ECESWA) developed the SGCSE qualification with Cambridge Assessment International Education (Cambridge). The Swaziland General Certificate of Secondary Education (SGCSE) qualifications enable learners to further their studies at tertiary institutions. Successful learners receive a certificate that carries both ECESWA and Cambridge logos and a statement that confirms that both qualifications are equivalent in terms of the standard and grade awarded to each qualification.

Cambridge Assessment International Education regularly conducts research to support claims of equivalence. This is done through comparability studies. In 2018, a comparability study conducted looked at the demand and awarding standard of SGCSE assessments in Mathematics against Cambridge International IGCSE Mathematics.

The aims of the study were to:

- 1) verify the extent to which the two qualifications are equivalent in relation to the demand and awarding standard
- 2) find out if there are disparities between the standards of SGCSE and the Cambridge IGCSE and
- 3) identify and prioritise ways to address any disparities between the standards of the SGCSE and the IGCSE.

The study employed both qualitative and quantitative approaches. The qualitative approach sought responses about the demand standard of the qualifications with the aim of ascertaining how the assessment objectives and assessment materials of the two qualifications compared, and how the demand of the question from both assessment was ranked. Eight judges were selected and with the help of the Scale of Cognitive Demands (CRAS) framework, the questionnaire was able to elicit information on the five dimensions of CRAS which are: complexity; resources; abstractness; task strategy and response strategy. The analysis used a quantitative approach which used a statistical Mann-Whitney U-test to analyse the rankings obtained by each judge.

The findings indicated that:

- 1) the demand of the questions for the Core and Extended tiers were broadly comparable in both qualifications. However, there was evidence that the response strategy was more demanding in the IGCSE than in the SGCSE
- 2) it was clear that there was a disparity in the awarding standard, with the quality of work required for Grades A and C in the Extended tiers being greater in the IGCSE than in the SGCSE.

The study therefore recommended different ways of addressing the disparities identified in the response strategy demand standard and awarding standard of the SGCSE and the Cambridge IGCSE.

Introduction

The Examinations Council of Eswatini (ECESWA) developed the Swaziland General Certificate of Secondary Education (SGCSE) qualification with Cambridge Assessment International Education (Cambridge). The SGCSE qualification enables learners to further their studies at tertiary institutions. Successful learners receive a certificate that carries both ECESWA and Cambridge logos and a statement confirming that both ECESWA and the University of Cambridge Local Examinations Syndicate (UCLES) are in collaboration. The back of the certificate carries the following statement:

The University of Cambridge Local Examinations Syndicate (UCLES) confirms that the standard and demand of each grade awarded for SGCSE subjects on this certificate is equivalent to the corresponding grade awarded for the International General Certificate of Secondary Education (IGCSE) subjects offered by UCLES.

Cambridge Assessment International Education regularly conducts research to support claims of equivalence. This is done through comparability studies. This paper reports on the comparability study that was conducted by Cambridge in 2018. The study investigated the degree of comparability between the demand and awarding standard of SGCSE Mathematics and IGCSE Mathematics.

For the purpose of the study the standard was defined as demand standard and awarding standard. Demand standard describes the depth of knowledge, skills and competencies required by the assessment instrument. Awarding standard describes the quality of work necessary to be awarded a particular grade or qualification, taking into account the difficulty of the tasks (how hard the candidates found the assessment).

Aims of the study

The aims of the study were to:

- 1) verify the extent to which the two qualifications are equivalent in relation to the demand and awarding standard
- 2) find out if there are disparities between the standards of SGCSE Mathematics and the Cambridge IGCSE Mathematics
- 3) identify and prioritise ways to address any disparities between the standards of the SGCSE Mathematics and the IGCSE Mathematics.

