UMALUSI

Council for Quality Assurance in
General and Further Education and Training

Report on the

2011 National Senior Certificate Examination

Post-Examination Analysis

Eksamenraad vir Christelike Onderwys (ERCO) report February 2012

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INTRODUCTION

Background

Umalusi has conducted the analysis of the National Senior Certificate (NSC) examination question papers for the past three years as part of the Maintaining Standards research project. The 2009 exam analysis was an attempt at benchmarking the second year of the NSC examinations. For 2009, the previous (Maintaining Standards 2008) analyses of the 2005 to 2007 NATED and the 2008 NSC examination papers were used, and compared with the 2009 NSC Department of Basic Education (DBE) examinations. In the same way the 2010 question papers were analysed and compared with the 2008 and 2009 question papers. The Independent Examination Board (IEB) and ERCO (Eksamenraad vir Christelike Onderwys) question papers have been included in the analysis since 2009 and 2010 respectively.

To date, ERCO question papers for the following examinations have been analysed:

- 2010 NSC Final Paper 1 and 2 (or P1 only in applicable subjects)

For the 2011 project, question papers for the following ERCO subjects were analysed: English First Additional Language (EFAL), Mathematics, Physical Sciences, Life Sciences, Geography, Accounting, Business Studies, and Economics.

The question papers were analysed with regard to the following:

- Coverage of the learning outcomes (LOs)and assessment standards (ASs)
- The cognitive demand of the question papers
- The level of difficulty of the questions.

The findings in this report are presented by subject in line with the three areas indicated above.

Purpose of the post-exam analysis

The purpose of the post-exam analysis project is primarily to inform the Umalusi standardisation process on the standard of the question papers with regard to the cognitive demand, level of difficulty and coverage of the LOs and ASs. The analysis also provides a comparison of the current year's examination paper with the past

years' examination papers. It is for this reason that Umalusi has maintained the use of the same taxonomies through the years – to enable the horizontal comparison of the question papers. This report is one of the other qualitative reports that are used to inform the decisions taken when standardising the NSC results.

Method of analysis

Generally, the teams used the exam analysis instrument developed by Umalusi. The instrument has been in use since 2008 when the first analysis was conducted. Using an MS Excel spreadsheet, each question was analysed according to type of cognitive demand, level of difficulty, content/skill/topic and learning outcomes (LOs) and assessment standards (ASs) (as described in the relevant curricula).

The teams used different taxonomies to analyse the cognitive demand of the question papers. These taxonomies were used because they have proven to be appropriate and useful in the analysis of the specific subjects. In some subjects the taxonomies are exactly the same as those used in the DBE Subject Assessment Guidelines (SAG), whereas in other subjects there are slight variations. It should be borne in mind that the ERCO question papers were set in line with the DBE SAG.

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ENGLISH FIRST ADDITIONAL LANGUAGE (EFAL)

1.1 Evaluators

Mr MJ de Jager, Ms N Nonkwelo and Ms P Voller

1.2 Introduction

As part of Umalusi's Maintaining Standards Project, the above evaluators were tasked with analysing the final 2011 National Senior Certificate (NSC) examination papers for English First Additional Language (EFAL).

In the post-exam analysis the following examination papers were considered:

- EFAL papers 1, 2 and 3 of the Eksamenraad vir Christelike Onderwys (ERCO)
- Paper 2 of the Eksamenraad vir Christelike Onderwys (Brainline Learning World)

The results of the 2011 analysis of ERCO NSC examination papers were also compared to the results of an analysis of 2010 ERCO NSC papers. As no papers for Brainline Learning World were analysed in 2010, no comparisons could be made.

The method used in the examination paper analysis is presented below.

1.3 Method of analysis

The examination papers mentioned above were analysed by using an exam analysis instrument developed by Umalusi (table 1). Using an MS Excel spreadsheet, each question was analysed according to type of cognitive demand, level of difficulty, content/skill/topic and learning outcomes (LOs) and assessment standards (ASs) (as described in the relevant curricula). This tool was used because it has been proven to be appropriate and useful in the analysis of language exam papers, and provides meaningful data.

Decisions about the type of cognitive demand and level of difficulty of the questions were made according to a typology closely linked to the revised version of Bloom's Taxonomy (2001). Questions were classified in one of five categories or types of cognitive demand. Within this category, each question was also classified

according to level of difficulty, that is, easy, moderate or difficult. The typology according to which the questions were analysed is presented in table 1.

Table 1: Typology used for analysis of questions

Category	Level	Description
Basic factual or conceptual knowledge (CK) • Recall, recite and remember facts • Define and describe basic facts • Identify, label, select, locate information • Know and use appropriate vocabulary	Easy	Very simple recall; identify specific data; tell; recite; list For example, identify parts of speech; match known words with definitions
	Moderate	Medium content, read and locate, briefly define a term, name and match For example, identify answers to wh- (equivalent) questions from a text; explain what synonyms are, learnt diagrams
	Difficult	Recall complex content For example, correct spelling and use of vocabulary; dictation of unfamiliar text; find synonyms or antonyms for words used in a text
Comprehension (C) • Understanding of previously acquired information in a familiar context • Change or match information • Distinguish between aspects, compare and predict, defend and explain	Easy	Simple relationships; simple explanations For example, convert active to passive forms; identify main and supporting ideas; identify cause, result or reason from a text
	Moderate	More complex reasoning; motivate inferences For example, explain; briefly summarise; translate; interpret realistic visuals; draw inferences from a text; make a prediction
	Difficult	Identify principles which apply in a novel context; more complex reasoning; motivate inferences or predications For example, use information from the text to support a position
Application (A) • Interpret and apply knowledge • Choose, collect and do basic classification of information • Modify by using existing knowledge • Using well-known procedures (not immediately obvious) • Decide on most appropriate procedure to use • Select the most appropriate data • Decide on the best way to represent data	Easy	Perform well-known procedures in familiar contexts. All of the information required is immediately available. For example, write texts related to familiar contexts; draft a friendly letter, basic business letter, invitation; provide the necessary information; organise information in a presentable poster or table to promote comprehension
	Moderate	Draw information from a given text; illustrate in words; construct ideas; propose a course of action based on a straightforward case study
	Difficult	Collect information from available texts to support a particular position/opinion; re-present the position in own text; undertake guided research to collect the information needed for a task; organise information into suitable form (report, memo, visual presentation)

Analysis & problem solving (AP) • Analysis of information in a new or unfamiliar context • Examine and differentiate • Distinguish to find the most appropriate • Research and investigate information • Solve non-routine, unseen problems through higher level of understanding and cognitive processes • Use higher-level cognitive skills and reasoning to solve non-routine problems • Break down problems into constituent parts – then solve using appropriate method • Non-routine problems based on real contexts	Easy	Simple process in known or practised context; drafting an invitation; writing a letter of thanks or condolence – not simply formulaic
	Moderate	Investigate; classify; categorise; compare; contact; solve; relate; distinguish; write a persuasive essay; take minutes of a straightforward meeting; deal with more complex case studies; propose course of action, e.g. in report form
	Difficult	Interpret; report on; sort; debate; prepare a speech and/or presentation; use higher-level cognitive skills and reasoning, in developing, for example, proposal to solve a problem, use appropriate methods in problem solving
Evaluation & synthesis (ES) • Making judgements (evaluate), critique, and recommend by considering all material available • Weigh possibilities and make recommendations • Construct new • Synthesise, create or find innovative solutions • Formulate new ideas	Easy	Make judgements; critique on fairly straightforward topics; recommend by considering all available material; weigh possibilities and make recommendations; give opinion
	Moderate	Substantiate an opinion; critique statements about situations made by others; synthesis, critical argument; novel or abstract contexts; create poetry/a narrative
	Difficult	Generalise patterns observed in situations; work with complex problems involving insight and leaps of logic; create new solutions to problems; redesign; write or critique complex issues; rewrite for a new context and/or setting; construct or formulate new ideas

It is important to note that the analysis process was a subjective one and that decisions on type of cognitive demand and level of difficulty were reached through consensus among the evaluators. Furthermore, the descriptions and examples (see table 1) provided for types of cognitive demand and levels of difficulty were only regarded as guidelines. For example, all friendly letters would not necessarily be regarded as easy application questions – all aspects of questions such as topic, purpose and language level should be taken into consideration when categorising a question.

In the analysis of the examination papers, the following procedure was followed:

In the first instance, the papers were evaluated at face value. The team considered the general impression of each paper, layout, instructions, numbering of questions, mark allocation, and so on. Once this had been done, the team did an item-by-item analysis of each question in each paper.

The data collected from this item-by-item analysis was plotted on an MS Excel spreadsheet and then used to compile a report on each paper.

Once the reports on the three papers had been completed, the results of the 2011 analysis were compared with the results of the 2009 and 2010 analyses. The content assessed in the three papers is indicated in table 2 below.

As was indicated above, papers 1, 2 and 3 as well as paper 2 of ERCO Brainline Learning World were analysed.

Table 2: Papers 1, 2 and 3 – content assessed

Paper 1	**Marks**	**Paper 2**	**Marks**	**Paper 3**	**Marks**
Comprehension	30	Novel	35	Creative writing	50
Summary	10	Drama	35	Longer transactional text	30
Language	40	Short stories	35	Shorter transactional text	20
		Poetry	35		
Total	80	Total	140	Total	100
					Grand Total: 320 marks

Table 3: Brainline Learning World – content assessed

Paper 2	Marks
Novel	35
Drama	35
Short Stories	35
Poetry	35
Total	140

1.4 Results of examination paper analysis

The number of papers analysed made it very difficult to present the narrative report in the format prescribed by Umalusi. Accordingly, the report is presented in the sections that follow. Section 1.5 discusses the compliance of the ERCO papers with the SAG, section 1.6 explains the cognitive demand and level of difficulty of the exam papers, and sections 1.7 and 1.8 discuss a model for future use and the standard and quality of the papers respectively.

1.5 Compliance with the Subject Assessment Guidelines

No specific assessment guidelines for the ERCO papers were provided to the evaluation team. However, the Umalusi officials informed the team that the ERCO papers were compiled in accordance with the Subject Assessment Guidelines (SAG) and the guidelines for setting Grade 12 examinations in languages as prescribed by the DBE.

Paper 1

The ERCO paper that was analysed adhered to all the requirements set out in the SAG, including mark allocation (80 marks) and duration (2 hours).

The comprehension questions (Q1) were set on one text only.

The question on the summary (Q2) required the learners to summarise a different text to the one in Q1 in a seven-point summary of approximately 70 words. This, and the fact that the passage for the summary question differed from that used in the comprehension question, means that it is in accordance with the requirements of the SAG.

As suggested in the SAG, language was assessed in context in section C (visual literacy, using a cartoon [Q 3.1] and an advertisement [Q 3.2]). Language and editing skills were assessed in context using a magazine article (Q4). Dictionary and language skills were assessed in context using a short extract from a dictionary (Q5).

The mark allocation and duration of Paper 1 agreed exactly with the suggestions in the SAG – comprehension (30 marks), summary (10 marks) and language structures (40 marks) in two hours.

Paper 2 (including Paper 2 of ERCO Brainline Learning World)

The format of the ERCO Paper 2 and that of the ERCO Brainline Learning World Paper 2 was exactly the same. In this section, "Paper 2" refers to both the ERCO Paper 2 and the ERCO Brainline Learning World Paper 2. Paper 2, the literature paper, was a very long paper, owing to the fact that a large number of literary works were examined, as questions needed to be set on all the prescribed works so as to afford all learners the opportunity to answer questions on the literary works they had studied during the year.

As with Paper 1, this paper also adhered to all the requirements in the SAG: mark allocation (70 marks), duration of the paper (2 hours) and length of the essay-type questions (250–300 words).

Two questions (one essay questions and one contextual question) were set on novel, drama and short stories (35 marks each), and four contextual questions were set on seen poems (17½ marks each). Learners were required to answer one question from two of the four sections (novel, drama, short stories and poetry) set in the paper. Learners who chose poetry as one of the sections were required to answer three questions in total (one on the novel, drama or short stories and two on poetry), while those who did not choose poetry as one of the sections, were required to answer only two questions.

Paper 3

As with Papers 1 and 2, Paper 3, the writing paper, adhered to the SAG.

In section A (essay), the learners could choose to write one essay (50 marks) of 250–300 words from a number of essay topics and visual stimuli as prescribed in the SAG.

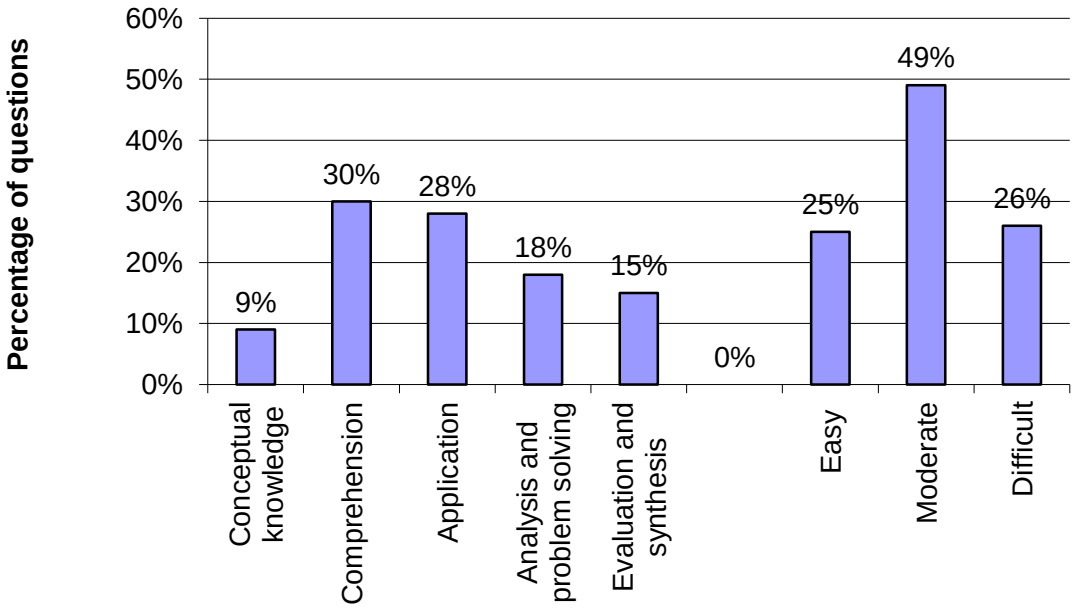
In line with the SAG, in section B (longer transactional text) learners could choose to write a letter to the press, a testimonial, a report or a newspaper article (30 marks) of 120–150 words.

In section C (shorter transactional texts), the learners could choose to write notes, an email or an announcement (20 marks) of 80–100 words in line with the SAG.

1.6 Cognitive demand and level of difficulty

Paper 1

The type of cognitive demand and level of difficulty of the questions in ERCO Paper 1 are indicated in graph 1.



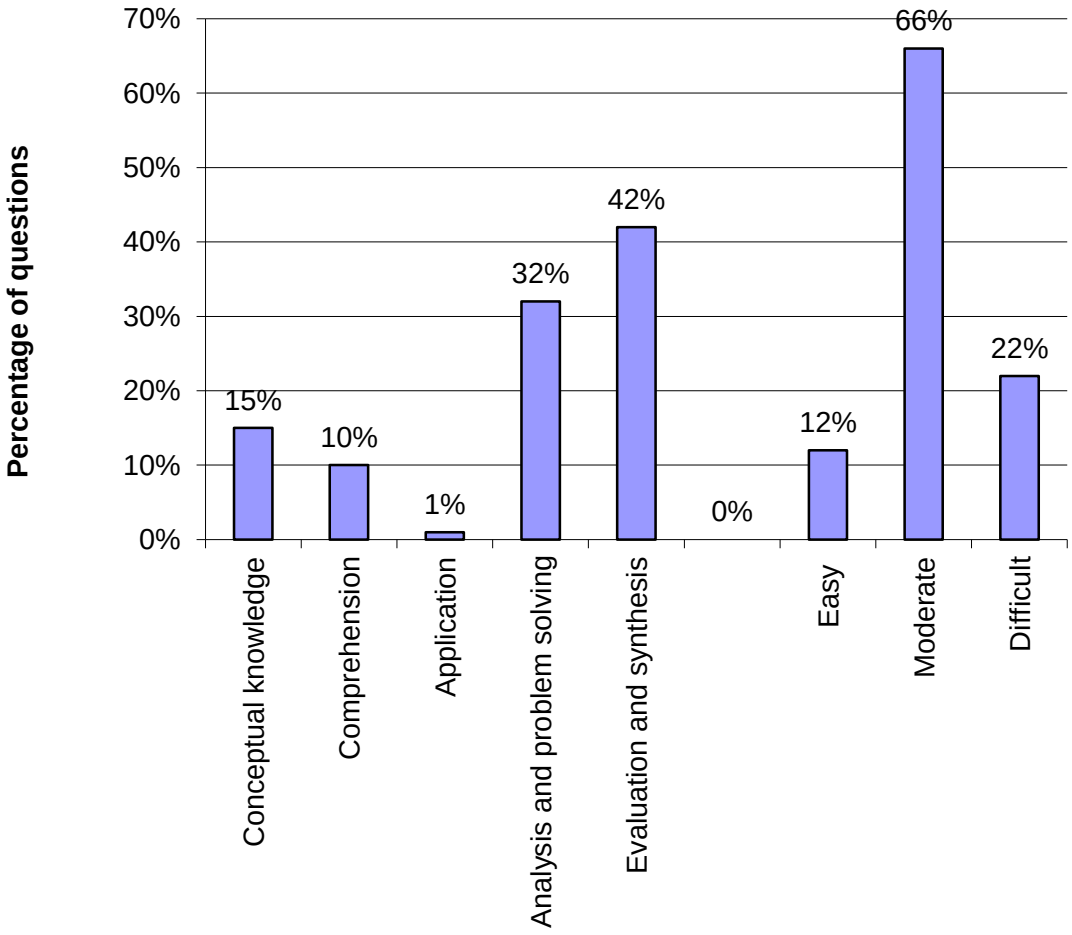
Graph 1: Paper 1 – type of cognitive demand and level of difficulty

Compared to the 2010 paper, the level of cognitive demand of questions in the 2011 paper was much more balanced. Thirty percent of questions were regarded as comprehension questions, while 28% were regarded as application questions. The remainder of the questions were regarded as analysis and problem-solving (18%), evaluation and synthesis (15%) and conceptual knowledge (9%) questions. With regard to the level of difficulty, as opposed to the 2010 paper in which most of the questions were regarded as difficult (48%), most of the questions in the 2011 paper were regarded as moderate (49%) questions, while 25% of questions were regarded as easy and 26% of questions were regarded as difficult. The team was of the opinion that the 2011 paper was much more balanced with regard to both

cognitive demand and level of difficulty and that most learners would have been advantaged by this spread.