Scheme of Assessment

SGCSE Mathematics

The SGCSE Mathematics syllabus is a tiered syllabus. The syllabus has three components (Papers 1, 2 and 3). Papers 1 and 2 are for the Core tier and the grades are from C to G. Paper 3 is an Extended paper awarding grades from A* to C. All candidates are required to sit two papers (Papers 1 and 2) and the Extended candidates also sit Paper 3, The extended candidates are solely assessed on Paper 3 if they achieve at least a Grade C. If they do not, their performance on Papers 1 and 2 is used to assess them. However, the highest grade that they can achieve is a grade C. Table 1 shows a summary of the scheme of assessment for the SGCSE Mathematics.

Table 1: SGCSE Scheme of Assessment

Component	Type of assessment	Duration of assessment	Total marks	Weighting in full assessment	Component grades assessed
1 - Core	written	1 hour 30 minutes	60	40%	C to G

2 - Core	written	2 hours	90	60%	C to G
3 - Extended	written	2 hours 30 minutes	100	100%	A* to C

IGCSE Mathematics

IGCSE Mathematics syllabus is tiered. The syllabus has four components (Paper 1, 2, 3 and 4). Paper 1 and 3 are from the Core syllabus content whilst Paper 2 and 4 are from the extended syllabus content. All candidates take two papers. The Core tier awards at Grade C to G and the Extended tier awards at Grades A* to E. Candidates sit only the papers from the tier which they have been entered. Table 2 shows a summary of the scheme of assessment for the SGCSE IGCSE.

Table 2: IGCSE Scheme of Assessment

Component	Type of assessment	Duration of assessment	Total marks	Weighting in full assessment	Component grades assessed
12- Core	written	1 hour	56	35%	C to G
22 - Extended	written	1 hour 30 minutes	70	35%	A* to E
32 - Core	written	2 hours	103	65%	C to G
42 - Extended	written	2 hours 20 minutes	130	65%	A* to E

The schemes of assessment for both qualifications are slightly different in that candidates in the Extended SGCSE Mathematics enter for three papers (two core papers and the extended paper). However, only one paper contributes to their final grade whereas for IGCSE candidates enter for two papers to contribute to the final grade. The grades assessed for the Extended papers in SGCSE and IGCSE are different as shown in Table 1 and Table 2. The duration of assessment and total marks are also different for both qualifications

Theoretical Framework

The judges were asked to rank the difficulty of all the questions contained in the November 2017 series question papers using the Scale of Cognitive Demands Framework (CRAS). The scale was developed by Hughes, Pollit and Ahmed in 1998, who worked with examiners in a number of subjects to develop a way of rating the cognitive demands of assessment tasks. The scale has previously been used in research by the Qualifications and Curriculum Authority (QCA) and by Cambridge Assessment.

The scale identifies five types or 'dimensions' on which questions are ranked as five separate exercises:

- Complexity: the complexity of each component operation or idea and the links between them
- Resources: the use of data and information
- Abstractness: the extent to which the student deals with ideas rather than the concrete phenomena
- task strategy: the extent to which the student devises (or selects) and maintains a strategy for tackling the question
- response strategy: the extent to which students have to organise their responses

Methodology

The study employed both qualitative and quantitative approaches. The qualitative approach sought responses about the demand standard of the SGCSE and IGCSE qualification with the aim of ascertaining how the assessment objectives and assessment materials of the two qualifications compared, and how the demand of the questions from both assessment was ranked.

Eight judges were invited to participate in the study, four selected by ECESWA and four by Cambridge. However, one of the ECESWA judges and one of the Cambridge judges withdrew from the study leaving six judges in total. All the judges were not permanent employees of either Awarding Organisation. None

of the judges was a Principal Examiner, Setter, Reviser or Vetter on the syllabuses being compared. All the judges were experts in Mathematics.

Data collection

Demand standard

A questionnaire was administered to the six judges. For the demand standard, the questionnaire was able to elicit information on how the demand of the questions from both assessment is ranked. Before the judges completed the questionnaire, there was a standardisation meeting which was done via an online to ensure that the judges were familiar with the CRAS dimensions.

The judges were asked to use the scale to give a rating to each question and then to rank the questions from the different sets of papers for each qualification, depending on the subject. Each question was provided separately on A4 paper and given a question card number. To avoid any bias when the rating and ranking of questions were performed, a randomisation strategy was used. The judges received randomised groups of questions and were not informed to which of the two qualifications the randomised questions belonged.