Paper 2

The type of cognitive demand and level of difficulty of the questions in the ERCO Paper 2 are indicated in graph 2 below.



Graph 2: Paper 2 – type of cognitive demand and level of difficulty

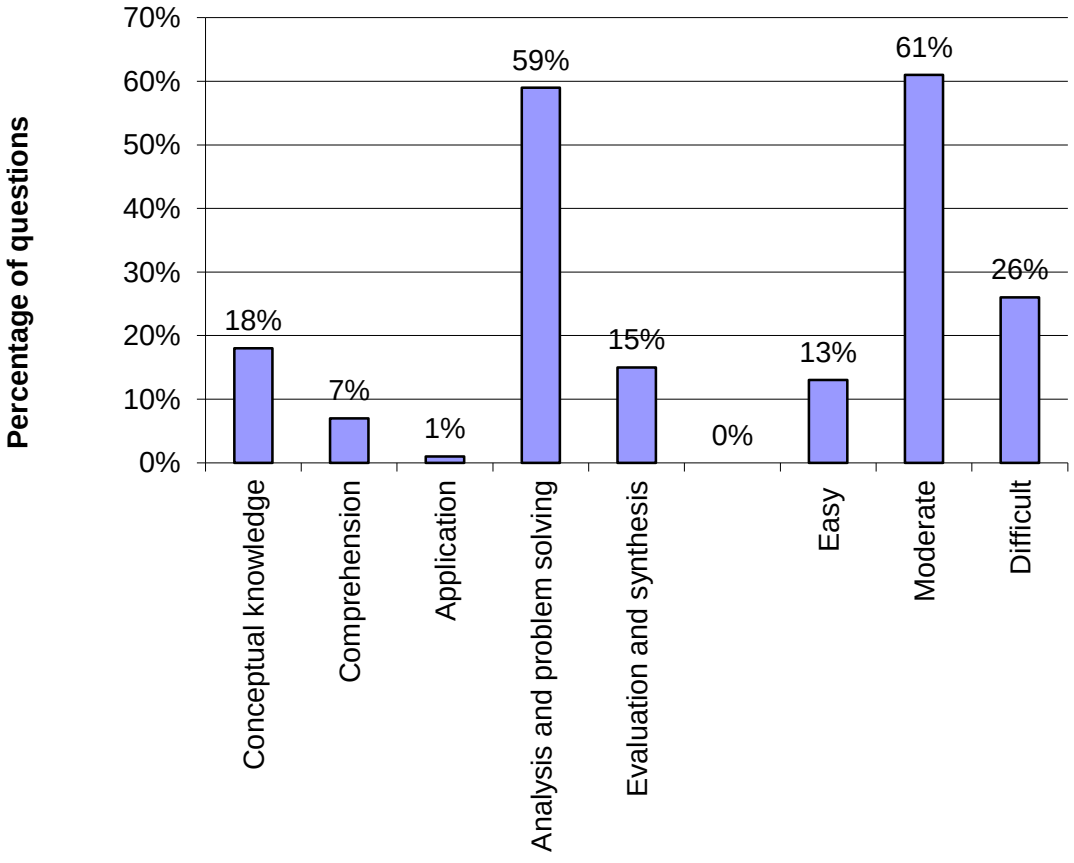
From the graph it is clear that there was a leaning towards evaluation and synthesis (42%) and analysis and problem-solving questions (32%).

As with the DBE papers, the team was of the opinion that this was acceptable for the literature paper as the evaluation of literature texts mostly requires learners to provide personal responses to texts, or to analyse and evaluate texts before providing answers to the questions.

With regard to the level of difficulty of questions, 66% of questions were regarded as moderate, while only 12% were regarded as easy and 22% as difficult. Although the questions set in a literature paper are by nature more difficult, the team was of the opinion that the level of difficulty of the questions in this paper should have been more balanced – a spread of more or less 50% moderate questions and 25% easy and 25% difficult questions would have been more acceptable.

Paper 2 (ERCO Brainline Learning World)

The type of cognitive demand and level of difficulty of the questions in the ERCO Brainline Paper 2 are indicated in graph 3 below.



Graph 3: Paper 2 Brainline – type of cognitive demand and level of difficulty

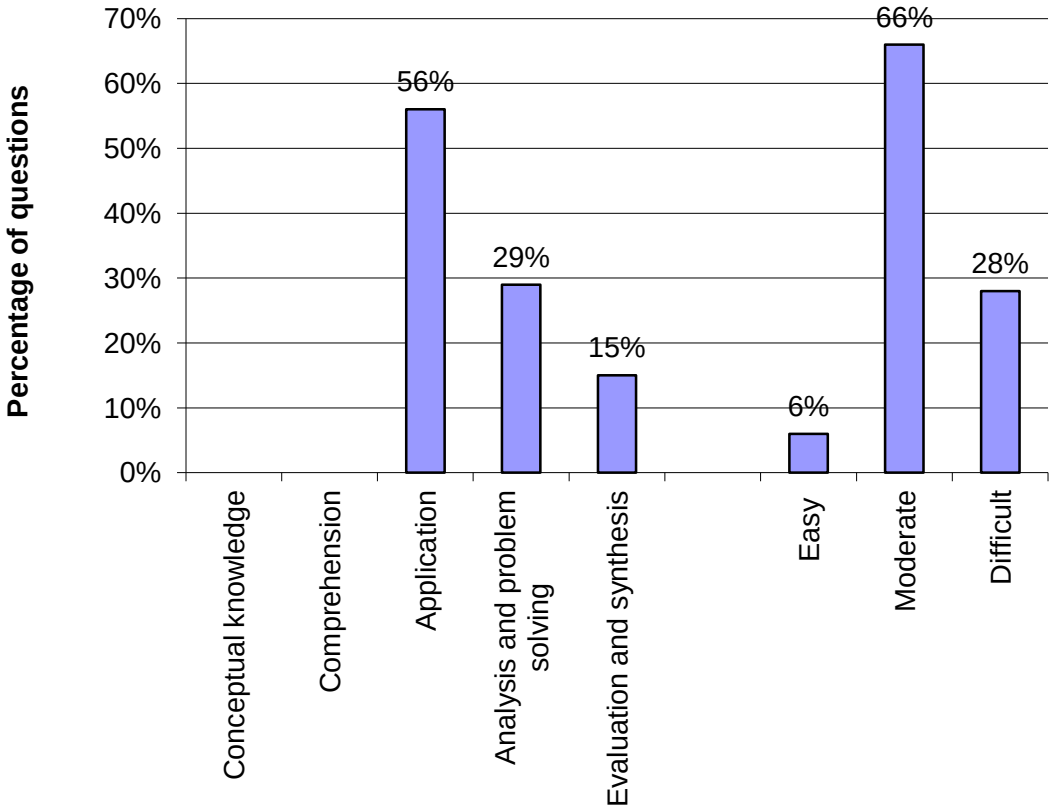
From the graph it is clear that there was a leaning towards analysis and problem-solving questions (59%), while the remainder of the questions were regarded as conceptual knowledge (18%), evaluation and synthesis (15%), comprehension (7%) and analysis (1%) questions.

Although the team was of the opinion that questions set on literary works are by nature cognitively more demanding, the spread of questions should be more balanced between the levels of cognitive demand. One would expect that literature questions would require learners to give personal responses to texts, but in this case only 15% of questions were evaluation and synthesis questions in which learners could present personal responses to texts. The team would thus strongly suggest that in future application, analysis and problem-solving questions and evaluation and synthesis questions in the papers should be more evenly balanced.

With regard to the level of difficulty of questions, 61% of questions were regarded as moderate, while only 13% were regarded as easy and 26% as difficult. This spread is almost identical to that of the ERCO Paper 2, as many of the questions set in that paper were repeated in the Brainline paper. As in the case of the ERCO Paper 2, the team was of the opinion that the level of difficulty of the questions in this paper should have been more evenly balanced.

Paper 3

The type of cognitive demand and level of difficulty of the questions in the ERCO Paper 3 are indicated in graph 4 below.



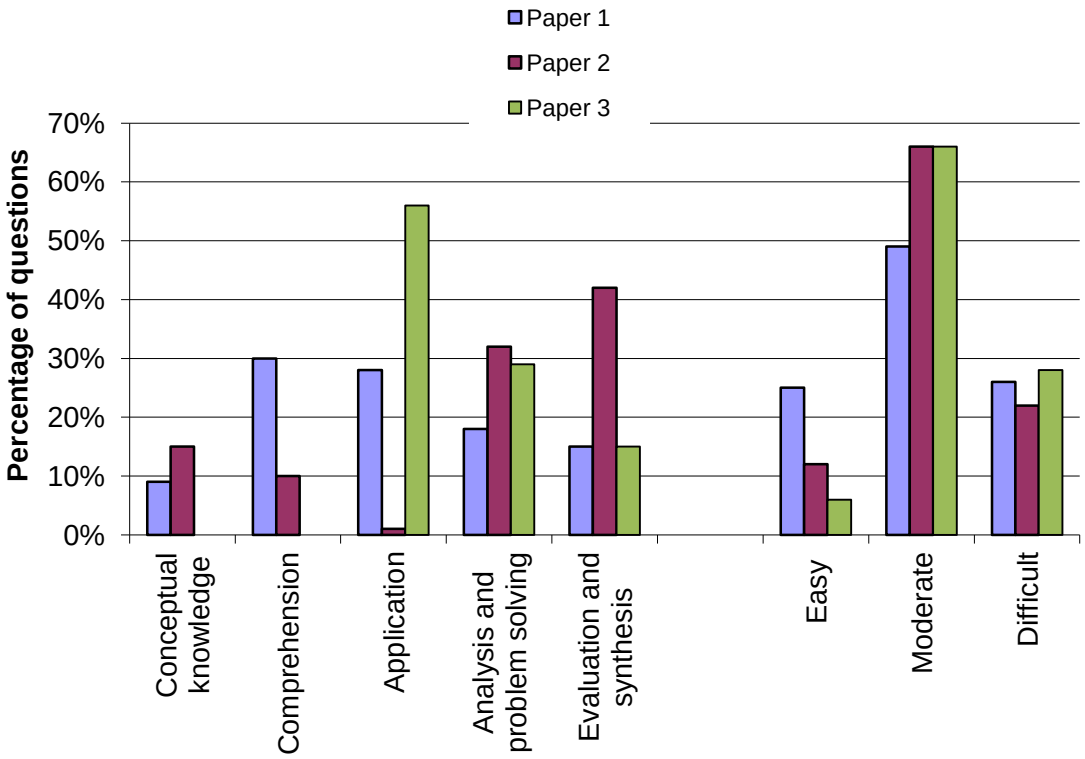
Graph 4: Paper 3 – type of cognitive demand and level of difficulty

From graph 4 it is clear that the questions in the paper entailed application (56%), analysis and problem-solving questions (29%) and evaluation and synthesis questions (15%).

The team was of the opinion that a writing paper should contain more questions that test higher-order thinking skills; however, the distribution in this paper leans mainly to application questions. In 2010 the team was of the opinion that the distribution should be adjusted to include a number of evaluation and synthesis questions in which learners are allowed to make own judgments about texts or visual stimuli. Although this was done in the 2011 paper, the team was of the opinion that even more analysis and evaluation questions could be included in future papers.

With regard to the level of difficulty of questions, only 6% of questions was regarded as easy, while 66% was regarded as moderate and 28% as difficult. As with the type

of cognitive demand, the team was of the opinion that in future papers the level of difficulty should be more evenly spread between easy, moderate and difficult questions.



Graph 5: Combined papers – type of cognitive demand and level of difficulty

From graph 5 it is clear that the type of cognitive demand and level of difficulty varied greatly between the different papers. Accordingly, the team was of the opinion that examiners should strive for a more balanced distribution of cognitive demand type and level of difficulty in the questions in all papers.

1.7 Model for future use

The team was of the opinion that, in general, the 2011 NSC final papers for EFAL of all the examining bodies constituted a good model for future examinations.

The team once again commented on the length of Paper 2 for ERCO and Brainline Learning World, as they felt that the sheer bulk of the paper and the large number of choices might have been confusing for some learners, although the clear

instructions provided throughout the paper should have enabled the learners to make the correct choices.

1.8 Standard and quality of papers

The team was of the opinion that the 2011 EFAL final examination papers were of a very good standard and quality.

Although the language level in most of the papers seems to have been of an appropriate level, the team was of the opinion that the language level of the ERCO Papers 1 and 2 was above the language competency level of the average first additional language learner.

In the ERCO Papers 1 and 2 the phrasing of the following questions was unclear:

- Q1.5 … "evocative names …" (1 mark)
- Q5.2 "I have told you times without …" (1 mark)
- Q5.3 … "substitute some form of number … " (1 mark)
- Q5 (Paper 2): "hidebound farmers", "eventual revelation" and "inevitable consequences" (35 marks)

The team also found the format of the papers and questions to be appropriate. Further, the questions were stated in a concise and to-the-point manner, avoiding long wordy introductions or instructions.

The instructions on the information pages for each paper were very clear. Learners who read and followed the instructions to the letter would have had no problem in answering correctly and answering the correct number of questions.

With regard to the contextualisation of questions the team was of the opinion that the contexts in which the questions were set were appropriate for the South African learner. This was an improvement on the 2010 ERCO papers in which the texts clearly indicated an American influence.

With regard to the appropriateness of texts and the stimulus material provided, the team was of the opinion that they were clear (in most cases), appropriate and pitched at the correct level.

The team felt that, although the quality of the ERCO papers had improved considerably since 2010, a few issues could still be improved. The team suggested that the extracts from literary texts included in the paper should be placed in text boxes in order to clearly distinguish between the extracts themselves and the questions.

The team also suggested that all lines in extracts, and not only every fifth line, should be numbered. This would mean that, in texts, should a reference be in a line without a number, learners would be able to find it without having to count the lines. The team also noticed that the lines in some extracts were not numbered at all (see Q6). The instructions to Q6 contained an error "… IN YOU OWN WORDS" instead of IN YOUR OWN WORDS.

The team noticed that the extracts in the Brainline paper were placed in text boxes; nevertheless, the team found that the layout of this paper could have been improved. The spacing between sections and even between questions was not consistent throughout – this, and the many irregular white spaces created an unfinished impression.

The printing of the ERCO Paper 3 (which was at the team's disposal) was not of a high quality. The numbering of the general instructions for the paper was not always visible – it seems as though the numbering had been cut off during the printing/copying process. The images used in Q1.8a and Q1.8c were not very clear and the team found it strange that an image of a typical London bus sporting a BEEFEATER sign was included in the visual used for Q1.8c.

Carelessness by final proofreaders/editors of the ERCO papers contributed to an "unfinished" feel to the documents (papers and memoranda) that the team had at their disposal; for example, the words "Gereed om gedruk te word" on the cover page of the memorandum for ERCO Paper 1 as well as handwritten comments on the first page.

1.9 Closing remarks

The 2011 ERCO papers have greatly improved compared to the 2010 papers. However, the team was of the opinion that the 2011 papers were more difficult than those of the other examining bodies. This level of difficulty was exacerbated by the

elevated and, in some instances, verbose and archaic use of language. For this reason the team was of the opinion that the ERCO papers, although an improvement on the 2010 papers, could still be improved in future.

MATHEMATICS

2.1 Evaluators

Lynn Bowie, Alison Kitto and Williams Ndlovu

2.2 Introduction

The analysis of the NSC Mathematics papers was done by a team consisting of a consultant (a former examiner of both mathematics and additional mathematics with 30 years of experience as a Mathematics teacher and six years in mathematics teacher education), a Mathematics teacher (with 14 years' teaching experience and four years' experience in marking matric examinations) and a university lecturer (with 10 years' experience in lecturing mathematics and six years' experience in mathematics teacher education).

All learners taking the National Senior Certificate (NSC) are required to take and pass either Mathematics or Mathematical Literacy.

2.3 Method of analysis

In analysing the type of cognitive demand in the Mathematics examination papers for 2011, the team used the taxonomy of categories of mathematical demand set out on page 13 of the *DBE Subject Assessment Guidelines for Mathematics NCS*, January 2008. The team chose to use this taxonomy as it is tailored specifically for mathematics examinations. The description of the categories, as given in the Subject Assessment Guidelines (SAG), is shown in table 4.

Team members also used the examples of the types of question that can be set for each of the four categories of cognitive demand provided on pages 32 to 34 of the SAG, Jan 2008, to help guide their analysis.

In addition to using these categories the team designated a subcategory (E = easy, M = moderate, D = difficult) to each task. This subcategory was used to make finer distinctions within categories. For this reason we have looked at them in conjunction with the category designation. For example, we look at the number of questions involving routine procedures (R) at differing levels of difficulty, to get an idea of how many were easy (RE), moderate (RM) or difficult (RD).

Table 4: Cognitive levels as described in the Subject Assessment Guidelines

Cognitive levels	Explanation of skills to be demonstrated
Knowledge (K)	• Algorithms • Estimation; appropriate rounding of numbers • Theorems • Straight recall • Identifying from data sheet • Simple mathematical facts • Knowledge and use of appropriate vocabulary • Knowledge and use of formulae All of the above will be based on known knowledge.
Routine procedures (R)	• Problems are not necessarily unfamiliar and can involve the integration of different LOs • Perform well-known procedures • Simple applications and calculations which must have many steps and may require interpretation from given information • Identifying and manipulating of formulae All of the above will be based on known procedures.
Complex procedures (C)	• Problems are mainly unfamiliar and learners are expected to solve by integrating different LOs • Problems do not have a direct route to the solution but involve: ❖ using higher level calculation skills and reasoning to solve problems ❖ mathematical reasoning processes • These problems are not necessarily based on real-world contexts and may be abstract requiring fairly complex procedures in finding the solutions.
Solving problems (P)	• Solving non-routine, unseen problems by demonstrating higher level understanding and cognitive processes • Interpreting and extrapolating from solutions obtained by solving problems based in unfamiliar contexts • Using higher level cognitive skills and reasoning to solve non-routine problems • Being able to break down a problem into its constituent parts – identifying what is required to be solved and then using appropriate methods in solving the problem • Non-routine problems based on real contexts

The experience of the team in evaluating the 2008 and 2009 papers had led us to produce a refined taxonomy which we used for the analysis in 2010 and which we feel provides a good reflection of the level of difficulty of the paper. This categorisation is summarised in table 5 below.