The judges carried out each ranking exercise, recording the order in which they ranked the questions cards in the questionnaire. The judges were asked to justify their ranking of the most demanding and the least demanding questions for each dimension in order to provide a check that they had understood the dimension and were applying it when ranking the questions.

The judges were asked to rank one pack containing all of the Core tier questions from Paper 12 and 32 from IGCSE and Paper 1 and 2 from SGCSE, and another pack containing all of the Extended tier questions from Paper 22 and Paper 42 from IGCSE and Paper 3 from SGCSE.

Awarding standard

The questionnaire comprised questions about the awarding standard set by the November 2017 series. It was aimed at finding out how similar was the quality of work required of candidates for the two qualifications in order for them to be awarded the chosen grade. The judges were provided with packs of candidates answer scripts from the 2017 examination series at each of the key grades of Grade A, Grade C Extended, Grade C Core, Grade E and Grade G. Within each pack there were two sets of answer scripts, one set from SGCSE component and one set from each IGCSE component. Each answer script had received the borderline mark at the threshold being considered. The marks, and annotations were removed from the answer scripts. The purpose of removing the marks was to focus the judges' attention on the quality of the work rather than the way it was marked. In total, judges were given three separate packs of answer scripts for each grade, with each pack containing the work of one pseudo candidate for each qualification. The standard was compared to two Assessment Objectives, which represent both qualifications. These Assessment Objectives are: Mathematical Techniques, and Applying Mathematical Techniques to Solve Problems.

Data Analysis

The analysis used a qualitative and quantitative approach. The bulk of the questionnaire analysis comprised analysing and summarising the written comments of the judges in the report. The aim was to ensure that common themes were identified and the less common, but pertinent, comments and opinions of the individual captured.

Qualitative Data Analysis

This qualitative data from the questionnaire provided the rich and detailed information needed to help identify areas where the qualifications were equal together with the evidence for this, along with any areas of disparities and their nature. The results of the analysis formed the basis of the conclusions regarding the accuracy of the equivalency statement printed on the certificates and provided the information needed to identify causes of any disparity, the size of the disparity and ideas bringing the SGCSE into line with the IGCSE with regards to the standards.

Quantitative Data Analysis

Some simple quantitative analysis of the information in the questionnaire was conducted. The purpose of quantitative analysis was to provide a method of summarising the combined overall opinion of the six judges with regard to each section of the questionnaire. The bulk of the analysis focussed on the summary tables completed by the judges throughout the questionnaire.

CRAS ranking analysis

The quantitative analysis used a statistical Mann-Whitney U-test to analyse rankings obtained by each judge. Using this test, it was statistically tested whether there were differences in the rankings of the questions for the two qualifications. The ranking was as follows: a question with low ranking was considered to be more demanding than a question with a high ranking. A statistically significant difference in the rankings would indicate that the standard of the questions from the two qualifications might be different. The statistical test was performed for each CRAS dimension, for each judge's rankings, for each group of (multiple choice and short and structured questions) questions and for each subject. For example, for the Complexity dimension, six rankings from each of the six judges were received and hence six statistical tests, each independent from the others.

Findings

Mathematics demand standard (Question Papers)

CRAS ranking findings

CRAS was used to assess the equivalency of the demand standard of SGGCSE Mathematics and IGCSE Mathematics. The Core and Extended papers of both qualifications were compared as separate data sets. The study found that there was no significant difference in the demand standard at Core and Extended tier between SGCSE and IGCSE Mathematics for the dimensions of Complexity, Resources, Abstractness and Task Strategy. However, for the dimension of Response Strategy, the study found that there was a significance evidence of a difference in the demand of the questions in the Core tier between SGCSE and IGCSE Mathematics, with IGCSE being more demanding.

Awarding Standard

Judges made a number of comments on the nature of the assessment model which may explain the different performance standards demonstrated in the two qualifications in the Extended tier.