Table 5: Categorisation of cognitive demand and level of difficulty

	Level	Categories and subcategories included	Description (to be read in conjunction with the descriptions in table 3)
Lower cognitive demand	Level 1	Knowledge and routine procedure (easy)	Questions that require recall or the performance of a simple, well-known procedure. The well-known procedure will generally require only one or two steps.
	Level 2	Routine procedure (moderate)	Questions that require the performance of a straightforward well-known procedure.
Higher cognitive demand	Level 3	Routine procedure (difficult) and complex procedures	Questions that either require the performance of a well-known procedure that is difficult to execute/involve complicated manipulation or that require performance of complex procedures where there is no direct route to the solution.
	Level 4	Problem solving	As described in table 3.

Each team member initially worked through the examination papers individually and allocated each question[1] to one of the categories of cognitive demand. After the initial individual analysis, the team discussed the papers question by question to produce a single team evaluation of the examination. Clearly, the categorisation of questions into the various levels of cognitive demand relies on the judgement and experience of each of the individual evaluators and, thus, there were questions where our evaluations differed. In these cases the team discussed and debated the cognitive demand of the question to reach consensus. In addition, the team kept a record of all the questions placed into each category. If there was a debate about whether to categorise a question as *routine* or *complex*, for example, we could compare the question to other questions in these two categories to help us decide where to place the question and to ensure consistency in our evaluations. The team referred to records of our allocation of questions from the 2009 and 2010 Mathematics examination papers into the categories and subcategories to help guide our allocation of questions from the 2011 examination papers and ensure consistency across the years.

The levels given in our taxonomy do not correspond exactly to the taxonomy provided in the SAG, as shown in table 3. However, in making a comparison

[1] If question 2 was divided into 2a, 2b i, 2b ii and 2c, we analysed 2a, 2b i, 2b ii and 2c separately. For ease of reference we will refer to these sub-questions and sub-sub-questions simply as questions.

between our evaluation and the weighting suggested in the SAG we have equated our level 1 with the lowest level of cognitive demand in the taxonomy, and our level 2 with the second lowest level, and so on. Although this decision means that we are, for example, comparing our level 1 (which contains both Knowledge and Routine Easy questions) with the SAG level 1 (which is the Knowledge category), the team felt the understanding and use of the categories in the taxonomy has evolved to represent the levels we present in table 4 more strongly. We thus felt that making the comparison in this way was appropriate.

2.4 Cognitive demand

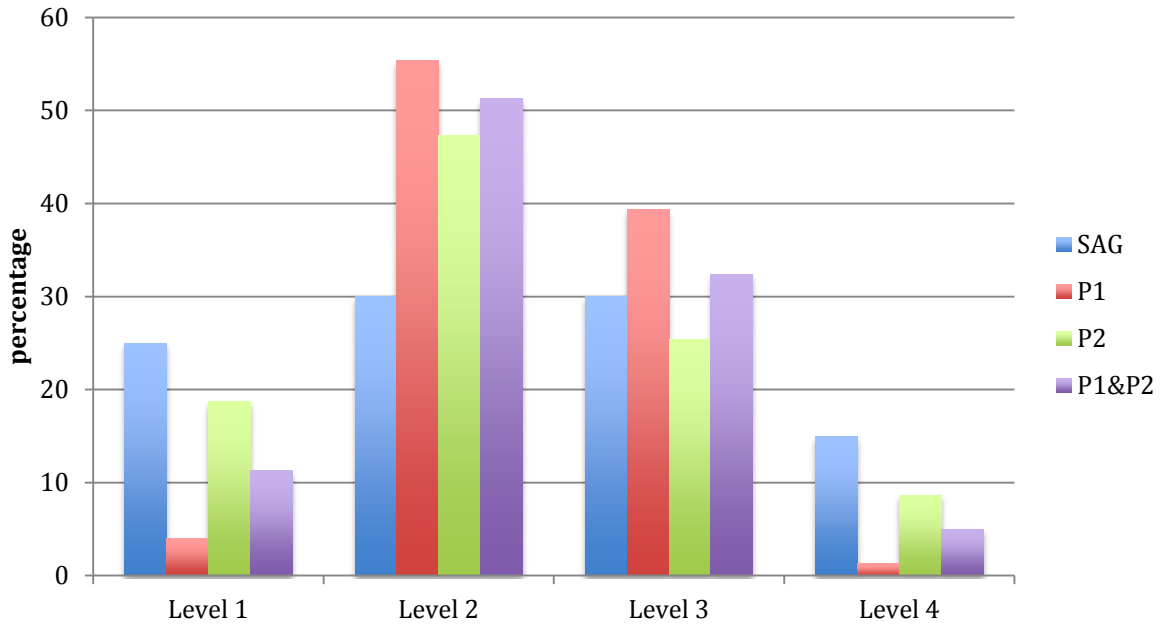
Table 6 and graph 6 below show the categorisation in terms of cognitive demand of the ERCO core Mathematics papers. Papers 1 and 2 are shown separately and a combined mark for both papers is given as well. The suggested allocation of marks as presented in the SAG document is also provided.

Table 6: Categorisation of cognitive demand

	SAG	P1	P2	Combined papers
Level 1 K+RE	25	4	19	11.5
Level 2 RM	30	55	47	51.5
Level 3 RD +C	30	40	25	32
Level 4 P	15	1	9	5

Comparing the allocation of marks to levels with the suggested allocation in the SAG we note the following:

- Neither paper contained sufficient level 4 (problem-solving) questions.
- Neither paper contained sufficient level 1 marks. This was particularly pronounced for Paper 1.
- Both papers were heavily weighted at level 2.



Graph 6: Cognitive demand and level of difficulty

2.5 Weighting of levels of difficulty

In table 7 we have combined levels 1 and 2 to give a picture of the weighting of lower cognitive demand compared to higher cognitive demand questions.

Table 7: Weighting of lower and higher cognitive demand

	SAG	P1	P2	P1&P2
Lower cognitive demand	55	59	66	63
Higher cognitive demand	45	41	34	37

Table 7 indicates that both papers were easier than the SAG recommend, although this was more pronounced for Paper 2.

2.6 Model for future use

The team felt that the papers were not good models for future use. A number of the questions asked focused on work that was emphasised in the old NATED curriculum that has subsequently been de-emphasised in the NCS, for example the work on logs in Q4.7 of Paper 1 or the testing of concurrency in Q1.3 of Paper 2. There was an overemphasis on problems that lead to simultaneous equations.

2.7 Standard and quality of papers

The team felt that much needs to be done to improve the quality of these examination papers. Comments on individual questions are provided in the Excel spreadsheet, but the team felt the following general points were important:

- It is useful to italicise variables and function names to distinguish them from ordinary text. We felt that it might be useful for the examiners to consider the use of Word's equation editor for mathematical text.
- In Paper 1, Q7 was spread over two pages and learners would have had to refer to information on the previous page to answer Q7.3–7.5. It would be preferable to try to avoid this.
- The financial mathematics questions were problematic:
- The complexity in Q2.1 was largely in reading the long description.
- In Q2.2 the statement that R445 per month is paid is not considered in the answer in the memo. However, if it is considered then it contradicts the answer. This means the question contains contradictory information.
- In Q2.3.2 the cost of the machinery differs from the amount borrowed calculated in Q2.3.1. This is confusing as the question implies the amount borrowed is the cost of the machinery.
- The data-handling questions could be improved:
- Although Q9.3 and 9.4 could be seen to test insight, the small number of data points used means that learners could just re-do the calculation. It would be better to ask a similar question, but without giving the actual data points.
- In Q10 the context is quite artificial.
- The team evaluated the English version of the papers. The English in these papers was often unclear (e.g. using variation width in place of range or mean point of concurrency in place of centroid, using the word "tapped" in Q3.3) or complicated. We believe that most learners use the Afrikaans version of the papers (which we did not see). However, if a learner were to use the English version of the papers they would have found some questions very difficult to interpret because of the poor language used.

2.8 Comparison of 2010 and 2011 Papers 1 and 2

Tables 8 and 9 below show the combined weightings of Papers 1 and 2 for 2010 and 2011.

Table 8: Levels 1 to 4 comparison of combined weighting 2010–2011

	SAG	2011	2010
Level 1 K+RE	25	11.5	21
Level 2 RM	30	51.5	43
Level 3 RD +C	30	32	36
Level 4 P	15	5	0

Table 9: Comparison of weighting for lower and higher cognitive demand 2010–2011

	SAG	2011	2010
Lower cognitive demand	55	63	64
Higher cognitive demand	45	37	36

These tables indicate that the proportion of lower to higher cognitive demand marks in the 2010 and 2011 ERCO Mathematics examinations was similar.

Table 10, shown below, indicates that, in 2010 and 2011, there is no pattern of consistent discrepancy in the level of difficulty of Papers 1 and 2.

Table 10: Papers 1 and 2 comparison of level of difficulty 2010–2011

	SAG	P1		P2	
		2011	2010	2011	2010
Lower cognitive demand	55	59	64	66	64
Higher cognitive demand	45	41	36	34	36

2.9 Closing remarks

We felt that the ERCO papers needed some work in terms of compliance with the curriculum and quality of typesetting.

PHYSICAL SCIENCES

3.1 Evaluators

Dr Sharon J Grussendorff (team leader), Ms Akeda Isaacs, and Dr André van der Hoven

3.2 Introduction

In order to make an attempt at benchmarking the NSC examinations held in 2011, the previous (Maintaining Standards 2008, 2009 and 2010) analyses of the 2008, 2009 and 2010 NSC examination papers were used.

In addition, the 2011 ERCO examination papers were considered in terms of their overall quality.

The papers analysed include the 2011 ERCO Physical Sciences final Papers 1 and 2.

3.3 Method of analysis

To provide a guide for decisions made about type of cognitive demand and level of difficulty, the Physical Sciences team used a table that has been developed and used in previous Umalusi benchmarking research projects (Umalusi, 2008). This tool was used because it has proved to be appropriate and useful in the analysis of Physical Sciences examination papers, and provides meaningful data.

Table 11: Types and levels of cognitive demand

Category	Level	Descriptions	Examples
Remember Factual knowledge (F)	Easy	Very simple recall; state a simple law or equation; recognise content in MCQ;	State term/simple definition e.g. velocity is rate of change of position; naming homologous series (simple); structural formula for simple (1 or 2 carbon) organic compounds e.g. ethane, methane etc; labelling diagrams
	Medium	Medium content, learnt diagrams	State Newton's laws, Boyle's law, draw electric field patterns etc; general formula for homologous series (containing functional groups), state Le Chatelier's principle
	Difficult	Recall complex content	Process for lab preparation of chemical compounds; testing for presence of chemicals; inorganic chemical interactions

Understand Conceptual knowledge (C)	Easy	Simple relationships; simple explanations; 1-step answers; derivation of units	Relationship between resultant and equilibrant; explain what is meant by …;
	Medium	Counter-intuitive relationships; qualitative proportional reasoning; more complex relationships or explanations; 2 steps to arrive at answer, simple applications; interpretation of realistic diagrams	Direction of acceleration for free-fall; effects of changes in circuits; identifying acid-base conjugates, redox pairs/ reactions etc; simple influences on dynamic equilibrium; diagrams of AC/DC generators; naming type of reaction etc; formulate a hypothesis; identify dependent and independent variables and controlled variables; writing conclusions
	Difficult	Identify principles which apply in a novel context; explaining complex reasoning involving synthesis, critical argument; novel or abstract contexts etc	Identify all influences on realistic motion; identify isomers of organic compounds; complex influences on dynamic equilibrium
Problem solving (P)	Easy	Simple procedure; plug into formula with only one unknown; no extraneous information; known or practised context; simple chemical equation	Given current and resistance, calculate voltage; simple conservation of momentum; reading values off a given graph;
	Medium	Sketch graphs; construction or interpretation of schematic diagrams; problems with 2 or more steps; basic logic leaps; proportional reasoning; interpretation of table of data; acid-base or redox equation	Sketch graph of motion or get information from given graph; force or vector diagrams; diagrams of drip patterns; circuits diagrams; concentration or molar calculations; naming of organic compounds; writing and balancing equations for reactions; using redox table; writing structural formulae
	Difficult	Complex abstract representation; combination of concepts across sub-fields; complex problems involving insight and logic-leaps; formulating new equations (using all unknowns); problem solving in novel context	Interpret complex graphs; translate between various graphs of motion; combine equations for mechanical energy and motion; combine gravitational and electrostatic forces; complex circuit calculations; combination of various factors influencing equilibrium

3.4 Results of examination paper analysis

Overall impression of the ERCO exam papers for 2011

The Umalusi Physical Sciences evaluation team found the 2011 ERCO papers to be extremely superficial; moreover, the team believes that they cannot be considered to be of a sufficiently high standard. The following specific comments should be noted:

- The formula sheet provided in Paper 1 did not match that in the Examination Guidelines document, as it contained some errors, and some missing formulae.
- The paper included questions on double-slit interference patterns, which are beyond what is stipulated in the Examination Guidelines document.
- In one of the problems the value used for the acceleration caused by gravity contradicted what was given in the information sheet.
- There were a number of spelling and grammatical errors throughout the paper (in the English version). In addition one of the questions had missing words which made the question unanswerable.
- The memorandum did not indicate whether marking should be positive, and did not supply any alternatives.

Note on the language level in the ERCO NSC 2011 papers

No problems were noted with the language levels of the exam papers. However, the English versions of the exams contained numerous spelling and language errors. The Afrikaans papers were not considered by this team.

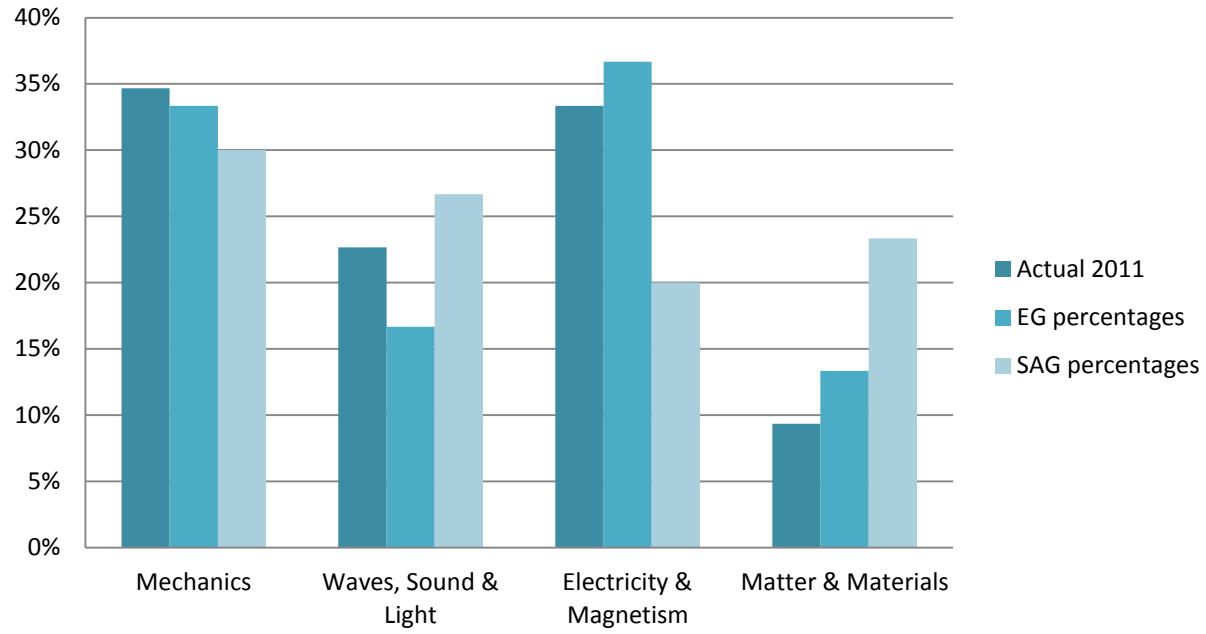
3.5 Compliance with Subject Assessment Guidelines

In completing the analysis of the ERCO examination papers, it was assumed that Annexure A of the DBE Examination Guidelines should also apply to these exams.

Compliance of knowledge areas

The ERCO Paper 1 agrees with the Examination Guidelines document (2009) except in Waves, Sound & Light, which is over-represented, and Matter & Materials, which is under-represented. In the ERCO Paper 2 there is a good match between the exam paper and the stipulated percentage in the Examination Guidelines document. However, both papers have not taken Annexure A to the Examination Guidelines (2010) into account

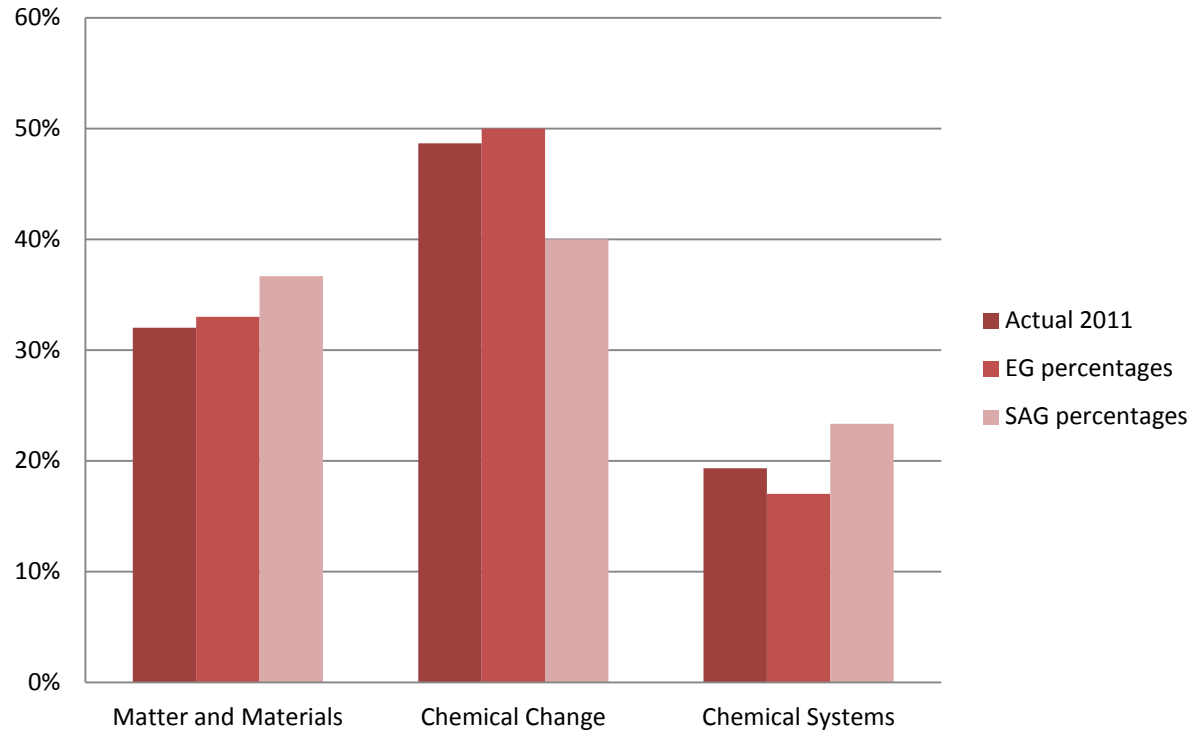
The following graph shows a comparison of the percentage coverage of knowledge areas in the DBE Examination Guidelines (2009) and Subject Assessment Guidelines (SAG) (2008) and the coverage in the ERCO 2011 Paper 1.



Graph 7: Paper 1 – comparison of knowledge area coverage

The 2011 Paper 1 agrees with the Appendix of the Examination Guidelines (2011) in the areas of Mechanics and Electricity & Magnetism, but is over-represented in Waves, Sound & Light, and under-represented in Matter & Materials. It also differs markedly from the SAG, but this is as a result of the multiple changes that have taken place in the history of the NCS.

The following graph shows a comparison of the percentage coverage of knowledge areas in the Examination Guidelines (2009) and the SAG (2008) and the coverage found in the ERCO 2011 Paper 2.



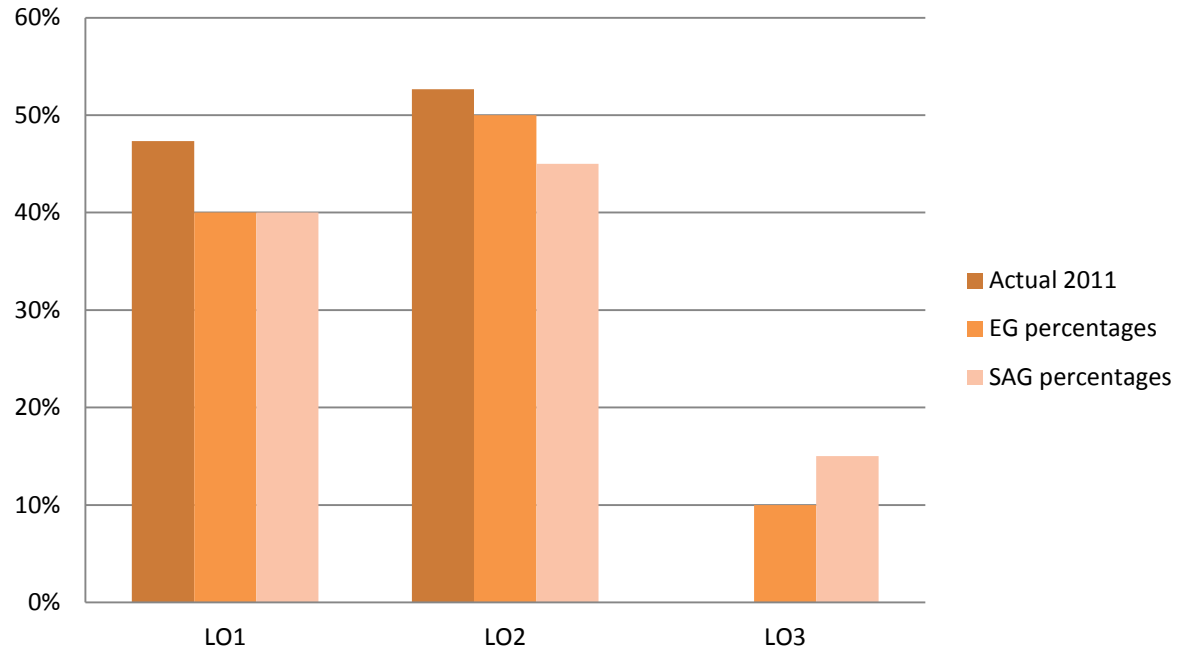
Graph 8: Paper 2 – comparison of knowledge area coverage

There is a good agreement between the 2011 ERCO exam paper and the stipulated percentage in the Examination Guidelines document.

It was noted that the content of Colour and Lasers was examined again (as it was in 2010), despite the fact that these were stipulated as non-examinable in Annexure A (2010) of the Examination Guidelines document.

Match with learning outcomes

The following graph shows a comparison of the percentage coverage of learning outcomes in the Examination Guidelines (2009) and the SAG (2008) and the coverage in the ERCO 2011 Paper 1.

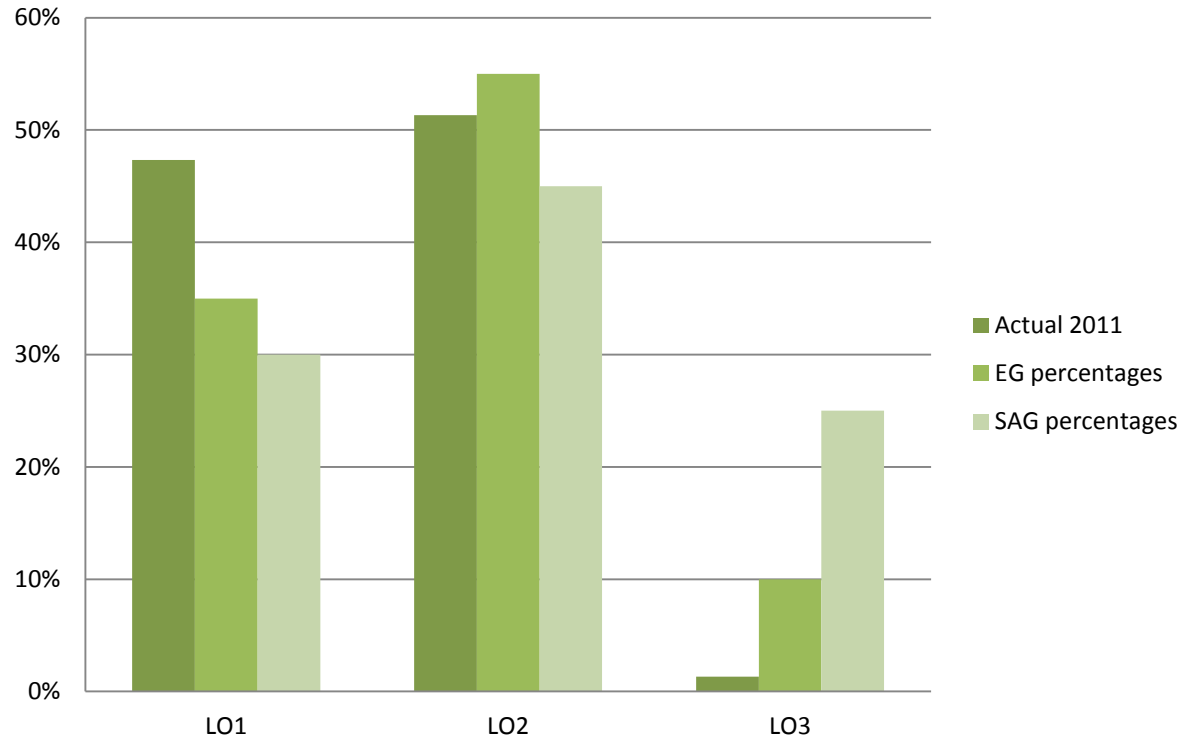


Graph 9: Paper 1 – comparison of learning outcome coverage

This graph shows a higher percentage of LO1 questions than either of the guideline documents suggest. This is because of the large proportion of problem-solving questions in Paper 1. There are no questions on LO3, which is a contravention of the stipulations in the guidelines.

The following graph shows a comparison of the percentage coverage of learning outcomes in the Examination Guidelines (2009) and the SAG (2008) and the coverage in the ERCO 2011 Paper 2.

Again this graph shows a bias towards questions that assess LO1. This is because of the large proportion of problem-solving questions in Paper 2. LO3 is again under-represented (only 1%).



Graph 10: Paper 2 – comparison of learning outcome coverage

3.6 Model for future use

Overall, the impression of both papers was that they are not a good model for future examinations because they are far too superficial and poorly structured to suffice as a Grade 12 exit-level examination paper.

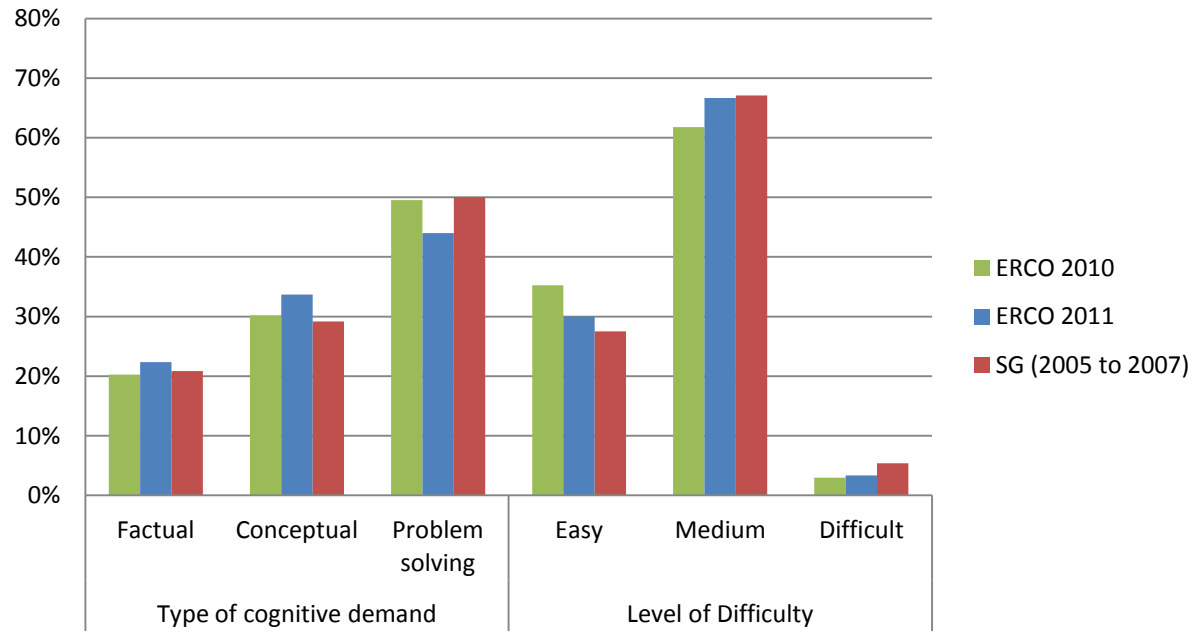
3.7 Standard and quality of papers

The marks associated with the various types of cognitive demand and levels of difficulty were combined for each exam paper analysed, and these were compared with the 2010 ERCO exams. These are presented in table 12 below:

Table 12: Comparison of cognitive demand and level of difficulty 2010–2011

Year	Type of cognitive demand			Level of difficulty		
	Factual	Conceptual	Problem solving	Easy	Medium	Difficult
2010	20%	30%	50%	35%	62%	3%
2011	22%	34%	44%	30%	67%	3%

During the analysis of the ERCO exam papers the Umalusi evaluators had a sense that the overall exam resembled a Standard Grade paper from the previous NATED 550 qualification. The team consequently decided to test this perception. A graph of these results is shown below in Graph 11:



Graph 11: Comparison of 2010–2011 papers with standard grade 2005–2007

This graph shows the clear resemblance of the ERCO 2010 and 2011 papers with the prior Standard Grade examination level for two years running – in fact the ERCO papers are less demanding than the previous Standard Grade papers, as shown by the lower percentage of difficult questions (3% in both 2010 and 2011 compared with 5% on the old SG) and a higher percentage of easy questions (35% in 2010, and 30% in 2011, compared with 28% on the SG). This raises urgent concerns about this examination being placed on a par with other NSC examination papers.

Closing remarks

In the ERCO examination papers the amount of text used was kept to the necessary minimum.

Overall standard of exam papers

- The combined percentage of easy and factual questions in the ERCO Physical Science papers is 42%, which is a large percentage for marks that are attainable at the lower end.
- ERCO has a low percentage of conceptual questions (34%). Analysis of learner results in an Item Response Theory study (Umalusi, ongoing) has shown that learners find conceptual questions most difficult, even ones judged to be easy by the Umalusi evaluators.
- It was found that generally the exams lacked questions which probe deep conceptual understanding. These are categorised as Conceptually Difficult questions using the Umalusi Physical Sciences tool. The following table shows the percentages of questions that fall into the Conceptually Difficult category in each paper.

Table 13: Percentages of questions falling into conceptually difficult category

Exam Paper	Percentage of conceptually difficult
Paper 1	3%
Paper 2	0%

3.8 References

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LIFE SCIENCES

4.1 Evaluators

Dr Edith Dempster (team leader), Susan Wiese and Lizette Cilliers

4.2 Summary

Curriculum change

A *New Content Framework for Life Sciences* was examined for the first time in 2011 by all examining bodies. A curriculum comparison showed that Environmental issues in the original NCS has been replaced by population and community ecology in the New Content Framework and several topics have been added to the curriculum. The overall effect is that cognitive demand has increased in the examined curriculum for 2011. It was noted that the IEB added depth to the topics retained.

Knowledge areas have been moved between examination papers, with Heredity and Evolution now being examined in Paper 1, and Life Processes and Ecology in Paper 2. This is an improvement on the previous arrangement. Prescribed weighting on levels of cognitive challenge and LOs has also changed.

Analysis of examination papers

Examination papers for 2011 were analysed using a four-level measure of cognitive demand, and three levels of difficulty.

Cognitive demand:

- Remember factual or conceptual knowledge
- Understand facts or concepts
- Apply procedures, facts or concepts to unfamiliar contexts
- Analyse or evaluate supplied or recalled information, or create a new product

Levels of difficulty:

- Easy: a question that is easy to understand, based on content that learners find easy to learn, and requiring an output that is easy to construct.

- Moderate: questions that are somewhat more difficult to understand, based on content that learners find more difficult to learn, and requiring an output that is more difficult to construct.
- Difficult questions are difficult to understand, and/or based on content or skills that are cognitively challenging, and require an output that learners find difficult to construct.

The examination papers analysed for this report were the ERCO Life Sciences Papers 1 and 2, which examined only the New Content Framework.

ERCO deviated somewhat from the percentage of marks allocated to each knowledge area as specified in the respective assessment guidelines (Examination Guidelines 2009 and 2011 for DBE).

ERCO examinations

The 2011 examination was overweighted in understand-type questions, and underweighted in higher-order questions relative to the Examination Guidelines of 2011. Paper 2 was rated as somewhat easier than Paper 1. Overall, the proportion of marks allocated to difficult questions was low. As the examination was rather easy, and given that the curriculum was more demanding, we predict a similar mark profile to previous years.

Numerous spelling, grammatical and scientific errors were detected in the examination papers.

Concluding comments

Specific recommendations and critiques of types of question are given in the main report.

4.3 Introduction

The subject of Life Sciences emerged from the merger of the old Biology and Physiology subjects of the NATED 550 curriculum. Life Sciences is structured around three LOs:

- LO1 The learner is able to competently explore and investigate phenomena relevant to Life Sciences by using inquiry, problem-solving, critical-thinking and other skills.
- LO2 The learner is able to access, interpret, construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences.
- LO3 The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and biases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.

The LOs are further subdivided into assessment standards, which indicate progression across the three years of FET. The assessment standards are not used in the design of assessment tasks.

The LOs have been adopted in practice. LO1 is interpreted as any question that can be answered using skills only. It includes extracting information in given text, interpreting tables of data and graphs, and drawing graphs. LO2 is interpreted as any question that requires acquired knowledge or concepts for the construction of an answer. LO3 is interpreted as questions that relate to learners' everyday life.

The subject matter is organised into four knowledge areas:

- Tissues, cells and molecular studies
- Structure, control and life processes in plants and animals
- Environmental studies
- Biodiversity, change and continuity

(National Curriculum Statement Life Sciences 2003)

New Content Framework 2011

A new curriculum for Life Sciences was introduced in Grade 10 in 2009 and was examined in the NSC for the first time in 2011. This is referred to as Version 1 in the examination papers and throughout this report. However, part-time candidates and those repeating the subject had the option of writing examinations on the previous curriculum. This paper is referred to as Version 2 in the examination papers and throughout this report.

ERCO examined the New Content Framework only.

Comments

The structure of the examination papers is as follows:

Theory papers x 2 (2,5 hours each)

- Section A: short answers 50 marks
- Section B: variety of question types 60 marks
- Section C: data-response questions 20 marks
- Mini-essay 20 marks
- Total marks 300

Analysis of examination papers

- Paper 1
- Paper 2

Documents used to guide the analysis were the following:

- DBE Life Sciences Subject Assessment Guidelines 2008 (for Version 2)
- DBE Life Sciences Examination Guidelines 2009 (for Version 2)
- DBE Life Sciences Examination Guidelines 2011 (for Version 1)
- IEB NSC Handbook 2009

4.4 Method of analysis

Cognitive demand

Pollitt, Ahmed and Crisp (2007) define "demand" as the "cognitive mental processes that a typical student is assumed to have to carry out in order to complete the task set by a question" (p. 169) and "difficulty" as "an empirical measure of how successful a group of students were on a question" (p. 169). Demand requires that examiners and evaluators of examinations identify what happens in the student's mind as s/he makes sense of a question and constructs a response to a question. Difficulty derives from the ability of the student and the requirements of an assessment task. It is estimated by analysis of students' scores on an examination or test. Accurate analysis of difficulty can only be conducted after the examination

process, since many unexpected factors intervene when students actually respond to questions (Pollitt et al. 2007; Coe 2008).

In the 2008 Maintaining Standards project, Umalusi required analysts to assign questions to one of three levels of cognitive demand, using a supplied analytical instrument. It also required analysts to make a subjective assessment of the level of difficulty on a three-level scale. This was conducted before examination results were available. The release of average marks for the three years prior to 2010 (Mabizela, 2011) enabled us to check our estimates of level of difficulty of examinations against the actual performance of learners. The results are presented in the tables that follow.

Life Sciences has been analysed for four successive years, using a three-level instrument as requested by Umalusi. There are advantages to all subjects using the same instrument, such as enabling comparability across subjects, as has been attempted by the Curriculum and Qualifications Authority and its successor, Ofqual in the United Kingdom (see, for example, QCA 2008a, 2008b; Ofqual 2011). However, in South Africa, agreement has not been reached among subjects on a common taxonomy, and each subject has adapted the recommended Umalusi instrument to suit that subject.

The curriculum change in 2011 permitted Life Sciences to change to a four-level taxonomy, which is aligned with the IEB taxonomy.

The taxonomy used in the 2011 analysis is based on the cognitive dimension of the Revised Bloom's Taxonomy (Anderson & Krathwohl, 2001) and shown in Table 18. One addition was made to the Anderson and Krathwohl definition for the cognitive skill "apply": apply conceptual or factual knowledge in an unfamiliar context. This is in line with the original Bloom's definition of the conceptual skill "application".