- Several judges commented that SGCSE candidates simply had fewer opportunities to demonstrate their abilities. This was because there was only one paper assessing this content in the SGCSE.
- One judge looked at the performance descriptors for Grade A candidates, and concluded that the paper for SGCSE would only allow candidates to potentially demonstrate ten (10) of them, whereas the IGCSE papers allowed candidates to potentially demonstrate twenty-four (24) of them. The IGCSE candidates were therefore likely to show better performance due to opportunity.

Table 3 Comparison in the standard of work at the thresholds of A, C, E and G in both qualifications.

Grade threshold	AO1: Mathematical Techniques	AO2: Applying Mathematical Techniques to solve problems
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A	There was evidence that IGCSE candidates were demonstrating better performance in that area.	There was evidence that IGCSE candidates were demonstrating better performance in that area.
C (Extended)	There was evidence that IGCSE candidates were demonstrating better performance in that area.	There was evidence that IGCSE candidates were demonstrating better performance in that area.
C (Core)	There was evidence that IGCSE candidates were demonstrating slightly better performance in that area.	There was no evidence of a difference in performance, though there was some evidence that IGCSE candidates were slightly stronger in that area.
E	There was no evidence of a difference in performance, though there was some evidence that IGCSE candidates were slightly stronger in that area.	There was evidence that IGCSE candidates were demonstrating slightly better performance in that area
G	There was no evidence of a difference in performance though there was some evidence that SGCSE candidates were slightly stronger in that area.	There was no evidence of a difference of performance in that area, with the judges felt that performance was very close in the two qualifications

The information from the Table 3 shows a disparity in the awarding standard. IGCSE candidates seemed to perform better at Grades A and C Extended papers than SGCSE. The awarding standard of the SGCSE Extended paper at Grades A and Grades C was low in comparison to the IGCSE.

6.0 Conclusions

The conclusion from the findings was that the demand of the two syllabuses are similar and that any differences do not amount to a material difference in the demand standards of the two qualifications. However there was significant evidence of a difference in the response strategy demand of the Core tier between SGCSE and IGCSE. The response strategy of the Core tier SGCSE materials seemed to be less demanding than the IGCSE.

There was some evidence that the SGCSE awarding standard was lower than the IGCSE at Grades A and C in the Extended tier. This could be addressed in a number of ways.

- The Grade boundaries could be adjusted upwards. The adjustment should account for no more than an additional 5% drop in outcomes in a single series, on top of any genuine differences in the abilities of the two cohorts.
- There was also some evidence that the disparity was due to lack of opportunity for the SGCSE candidates. The current assessment model forces Extended tier candidates to sit two papers which do not count towards their final grade, and this means that the only evidence of their ability comes from a single paper, where all questions are aimed at candidates C and above.
- It would be preferable for candidates to sit papers exclusively for their tier of entry, and for the Extended tier to have two papers, perhaps covering a broader range (A*-E). This would allow papers to be more accessible, for candidates to have adequate opportunity to demonstrate their abilities, and for candidates who are mis-entered to potentially still be given a D or E grade.

7.0 Recommendations

The study identified and prioritised ways to address any disparity between the demand standard of the SGCSE qualification.

- At the earliest opportunity, the syllabus should be revised to accommodate the exclusive papers for Core and Extended candidates. Extended candidates should sit only papers that would contribute to their grade, and are targeted to their abilities, and should sit more than one contributing paper. This would give them the opportunity to demonstrate their skills.
- If the above change is made, ECESWA should consider the extended tier awarding grades A*-E, as this will allow accessible papers and will provide protection for mis-entered candidates in the Extended tier, without the need for them sitting non-contributing papers.
- On Paper 3, 70% of the marks are required for Grade A and 47% of the marks are required for Grade C. The optimal setting proportions are 80% of marks for Grade A and 60% of marks for Grade C. They should be a gradual adjusting of the standard, with no more than 5% outcome tightening in each series after the relative abilities of the cohorts are accounted for.