Table 14: Taxonomy of cognitive demand used in the analysis

Type of cognitive demand	Description
Remember	Recall; remember; identify; recognise
Understand	Interpret, exemplify, classify, categorise, infer (draw conclusion), compare, explain why
Apply	Implement, execute a procedure; apply conceptual or factual knowledge in an unfamiliar context
Analyse, evaluate, create	Find coherence, integrate, differentiate, check, create hypothesis, make a product, deconstruct complex information

Levels of difficulty

The required levels of difficulty have remained unchanged since the 2008 study.

Table 15: Criteria used in assigning levels of difficulty

Level of difficulty	Description
Easy	Simple wording, easy subject matter, short answer, answer easily extracted from text, professional experience
Moderate	Between easy and difficult
Difficult	Complex wording, more difficult subject matter, extended answer, use own knowledge and understanding in addition to provided information; professional experience

Not all three criteria need to be present for a question to be rated in terms of level of difficulty. Our combined experience of teaching Life Sciences also enabled us to make a subjective judgement of the level of difficulty of each question.

The three analysts discussed the various levels to clarify the criteria for each. We also referred to the definitions for each type of cognitive demand given by Anderson and Krathwohl (2001). We then analysed each exam paper independently, and entered our analysis on a spreadsheet. Where it was noticeable that we differed markedly in our analysis, we discussed the question, and arrived at a more similar decision. Totals for each cognitive level and level of difficulty were then calculated for each analyst, and averages calculated.

Each question was allocated to an LO and a Knowledge Area. Totals were calculated for each paper.

4.5 Compliance with the Subject Assessment Guidelines

The ERCO Paper 1 was similar to the weighting of knowledge areas prescribed by the SAG, but Paper 2 was substantially over-weighted in Life Processes and underweighted in Ecology. LO2 was slightly underweighted, and LO1 over-weighted, but within an acceptable range.

Table 16: Percentage of marks allocated per knowledge area and learning outcome compared with the SAG

Knowledge area/LO	SAG	Paper 1	Paper 2	Combined
DNA, protein synthesis, genetics	60	62.7		
Evolution	40	37.3		
Coordination & reproduction in plants & animals	60		72.0	
Ecology	40		28.0	
LO1	30			33.7
LO2	60			55.7
LO3	10			10.7

4.6 Cognitive demand and level of difficulty

Q: Comment on the cognitive demand and difficulty level of the paper(s) in relation to the stipulations of the SAG.

ERCO uses the DBE Examination Guidelines and Policy document to guide its curriculum and assessment.

Table 17: Percentage marks by cognitive demand, compared with examination guidelines

Cognitive demand	ERCO			Examination guidelines	
	Paper 1	Paper 2	Combined		
Remember	25.6	30.0	27.8	30	Knowledge
Understand	37.6	40.2	38.9	30	Comprehension
Apply	29.6	19.8	24.7	20	Application
Analyse, evaluate & create	7.3	10.0	8.7	20	Evaluation and synthesis

The two papers differed in terms of the cognitive demand profile, especially as Paper 1 had a much higher proportion of marks for "apply" questions than Paper 2. Overall, the examination was over-weighted in understand, and underweighted in higher-order questions.

Table 18: Percentage marks by level of difficulty

Level of difficulty	Paper 1	Paper 2	Combined
Easy	38.9	43.8	41.3
Moderate	47.6	46.0	46.8
Difficult	13.6	10.2	11.9

Paper 2 was rated as somewhat easier than Paper 1. Overall, the proportion of marks allocated to difficult questions was low. Accordingly, the examination was rather easy.

4.7 Model for future use

The format of the ERCO papers is the same as that of DBE papers. This is a satisfactory format for examinations.

4.8 Standard and quality of papers

In terms of the standard and quality of the 2011 final exam papers, especially with regard to language level, format of questions, the contextualisation of questions as well as the use and appropriateness of text and stimulus material for the questions, we found the following:

- There were numerous spelling and grammatical errors.
- Not all diagrams had been reproduced clearly.
- The layout of the paper was satisfactory, with white space between questions, and a clear font.
- Examiners had tried to keep all parts of a question on the same page, especially where learners had to refer to a diagram on a previous page.
- Marks were clearly indicated alongside questions.
- Sources of text and case studies were given in some, but not all, cases.
    - for example, the source of a graph showing brain size in several hominid species in Q4.1, Paper 1 was not identified
- Q4.1.2 of Paper 1 showed a phylogenetic tree for primate species without indicating the source.

- Q4.1.2b indicates a misconception about the interpretation of phylogenetic trees.
- Q4.1.2c also indicates a misconception about the interpretation of a phylogenetic tree.
- Q4.2 contains five spelling errors.
- The answer given to Q4.1.1e does not match the question.
- In Paper 2, Q1.1.7 does not make sense.
- Q1.2.1 contains an incorrect definition of ecological footprint.
- Q1.2.6 is incorrect.
- Q2.3.1a) is scientifically incorrect.
- Q3.4.3 contains a spelling error that changes the meaning of the question.
- The diagram in Q3.5 is very confusing, because it shows a bundle of nerve fibres emanating from a single myelin sheath, which is incorrect. In this question the examiner confused a single nerve with a single neuron.
- Q4.3 begins with irrelevant information.

In the 2010 report, we said that the format of the questions demanded too much reading, since every question was based on source material, and many questions were asked with few marks allocated to each. In 2011, the examiners reduced the reading demand of the examination, and reduced the complexity of the source material.

4.9 Comparison for 2010–2011 Life Sciences exam papers

Table 19: Percentage marks by cognitive demand and level of difficulty 2010–2011

Cognitive demand	**2010**	**2011**
Remember	22.2	24.4
Understand & apply	54.9	49.2
Analyse, evaluate, create.	22.9	28.4
Level of difficulty		
Easy	32.3	41.5
Moderate	47.1	42.1
Difficult	20.6	16.4
Raw mean score and standardisation decision	43.9	

The context of questions was accessible and appropriate for the subject matter.

Overall, the legibility of the papers was better than in 2010.

Several factors impact on a direct comparison of 2011 paper with 2010:

- 2011 examinations are based on somewhat different subject matter, with greater complexity than 2010.
- The weighting of LOs and cognitive levels has changed in the Examination Guidelines for 2011.

We note that our overall evaluation of the level of difficulty of the 2010 examinations is reflected in the mean scores obtained by learners. In 2009, a mean score of 38.65% was accepted for ERCO candidates. We assessed the 2011 examinations as less difficult than 2010, although, given that the curriculum was more demanding, we predict a similar mark profile to previous years.

4.10 Closing remarks

The 2011 ERCO papers provide the sources of case studies, diagrams and data sets. However, some ERCO questions provide false and misleading information that detracts from learning.

It was found that the essays in the ERCO papers required the reproduction of limited factual material, such as "state the causes, THREE symptoms and the possible treatment and prevention of gonorrhoea and HIV/AIDS." The memorandum contains a list of facts that would be marked correct, and a four-mark generic checklist for synthesis.

4.11 References

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GEOGRAPHY

5.1 Evaluators

Dr Sue Cohen (team leader), Ms Kedi Molapo and Ms Jenny Simons

5.2 Introduction

The 2011 ERCO Geography papers were analysed. The examination comprises two papers, Paper 1, a theory paper, and Paper 2, a paper consisting mainly of map work.

Both papers were analysed with regard to their compliance with the ERCO SAG. In this analysis, both the structure and the mark allocation of the various sections, as specified by the SAG for each paper, were analysed, as well as the compliance of each paper separately and combined with the examination as a whole for cognitive demand. The level of difficulty of each paper was also analysed, but the spread of questions across these levels is not specified in the SAG, and so the question of compliance was not considered. The cognitive demand and levels of difficulty of the 2011 papers were then compared with those of the 2008, 2009 and 2010 papers.

5.3 Method of analysis

The Umalusi instrument used for the analysis required that each question be analysed in terms of

- cognitive demand
- level of difficulty
- curriculum content

In Geography, five types of cognitive demand in a hierarchy of demand and three levels of difficulty for each were considered. This allowed for a fairly nuanced analysis of the papers.

Table 20: The Umalusi 5-level instrument – types of cognitive demand and level of difficulty

Type of cognitive demand	Level of difficulty
Conceptual knowledge (CK) Recall and recite knowledge Define and describe Identify, label, select, locate information	Easy
	Moderate
	Difficult
Comprehension (C) Understanding of previously acquired information in a familiar context Regarding information gathering: change or match information Regarding use of knowledge: distinguish between aspects, compare and predict, defend and explain	Easy
	Moderate
	Difficult
Application (A) Interpret and apply knowledge Choose, collect and do basic classification of information Modify existing information by making use of comprehended knowledge	Easy
	Moderate
	Difficult
Analysis & Problem-solving (A&PS) Analysis of information in a new or unfamiliar context Examine and differentiate Research and investigate information Distinguish to find the most appropriate solution	Easy
	Moderate
	Difficult
Evaluation & Synthesis (E&S) Making judgements (evaluate), critique, and recommend by considering all material available Weigh possibilities and make recommendations Synthesise or create innovative solution Construct or formulate new ideas	Easy
	Moderate
	Difficult

However, the papers were initially analysed using the three-level instrument shown in Table 28. In this three-level typology, the two highest cognitive levels on the five-level typology are collapsed into one, and comprehension and application are similarly collapsed to make one middle level category. For the sake of consistency, therefore, the findings of the analysis of cognitive demand are reported using this three-level typology. Where relevant, more nuanced information from the five-level analysis is used to comment on the findings.

Table 21: The Umalusi 3-level typology

	TYPE OF COGNITIVE DEMAND	LEVEL OF DIFFICULTY
Lower order	Basic conceptual knowledge Recall, Literal comprehension, Making simple evaluative judgements in terms of previously acquired facts, etc.	Easy
		Moderate
		Difficult

Middle order	Comprehension, application Understanding, application, analysis of previously acquired information in a familiar context Making evaluative judgements that require the use of a range of previously acquired facts/information, etc	Easy
		Moderate
		Difficult
Higher order	Problem solving Analysis, interpretation and application of information in a new or unfamiliar context Synthesis, creation of novel solution or product Evaluation or making judgement in relation to a mixture of old and new material or information	Easy
		Moderate
		Difficult

5.4 Compliance with Subject Assessment Guidelines

The ERCO sets its papers in accordance with the DBE SAG.

Structure of the examination

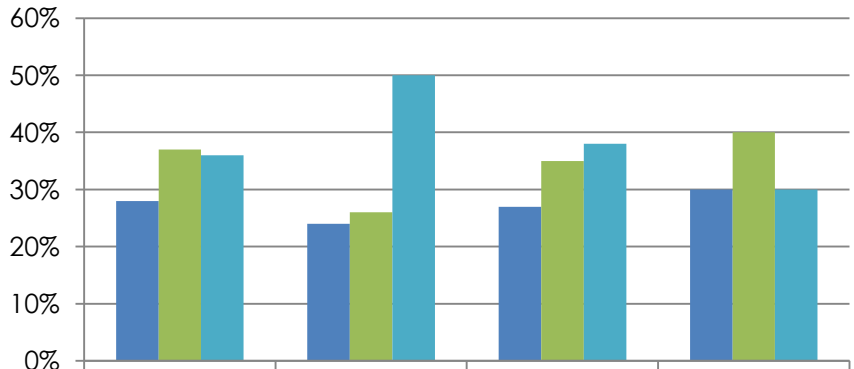
The structure of the ERCO examination complies with the requirements of the SAG. There are two papers for this subject: Paper 1 complies with the SAG in terms of the number of questions, in the same sections as required, and with the appropriate marks for each question and the paper as a whole. Table 22 below shows that Paper 2 complies with the allocation of marks across the two categories of question types, and the total for the paper as a whole.

Table 22: Paper 2 comparison with SAG – structure and compliance

	SAG	Paper 2
Basic map work skills	20	18
Application of theory	80	78
Total	100	100

Cognitive demand

Graph 12 below shows how the cognitive demand of the ERCO examination conforms to the SAG.



	P1	P2	P1 &P2	SAGS
Low: CK	28%	24%	27%	30%
Middle: C	37%	26%	35%	40%
Higher order: A; A&PS; E&S	36%	50%	38%	30%

Graph 12: Comparison of papers with SAG

Paper 1

Paper 1 complies well to the SAG, although is slightly more heavily weighted in the higher order than is required by the SAG.

Paper 2

The higher order is more heavily weighted than is required by the SAG and the low and middle order were concomitantly too lightly weighted. This is not surprising as this is the map work paper, which, by specification, has a high percentage of questions requiring the application of theory to the map provided.

Overall

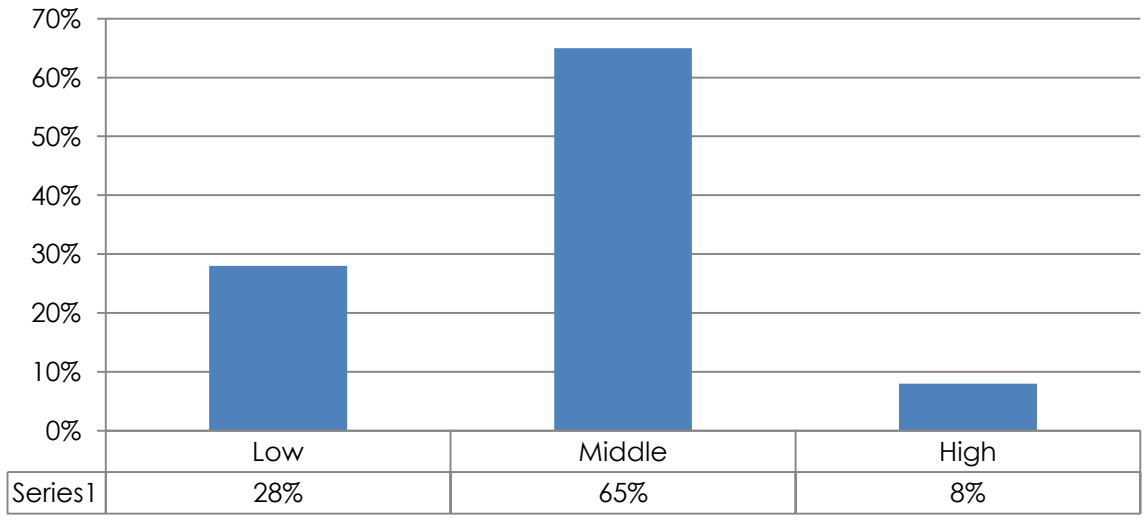
A reasonable degree of compliance has been achieved, although there is some weighting of the top levels of cognitive demand at the expense of mainly the middle.

5.5 Analysis of cognitive demand and level of difficulty using the Umalusi instrument

Cognitive demand

As with the other papers, the spread of marks across the three levels of cognitive demand in the Umalusi 3 level instrument was analysed. This is the first year in which ERCO set its own paper, and so only findings from the 2011 examination are presented here.

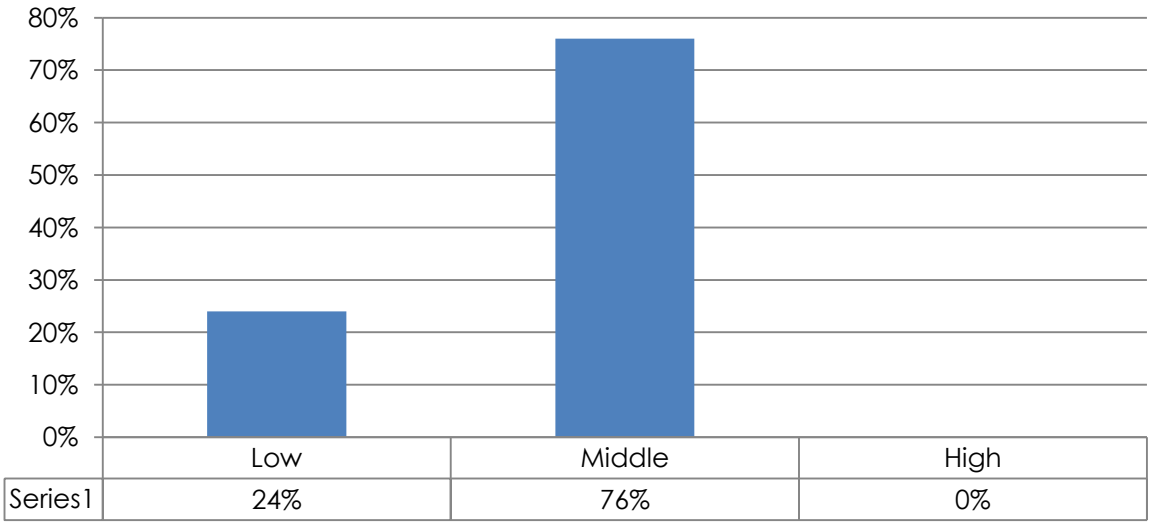
Graph 13 shows the findings for Paper 1.



Graph 13: Paper 1 – cognitive demand

The above graph shows that the greatest weighting of the cognitive demand for this paper lies in the middle level, followed by the low level, while the high order is the least weighted. This suggests that the paper is unlikely to discriminate the top-achieving candidates in the group effectively. Also, weak candidates will possibly find the paper difficult as the bulk of the marks are not in the low order, but require both comprehension and application skills.

Graph 14 below shows the finding for Paper 2.

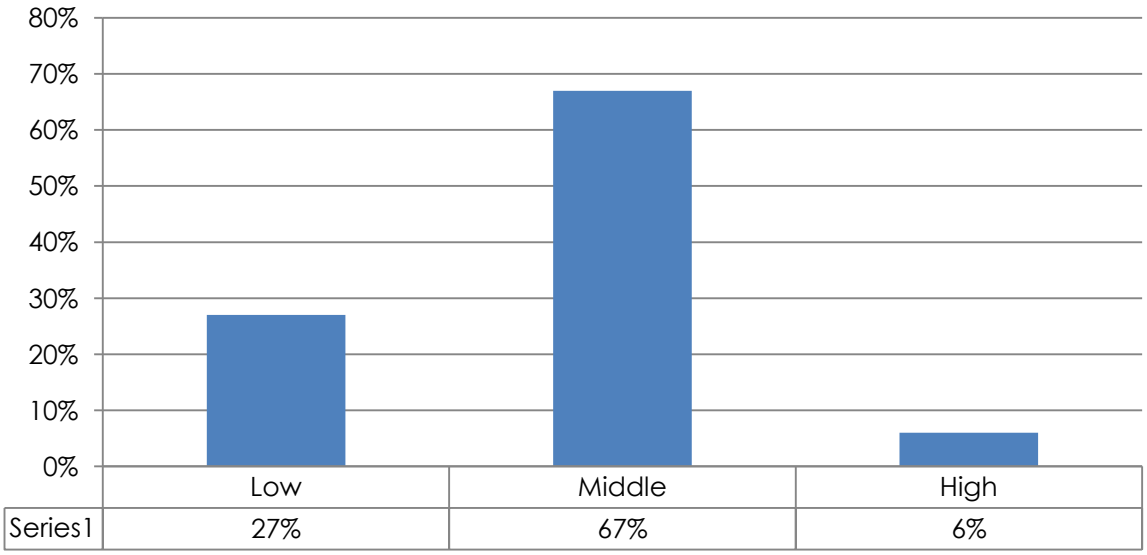


Graph 14: Paper 2 – cognitive demand

This paper is dominated by questions in the middle order – which, as suggested above, is in part explicable by the fact that it is the map work paper. What is noticeable, however, is that there are no questions demanding higher order thinking as defined by this typology. About one quarter of the marks is for questions which make low cognitive demand. This paper is therefore likely to be easy for strong candidates, with little to differentiate the really excellent among the group. Weaker candidates might be challenged by the low proportion of low order questions.

Graph 15 below shows the findings for the entire examination.

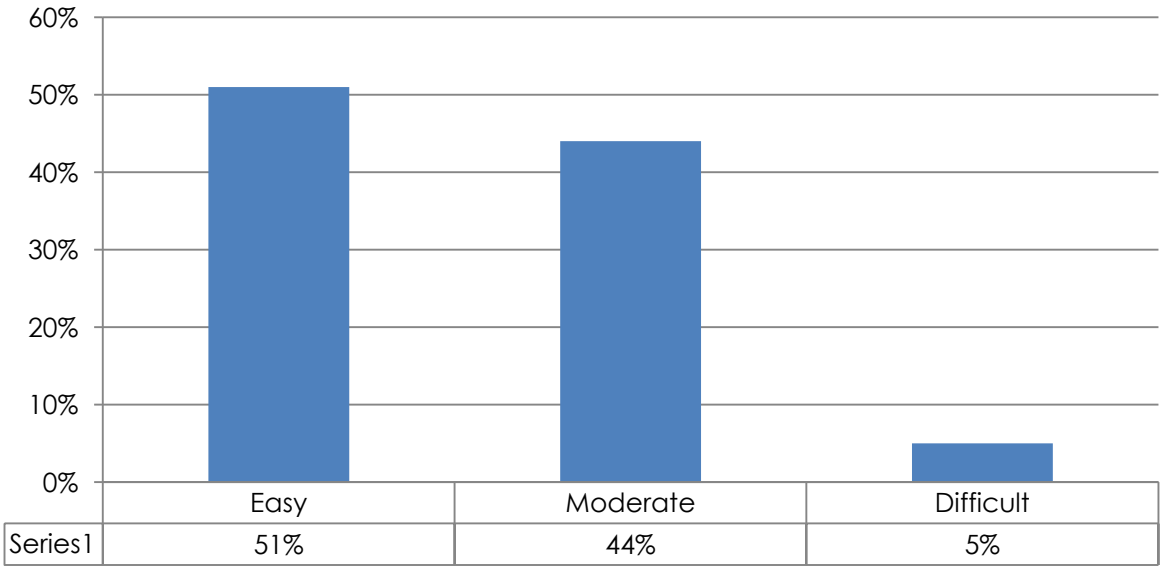
Here the weighting in the middle order noticed in the individual papers is again reflected, as is the small percentage of marks in the high order and the relatively low percentage in the low order. It is likely, given this distribution, that the cognitive demands of the paper will be challenging for weak candidates, and less so for stronger candidates.



Graph 15: Combined papers – cognitive demand

Level of difficulty

Graphs 16, 17 and 18 show the findings for the analysis of level of difficulty for the two papers and the examination as a whole

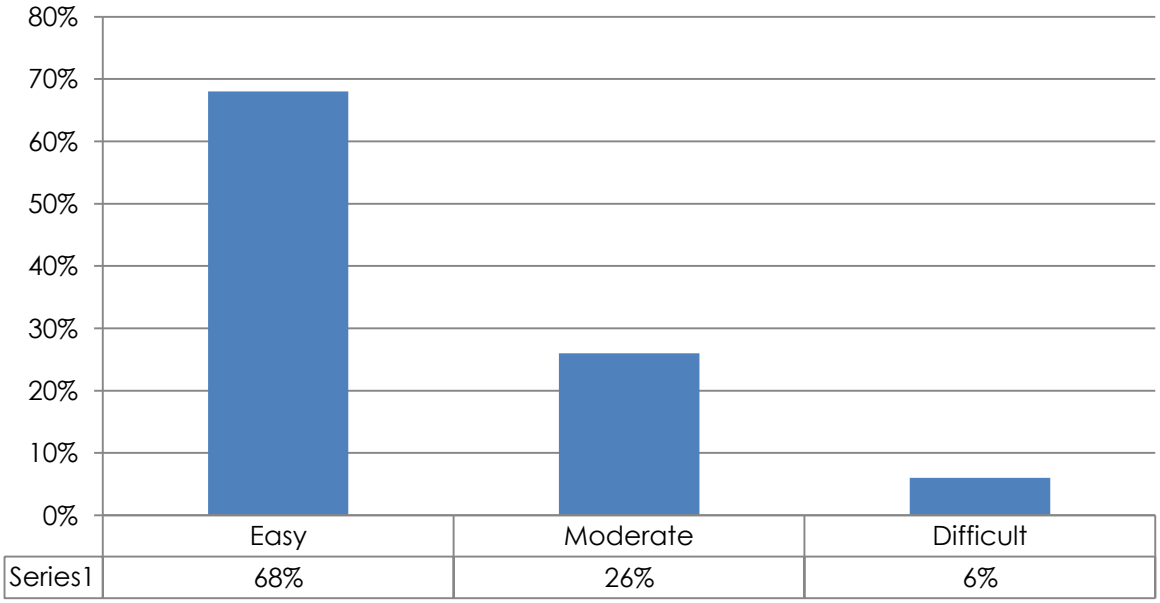


Graph 16: Paper 1 – levels of difficulty

Graph 16 shows that almost half the marks in Paper 1 was for questions deemed easy, while almost as many were for moderately difficult questions and only 5% for

questions deemed difficult. This suggests that weak candidates should not find the paper too difficult, and strong candidates should find it easy.

Graph 17 reflects the findings for Paper 2.

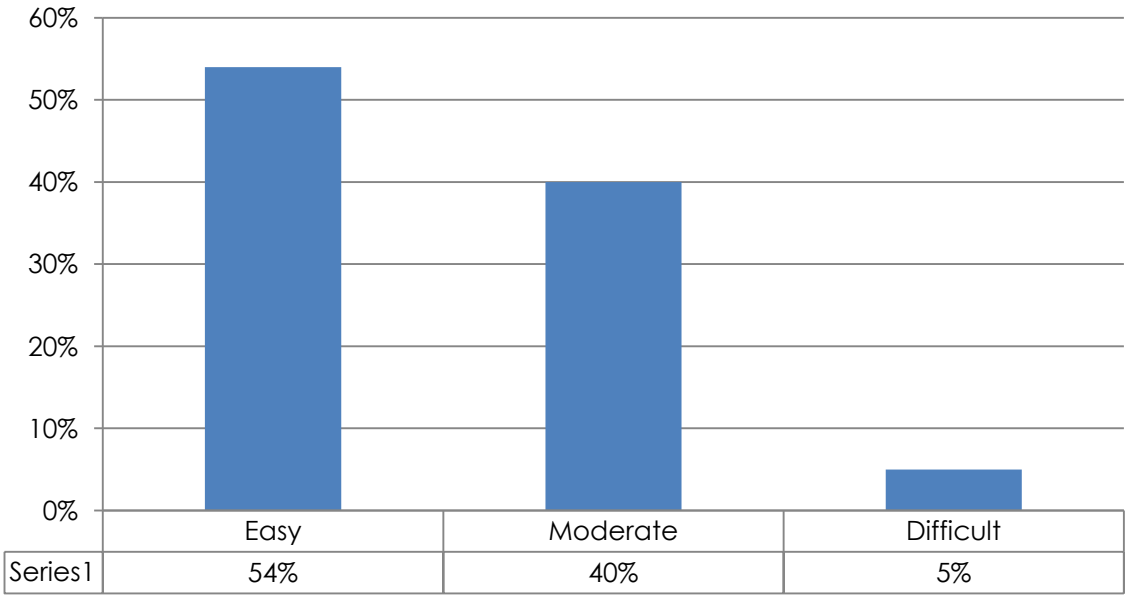


Graph 17: Paper 2 – levels of difficulty

This paper has a marked weighting in the "easy" category – almost 70% of the marks are located there.

For the examination as a whole, just over 50% of the marks were awarded to questions in the "easy" category, and only 5% to difficult questions. Weak candidates thus have a fair chance of passing, and strong candidates should do well.

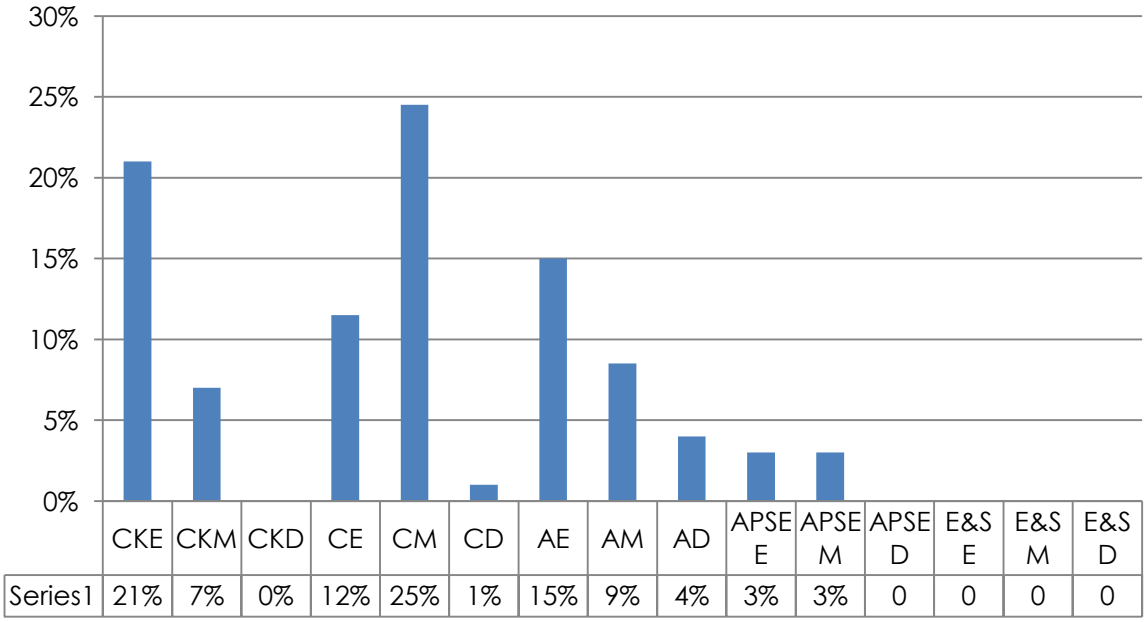
Graph 18 shows the levels of difficulty of the examination as a whole.



Graph 18: Combined papers – levels of difficulty

Cognitive demand and level of difficulty combined

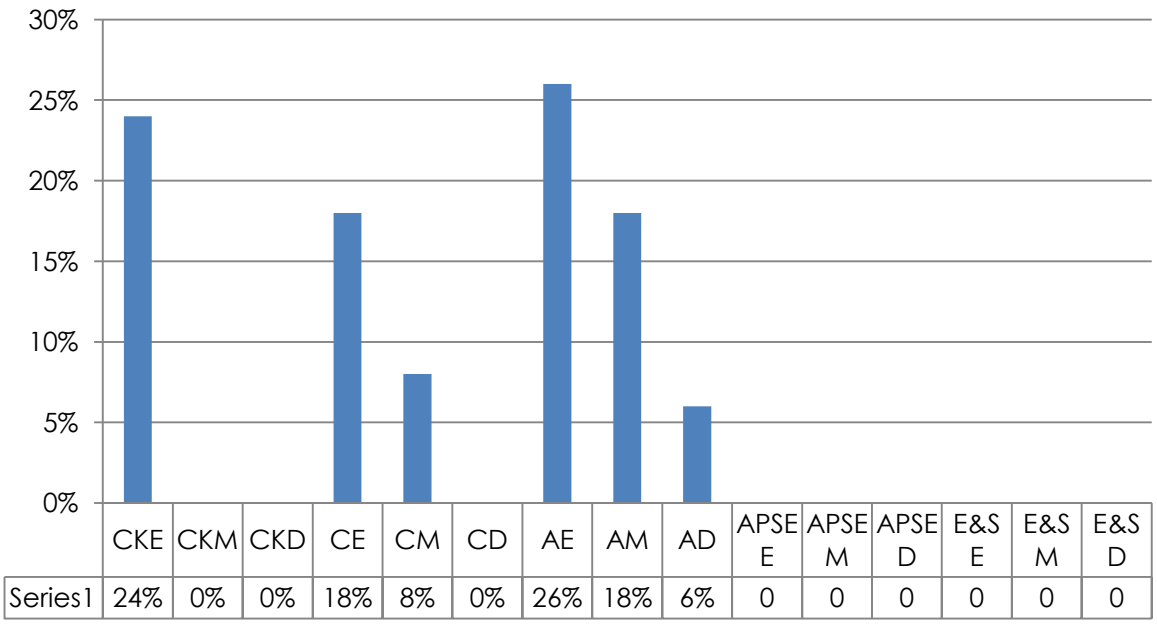
Graphs 19, 20 and 21 show the findings for each paper and the examination as a whole when cognitive demand and levels of difficulty are combined.



Graph 19: Paper 1 – cognitive demand/level of difficulty

Graph 19 shows that Paper 1 is most weighted in the categories "easy content knowledge", "moderately difficult comprehension" and "easy application". There is a notable dearth of marks allocated to difficult questions, and questions that make high order cognitive demand.

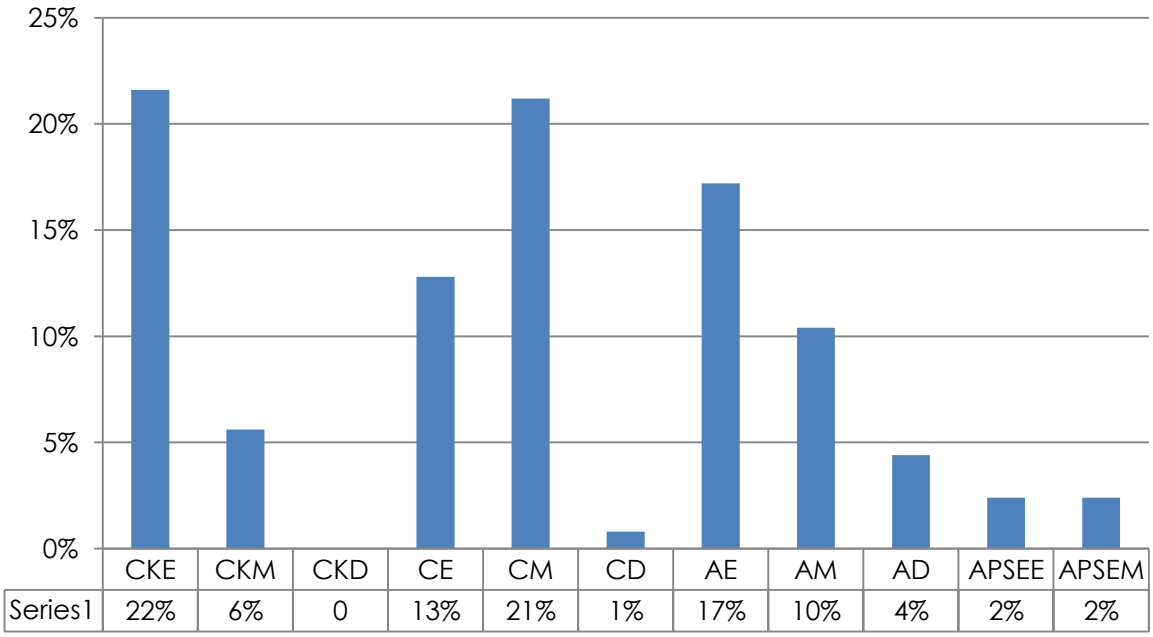
Graph 20 shows that, in Paper 2, the emphasis is on easy content knowledge, easy comprehension and easy and moderately difficult application questions. Again, the weighting is toward the cognitively less demanding and easier end of the spectrum.



	CKE	CKM	CKD	CE	CM	CD	AE	AM	AD	APSE E	APSE M	APSE D	E&S E	E&S M	E&S D
Series1	24%	0%	0%	18%	8%	0%	26%	18%	6%	0	0	0	0	0	0

Graph 20: Paper 2 – cognitive demand/level of difficulty

Graph 21 shows that the trends in the two papers individually come through in the analysis of the examination as a whole. Easy content knowledge and moderately difficult comprehension questions are most heavily weighted with some noticeable weighting on easy comprehension and application and moderately difficult application. Analysis, synthesis and evaluation are underrepresented, as are difficult questions.



Graph 21: Combined papers: cognitive demand/level of difficulty

Overall, then, the analysis of the ERCO examination found it to be easy to moderately difficult, and that it carries low cognitive demand. Weak candidates should pass, and strong candidates should do well.

5.6 Standard and quality of papers

The team felt that the standard and quality of the ERCO papers need to improve. In particular:

- The quality of the print was not always satisfactory
    - such as in the synoptic map, where it was, for example, difficult to read the information for the station model as required (Paper 1, Q1.3.3). However, the enlargement provided was useful.
- Some of the diagrams are poor:
    - such as that for Paper 1, Q1.4 ... The river system is not very realistic, and the proposed site for a dam is not on a river

    - the diagram in Paper 1 Q2.5.1 is confusing. The two parts are poorly placed; the wind system shown looks more like up and down slope winds, yet valley winds noted in the memo.

- The flow hydrograph in Paper 1, Q2 is not a hydrograph!
- There are far too many spelling and grammar errors – especially errors of concord. Some instructions are not clear or doable.

    - For example, perhaps something other than a label was being asked for?

- Some terminology is not used sharply enough – for example, in Paper 2, Q4.4 we wondered if the question was perhaps asking about the rural urban fringe and not the transition zone as specified. The instruction 'Give two evidence' is often used, but is grammatically incorrect.
- The annexure to Paper 1 was called "Annexure to Q1".
- Although some attempt had been made to ask a set of integrated questions on a resource provided, this did not always happen even where it could have, and the questions do not always scaffold a higher order response well enough. Often the "long" question in a section is unrelated to anything else in it – and is a low order question when it could have been a culminating higher order question – for instance

    - in Paper 1, Q27 has nothing to do with any of the other questions in Q2
    - In Paper 1, Q4.5.3 is simply asking for a list of factors influencing the development of the PWV – and, although it is part of a set of questions on this region, nothing has built up to it.

- Several questions are very broad and the memo seems to consider so many answers acceptable that it is not clear what knowledge or understanding is actually being tested. For example

    - In Paper 1, Q2.3.2 both igneous and sedimentary rock are acceptable answers – so what was the question actually asking?
    - In Paper 1, Q2.7 learners are asked to write an article on global warming and ways to reduce the release of greenhouse gas. The

memo does not include anything on global warming per se – just a list of measures to reduce greenhouse gas emission.

- Some questions look as if they might be testing interpretation or analysis – but in fact are merely comprehension questions as all the information is directly provided in the stimulus material; for instance

    - In Paper 1, Q1.6.2 "Describe the environmental impact this mid latitude cyclone might have in all the affected regions", all learners have to do is transcribe them from the list given in the resource in figure 1.6 – which incidentally, is not a figure but a text extract.

- In some cases, although a resource is provided, the question can be answered without referring to it. A good example of this is provided in Paper 1, Q4 – all subsections can be answered with no reference to the map provided.
- All the longer questions simply require content knowledge – with little manipulation of the information provided.

Overall, as the analysis shows, the paper has too many lower order and easy questions. Paper 2, in particular, is very basic and does not require much more than simple map reading.

ACCOUNTING

6.1 Evaluators

Mrs Jabu Ngwenya (team leader), Mrs Pamela Townsend and Mrs Mahlape Vanneer

6.2 Introduction

The 2011 Accounting examination papers of the Eksamenraad vir Christelike Onderwys (ERCO) were analysed to assess the standard of the question papers with regard to the following:

- Distribution of curriculum content over the three major Accounting disciplines (i.e. Learning outcomes (LOs) and assessment standards (ASs)
- The cognitive demand
- The levels of challenge
- The degree to which problem-solving questions were addressed

The 2011 exam papers were analysed with the 2010, 2009 and 2008 exam papers with the aim of rating the standard and quality.

As part of the final concluding remarks on the analysis, a comparison of the cognitive demand, levels of difficulty (challenge) and the degree to which problem-solving questions were addressed was done to provide a very clear picture of the overall standard and quality of the 2011 question papers.

6.3 Method of analysis

The Subject Assessment Guidelines (SAG) documents published by the DBE and the IEB include reference to the setting of Grade 12 NSC papers for those examining bodies. Accordingly, the ERCO has adopted the DBE SAG document. The DBE has further issued NSC Examination Guidelines to reinforce and clarify the requirements of the SAG.

The Accounting paper was analysed with regard to content coverage, cognitive levels, degree of difficulty (challenge) and problem-solving questions.

Table 23: Targets for content coverage as per the SAG

LO1	LO2	LO3
50–60%	20–25%	20–25%

With regard to addressing cognitive levels, ERCO uses an adapted version of Bloom's Revised Taxonomy with the following categories described:

- Lower-order: Remembering, understanding and low level-application (apply 1).
- Middle-order: More advanced application (apply 2) and low-level analysis (analysis 1).
- Higher-order: More advanced analysis (analysis 2), evaluation and creation.

Table 24: Targets for cognitive levels

Lower order	Middle order	Higher order
30%	40%	30%

Owing to the nature of the subject, Accounting, cognitive levels do not necessarily correlate with the degree of challenge. Although the following targets for degree of challenge are not stipulated in the SAG documents, it is generally accepted that they have been historically accepted as reasonable by the external moderators.

Table 25: Targets for degree of challenge

CHALLENGE		
Easy	**Medium**	**Difficult**
30%	40%	30%

Problem-solving questions of a deep nature would normally form part of the creative cognitive level, catering for new and unfamiliar situations within the context of the Accounting curriculum, and would require responses from candidates based on detailed financial information provided. Problem-solving questions of a surface nature were regarded as those of a more general nature that do not require in-depth interaction with information in a question. The following target is accepted as reasonable in the current context of high school education (in Accounting).

Table 26: Target for percentage of problem-solving questions

PROBLEM-SOLVING		
Surface	Deep	Total
		10.0%

6.4 Compliance with Subject Assessment Guidelines

Content coverage

The 2011 ERCO exam paper complies with the LO targets as set out in the SAG documents with a heavy focus on LO1 at 59%.

Table 27: Content coverage

	Financial accounting LO1	Managerial accounting LO2	Managing resources LO3
Actual	59%	21%	20%
Target	50–60%	20–25%	20–25%

6.5 Cognitive demand and level of difficulty

Cognitive demand

The paper does not comply with the SAG document as it has more focus on middle-order questions at 48%. Although the paper does not meet the targets, it reflects a closer adherence to a target of 30% for higher-order questions.

Table 28: Cognitive levels

	Lower order			Middle order		Higher order		
	Remember	Understand	Apply 1	Apply 2	Analyse 1	Analyse 2	Evaluate	Create
Actual	3%	6%	17%	44%	4%	9%	18%	0%
	25%			48%		27%		
Target	30%			40%		30%		

Levels of difficulty

Although the paper does not strictly meet the targets, there is an even spread across the three levels of difficulty. The actual degree of challenge for each area is not too far off the target figures and the paper reflects a higher percentage of easy questions compared to difficult questions.

Table 29: Levels of challenge

	Easy	Medium	Difficult
Actual	37%	36%	27%
Target	30%	40%	30%

Problem solving

Learners were required to apply theoretical knowledge in providing solutions to a general problem surface-type question worth only four marks (1%), they were not required to engage with financial information to identify and solve problems (deep level-type questions).

6.6 Weighting of cognitive demand

The major cognitive level of this paper still leans towards application at 61%. This is due to the focus on the application of accounting knowledge, especially in completing the financial statements and their respective notes.

What is of concern to this team is the percentage of questions that require students to use accounting knowledge to identify and solve an unfamiliar problem. Hence the create level reflects 0% of questions.

Table 30: Cognitive demand

	Remember	Understand	Apply 1	Apply 2	Analyse 1	Analyse 2	Evaluate	Create
Actual	3%	6%	17%	44%	4%	9%	18%	0%
Application			61%					

6.7 Model for future use

The paper can be used in the future. However, the team would like to see more questions of a problem-solving nature and further questions which analyse financial information. These higher-order type questions would improve the quality of the paper.

6.8 Standard and quality of the ERCO paper

Language

The language used was simple and appropriate, except where there were some translation issues, for example

- on the cover page, section B of question 4 refers to "inligting" instead of information (page 10)
- Q6 (point 6.7 page 14), "AAARP" instead of "IFRS" (GAAP).
- page 12 and 13, the word "change" is used to mean cash float; rather use the correct term – cash float
- pre-received income should be "income received in advance"
- "accumulated expenses and income" should be "expenses accrued" or "income accrued"

This could be confusing for learners.

Format

The format of the question paper was clear and well set out in most of the questions. Where a question is made up of two parts, it needs to be clearly stated that there are two parts and that they do not relate to each other.

Structure

The overall structure of the paper, the answer book and the memorandum was an improvement on last year.

- In Q1 it was felt that the required information could have been presented in a logical order. Students were asked to calculate amounts that would then be used in the Production Cost Statement. These amounts would then simply be

carried forward to the statement and method marks would be allocated to the statement.

- In the same question, in the additional information, clarification was needed on the costs related to the vehicle. The statement that the costs had to be divided equally was not clear. Consequently, the learners had to make an assumption that these costs were vehicle costs.
- When learners are asked to calculate a ratio or breakeven point, the year for which this calculation is required should be stated, for example Q1, section B required 1.6.
- The terminology used in point 5 of Q1 (reduced balance and carrying value) refers to one and the same thing. A more appropriate term in this case would be the "diminishing balance method of deprecation".

Allocation of marks was again not consistent. In some cases method marks were given and in other cases not.

- In Q1.3 (p 3) of the memorandum, a mark was allocated for a cost per unit which was not asked for in the question.
- In Q1.7 in the question paper, 3 marks were allocated but the memorandum showed 2 marks.
- In Q1.8 in the memorandum 4 marks were given, while the question paper gave 3 marks.
- In Q5.3.2 the question paper allocated 3 marks, while memorandum allocated 2 marks.
- In Q5.4 on page 17 of the memorandum no marks were allocated for the loan repayment. This type of error should have been picked up by the moderators.
- In the memorandum, Q3.8 and Q5.2 did not show the mark allocation.
- In Q4 point 4.5 the question asked whether the liquidity position improved or deteriorated. However, in the solution 8 marks were allocated, indicating that the learner needed to provide information related to both an improvement and a deterioration.

Layout

The front page (cover page) indicated the learning area, duration of the paper, total marks and year and the general instruction. The learning outcomes and the assessment standards per question were indicated separately, as recommended in the report last year.

Font size and formatting still needs attention, for example, page 10 of the question paper.

General impression of the paper and memorandum

In our opinion there has been a general improvement in the question paper. Last year the team indicated that there were issues around the moderation of the paper and we still feel that this issue has not been addressed sufficiently. The inconsistencies in mark allocation in the memorandum also need to be addressed.

6.9 Comparison of 2010–2011 papers

Content coverage

It was found that there has been an improvement in the allocation of content across the LOs. The 2010 paper reflected a heavy focus on LO1 at 74%, while neglecting LO3. By contrast, the 2011 paper complies with the SAG.

Table 31: Comparison of content coverage 2010–2011

	LO 1 Financial accounting	LO 2 Managerial accounting	LO 3 Managing resources
2010	74%	23%	3%
2011	59%	21%	20%
Target	50–60%	20–25%	20–25%

Cognitive levels

As indicated in the table below there has been an improvement in the allocation of questions across the various levels compared with the 2010 paper. However, the 2011 paper still reflects a heavy emphasis on the application of information, at 61% in comparison with 67% last year, which we then considered to be too high.

However, there has been an increase in the number of questions which require learners to analyse and interpret financial information.

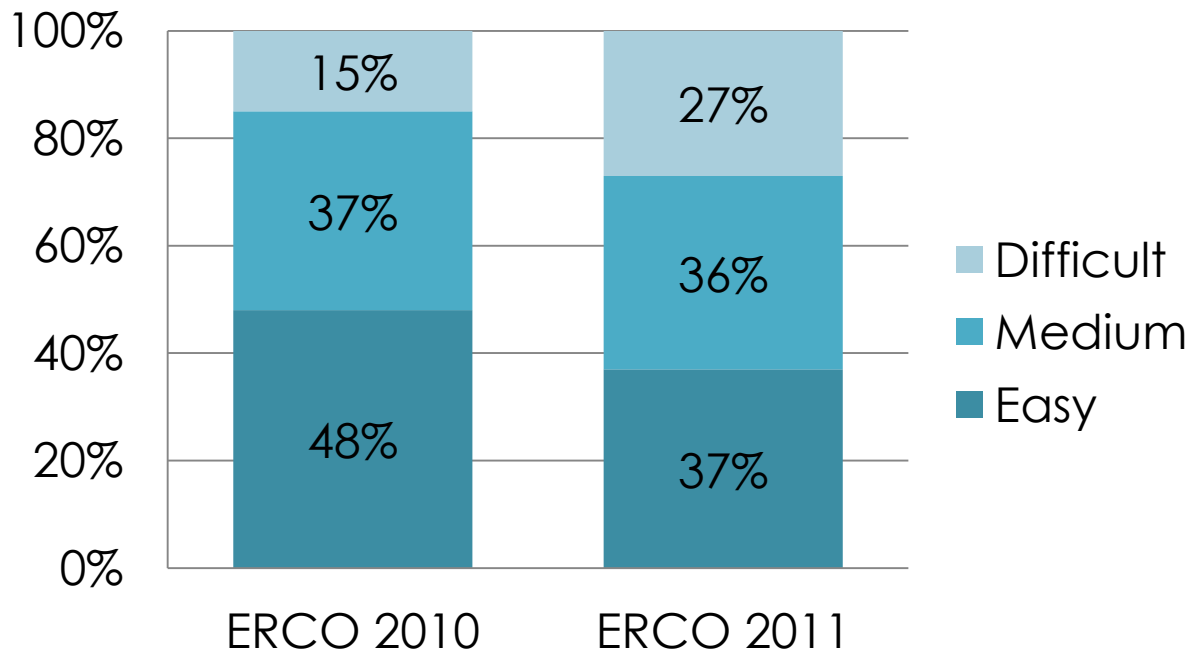
What is of concern to this team is that the percentage of questions that require learners to analyse information has decreased from 21% past year to 13% this year, with fewer marks being awarded for analysing information this year.

Table 32: Comparison of cognitive levels 2010–2011

	Lower order			Middle order		Higher order		
	Remember	**Understand**	**Apply 1**	**Apply 2**	**Analyse 1**	**Analyse 2**	**Evaluate**	**Create**
2010	5%	3%	36%	31%	17%	4%	4%	0%
	44%			48%		8%		
2011	3%	6%	17%	44%	4%	9%	18%	0%
	25%			48%		27%		
Target	30%			40%		30%		

Levels of difficulty

Although the paper does not meet the targets for level of difficulty, the 2011 paper is an improvement on the 2010 paper, as there is an even spread across the three levels of difficulty. The heavy emphasis on application-type questions has impacted on the degree of difficulty measured. This is further exacerbated by the fact that the format of the answer book requires learners to process information by simply placing the figures in the appropriate places without having to analyse where and why these amounts should be shown in the way they should be, for example the completion of the Balance Sheet, the non-current asset note and, to a lesser extent, the reconciliation of net profit to cash generated by operating activities and the Cash Flow Statement.



Graph 22: Comparison of levels of difficulty 2010–2011

Conclusion

The ERCO 2011 paper was more closely aligned to the SAG benchmark requirements than the 2010 paper. The 2010 paper failed to address content, spread of cognitive levels and degrees of challenge in appropriate weightings, and also ignored problem-solving questions.

Although the 2011 paper reflected the desired content with more appropriate weighting than 2010, the team noticed a trend for both papers to provide more easy-challenge or lower-order questions at the expense of higher-order questions. The lack of problem-solving questions, especially deep level problem-solving questions, is a concern.

In conclusion, the team believed that the quality of the 2011 paper is better than the 2010 paper based on the cognitive levels and degrees of challenge and the significant improvement in the quality of the questions in the 2011 paper.

ECONOMICS

7.1 Evaluators

Dr SM Maistry (team leader), Prof M van Wyk and Mrs L Rambuda

7.2 Introduction

The final examination paper for the ERCO National Senior Certificate Examination 2011 was analysed.

7.3 Method of analysis

In order to maintain consistency and to engage in meaningful comparisons across years, the Umalusi examination analysis framework that was employed for the analysis exercise for 2008 to 2010 was used again for the 2011 analysis process. As with previous years, the team applied a rigorous analysis procedure that entailed a careful scrutiny of both the examination question paper and the marking memorandum. The team leader discussed and reviewed the way in which the instrument had been employed in previous years and emphasised the need for consistency in the approach to the 2011 examination papers.

Before the paper was subjected to a panel analysis, each team member performed an *individual* analysis, making notes of areas of concern, ambiguity and uncertainty. The process entailed a fine-grained analysis of each question so as to establish its suitability, the cognitive demand, the level of difficulty, as well as the assessment standards and learning outcomes that were being assessed. The marking memorandum provided was also used to inform the analysis and classification of each question. When conflicting assessments of specific questions were encountered, the team leader allowed members to carefully deliberate with justification for the positions they had taken. These deliberations provided useful insights as to how different questions might be interpreted by learners. Eventually consensus was reached.

The ERCO paper provided for mandatory and choice questions, with section A comprising compulsory questions and sections B and C, choice questions. For the ERCO 2010 and 2011 papers, candidates selected questions totalling 300 marks out

of a total of 500 marks. In several cases choice alternatives within sections did not test the same level of difficulty or the same type of cognitive demand.

The following analysis categories were employed:

Table 33: Types and levels of cognitive demand

Type of cognitive demand	Level of Difficulty
Basic conceptual, knowledge Recall Literal comprehension Making simple evaluative judgements in terms of previously acquired facts etc.	Easy
	Moderate
	Difficult
Comprehension, application Understanding, application, analysis of previously acquired information in a familiar context Making evaluative judgements that require the use of a range of previously acquired facts/information etc	Easy
	Moderate
	Difficult
Problem-solving, analysis, synthesis Analysis, interpretation and application of information in a new or unfamiliar context Synthesis, creation of novel solution or product Evaluation or making judgements in relation to a mixture of old and new material or information	Easy
	Moderate
	Difficult

7.4 Compliance with Subject Assessment Guidelines

ERCO applies the same SAG as the DBE. The DBE Subject Assessment Guidelines (SAG) for Economics suggest an equal assessment weighting for each of the four learning outcomes in Economics.

Table 34: Comparison of the SAG requirements and the actual distribution

Learning outcome	SAG	Actual
LO1	25%	24%
LO2	25%	26%
LO3	25%	27%
LO4	25%	23%

From the above it can be seen that the distribution of marks across the four learning outcomes is appropriate, as there are only minor acceptable deviations from the stipulations in the SAG.

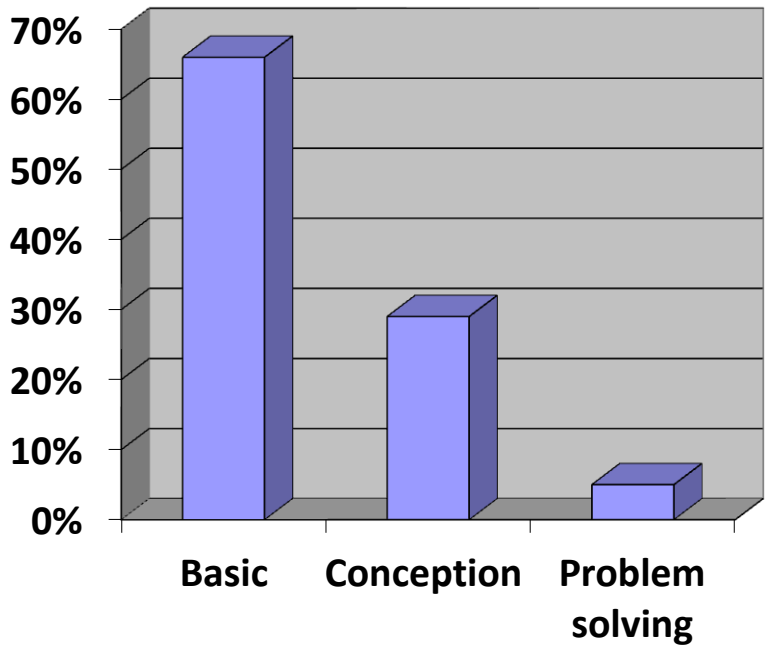
7.5 Cognitive demand and level of difficulty

In the table below, the percentage distribution of questions across the cognitive demand and difficulty levels is presented for the ERCO 2011 paper.

Table 35: Distribution of questions by cognitive and difficulty level

Type of cognitive demand			Level of difficulty		
Basic	Comprehension application	Problem solving/analysis	Easy	Moderate	Difficult
66%	29%	5%	30%	70%	0%

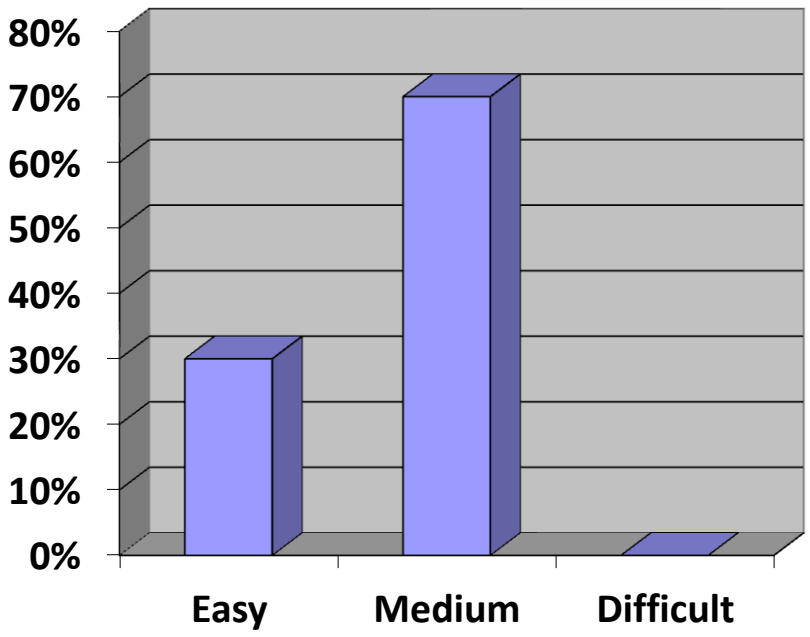
The graph below indicates the weighting of the questions in terms of cognitive demand.



Graph 23: Distribution of questions by cognitive demand

The SAG stipulate a 3:4:3 distribution of questions across the cognitive levels and difficulty levels. An analysis of the distribution of marks for 2011 reveals a substantial

shift from the SAG stipulations. These shifts are evident for both the level of difficulty and the cognitive level requirements. Questions in the basic category in particular are 26% higher than the expected norm, whereas questions in the problem-solving/analysis category are 25% lower than they should be.



Graph 24: Distribution of questions by level of difficulty

The movement away from the more demanding type of questions is also reflected in graph 24 on the distribution of questions according to difficulty level. While questions in the easy category are accurate in terms of the SAG requirements, that is, 30% of the paper, questions in the medium category have spiked to 70%, 30% higher than they should be. No questions were considered by the moderation team to be in the difficult category. The team's assessment of the ERCO 2011 paper is that it is of a lower standard than that recommended by the SAG.

7.6 Model for future use

The team is of the view that the current model and format has certain inherent tensions. This model has its origins in the old NATED examination structure and has not been critically analysed to assess its shortcomings. Arguably, the most crucial and important critique is the presence of choice questions within sections. Had the examining panel been meticulous in setting each choice question at precisely the

same level of cognitive demand and difficulty level, then there would have been no issue. However, a repeated critique by the assessment panel is that this model and its application by the examining panel are seriously flawed. Distinct examples of this kind of inconsistency are glaring, especially in Section C (long essay) where questions carry a significant 50 marks out of 300. In this section candidates are required to answer two questions. So if a candidate chooses two of the less cognitively demanding and easier questions, this translates into 33,33% of the total marks the candidate writes for. There is no way of controlling for this distortion, except to ensure that consistency of cognitive demand exists in all choice questions, an outcome the examining panel has not been able to achieve since 2008.

A further critique of the structure of the paper that derives from the principle of choice is that in attempting to be consistent across major choice questions with sub-questions, the examiners are forced into a rigid uniformity that comes at the cost of inventive, innovative and creative questioning. A creative strategy would free the examiner to work within the SAG yet "think out of the box" with regard to individual questions. There is no need for cross-question comparisons as each question then stands on its own.

7.7 Standard and quality of papers

The language level of this paper was suitable for Grade 12 learners. However, the technical aspects of this paper fell short of the expected standard for a national assessment protocol. In several instances, questions were poorly phrased; grammatically incorrect and ambiguous (see Appendix 2). Stimulus materials (texts and visuals) were relevant to the economic phenomenon being assessed, but the questions that were fashioned were not strongly related to the stimulus material presented. In some instances, such questioning was mere literal comprehension that required easy-to-spot answers from the stimulus provided. Difficult and cognitively demanding questions were lacking, yet there was potential for their inclusion.

A point of concern that the team deems is important to raise is the ideological bias that is infused into this paper via both the manner in which questions are fashioned and the type of expected answers that the marking memorandum presents. A specific example of this is Q10 which reads as follows:

- "Discuss the advantages that tourism held for the economy, highlighting the heritage of the Soccer world cup, according to the cartoon".

If we ignore the poor phrasing, this question presents as neutral and "innocent". However, a scrutiny of the model answer reveals the examiner's personal dissatisfaction with the fact that the stadiums were built exclusively for soccer, and not for other sports codes. The examiner proceeds to make a forthright and categorical statement that

- "The easiest solution will be to demolish the stadiums."

Two marks are allocated to this point. What is troubling is the absence of a theoretically informed economic rationale for the assertions that are presented as "acceptable answers" in the marking memorandum. It is also a concern that Umalusi's external moderator has sanctioned such a marking memorandum.

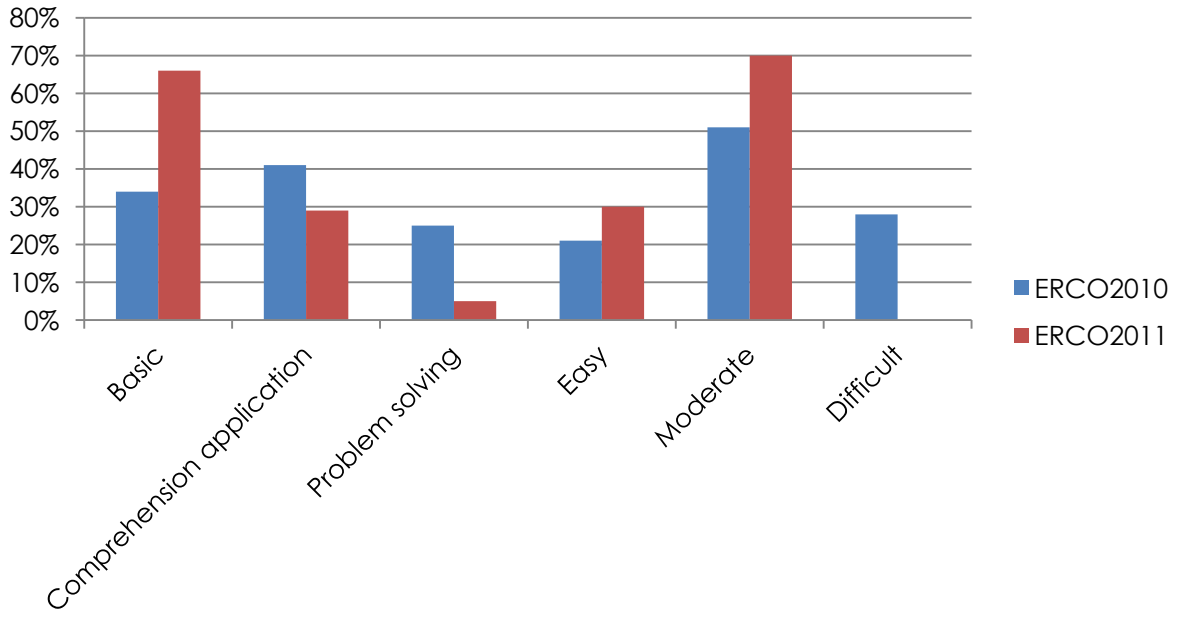
7.8 Comparison of 2010 and 2011 exam papers

In the table below, the data for 2010 and 2011 are presented.

Table 36: Comparison of cognitive demand and difficulty levels 2010–2011

	Type of cognitive demand			Level of difficulty		
Year	**Basic**	**Comprehension application**	**Problem solving**	**Easy**	**Moderate**	**Difficult**
2010	34%	41%	25%	21%	51%	28%
2011	66%	29%	5%	30%	70%	0%

The above data are shown in graph form below.



Graph 25: Comparison of cognitive demand and difficulty levels 2010–2011

The 2011 ERCO paper is easier than the 2010 paper. Evidence of this drop in standard is reflected in the increase in the percentage of questions set in the basic category of cognitive demand, rising from 34% in 2010 to 66% in 2011 – an increase of 32 percentage points. In the comprehension/application category, there is a reduction in questions from 41% in 2010 to 29% in 2011. A large decrease is also evident in the problem-solving/analysis categories, from 25 to 5%.

Questions classified as easy increased from 21 to 30%, while questions in the difficult category dropped dramatically from 28 to 0% (zero). There has been a definite swing towards a loading in the moderate category, which sees an increase from 51 to 70%.

The overall assessment of the 2011 paper then is that it is of a lower standard than the 2010 paper.

BUSINESS STUDIES

8.1 Evaluators

Ms Carina America (team leader), Mr Bernard Botha and Dr Milton M Nkoane

8.2 Introduction

This report provides an analysis of the NSC examination papers for Business Studies Grade 12 for the ERCO. The analysis focuses on cognitive demand and levels of difficulty.

The evaluation of the Business Studies Grade 12 examinations was done against the backdrop of the learners' knowledge and skills acquired in the FET phase (Grades 10 to12). Teaching and learning for Business Studies take place within the framework of a National Curriculum Statement (NCS) and are informed by developments in the business environment, recent and changed legislation and changing markets.

A team of three members was selected to analyse the examination papers

8.3 Method of analysis

The Umalusi instrument is user-friendly and makes provision for comments to substantiate the selection of categories. Item-by-item analysis of each question allows for standardisation, consistency and comparability. There may be deviations of 1% in the calculations owing to the rounding of decimals in the Excel spreadsheet.

It should be noted that the experiences and personal viewpoints of evaluators may in some instances have influenced the individual selection of categories. In cases where the selection of categories was not unanimous, it was extensively discussed by the team members until an agreement was reached.

A three-levelled typology aligned to the SAG document was used as illustrated in Table 37. The CK category refers to "conceptual knowledge" which includes "factual" knowledge. The P category includes evaluation and synthesis. The codes used in the analysis are as follows:

- CK = conceptual knowledge
- C = comprehension & application

- P = problem solving & analysis

Table 37: Types and levels of cognitive demand

Type of cognitive demand	Level of difficulty	Example
CK = conceptual knowledge/basic factual ± 30% of exam questions	Easy: factual recall	Name two challenges of corporate social investment for a business.
	Moderate: low level application, literal comprehension	Identify any two key success factors of Mazwe Tom's business enterprise. (Case study given)
	Difficult: making simple evaluative judgements in terms of previously acquired facts	Discuss the degree to which the following factors may impact on the success or failure of Toyota South Africa (Pty) Ltd: Capital requirements Taxation
C = comprehension/ application ± 50% of exam questions	Easy: simple explanations, application	Identify the sectors which the various business enterprises mentioned above belong to. Motivate your answer. (Case study given)
	Moderate: interpretation and low-level analysis, evaluative judgements that require the use of a range of previously acquired facts/information	Give Vusi advice on the different ways in which he can overcome his dissatisfaction as an employee at Bush Lodge. (Case study given)
	Difficult: moderately high thinking skills, more advanced application	Determine which investment earned the highest return. Show calculations to substantiate your answer. (Case study given)
P = problem solving/ analysis/evaluation/ synthesis ± 20% of exam questions	Easy: in-depth explanation, simple procedural calculations	What in your opinion has influenced the sales figures? (Scenario and pie chart given)
	Moderate: advanced analytical skills, application of information in a new or unfamiliar context;	Bongani states that the premium of R2 800 per month is not within his budget. What advice would you offer? Provide two suggestions. (Scenario given)
	Difficult: synthesis and evaluation; making judgements in relation to a mixture of old and new material or information	As a business consultant for Makhaya Tali's winery, identify the business challenges, devise strategies to overcome the challenges and determine the environment in which the challenges exist. Advise Makhaya Tali on how to evaluate the effectiveness of the strategies. (Case study given)

The following documents were consulted in the analysis:

- National Curriculum Statement (NCS): Grades 10–12. Subject Assessment Guidelines (SAG): Business Studies – January 2008. Department of Education (DoE).

- Examination Guidelines: Business Studies – Grade 12, 2009. Department of Education (DoE).
- National Senior Certificate Handbook. Implementation: Grade 12, 2010. Independent Education Board (IEB).

8.4 Results of examination paper analysis

The marks allocated according to cognitive demand and levels of difficulty are expressed in percentages. These are presented in the table below:

Table 38: Results of analysis of examination papers

Type of cognitive demand			Level of difficulty		
Conceptual knowledge	**Comprehension & analysis**	**Problem-solving**	**Level 1 (Easy)**	**Level 2 (Moderate)**	**Level 3 (Difficult)**
34%	51%	16%	34%	59%	7%

The combined analysis of cognitive demand and level of difficulty are reflected as follows:

Table 39: Combined analysis: results of analysis of examination papers

Level of Difficulty + Cognitive Demand								
CKE	**CKM**	**CKD**	**CE**	**CM**	**CD**	**PE**	**PM**	**PD**
11%	23%	0%	19%	24%	7%	4%	12%	0%

The codes reflected in table 39 are defined as follows and used accordingly in the rest of the report:

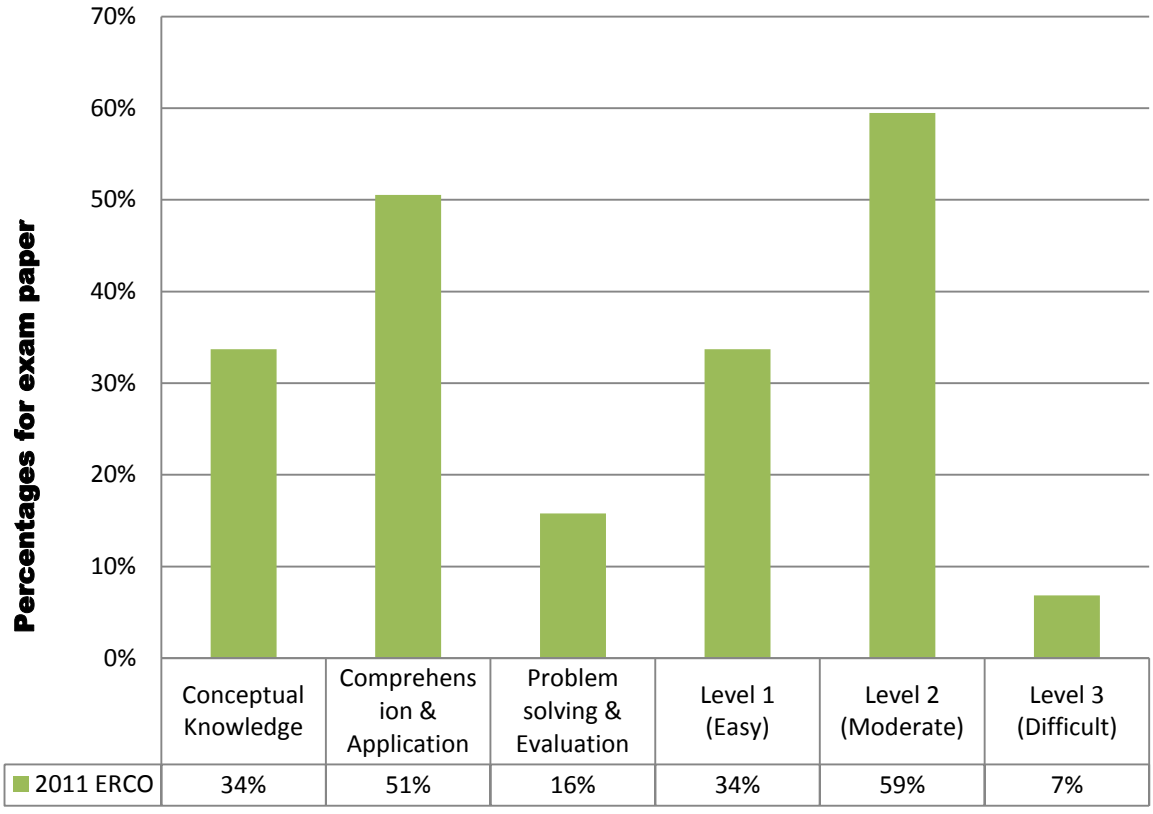
- CKE = conceptual knowledge easy;
- CKM = conceptual knowledge moderate;
- CKD = conceptual knowledge difficult
- CE = comprehension easy;
- CM = comprehension moderate;
- CD = comprehension difficult
- PE = problem solving easy;
- PM = problem solving moderate;
- PD = problem solving difficult

8.5 Compliance with the Subject Assessment Guidelines

The SAG of the DBE were used for the ERCO paper. The structure complies with the SAG document: one paper of 3 hours duration for a total of 300 marks. Section A consists of multiple-choice, true and false and short answer items totalling 40 marks; Section B consists of three direct questions of 60 marks each. Section C makes provision for a choice between four essay-type questions of which learners must do two questions for 40 marks each.

8.6 Cognitive demand and level of difficulty

The SAG indicates a ratio of 30%:50%:20% for cognitive demand. The 2011 cognitive demand analysis of 34%:51%:16% is fairly in line with the SAG requirements.



Graph 26: Cognitive demand and level of difficulty

According to the analysis, the level of difficulty ratio is 34%:59%:7%. The average learner could pass, since the easy questions CKE = 11%; CE = 19%; PE = 4%, and the basic factual recall questions were of a moderate nature, that is, CKM = 23%.

Table 40: Combined analysis of cognitive demand and level of difficulty

Conceptual knowledge			Comprehension & application			Problem-solving & analysis			Total
CKE	CKM	CKD	CE	CM	CD	PE	PM	PD	
11%	23%	0%	19%	24%	7%	4%	12%	0%	100%

8.7 Weighting of cognitive demand

The questions compare favourably with the SAG requirements and are mostly comprehension and application on a moderate level, that is, interpretation and low-level analysis and evaluative judgements that require the use of a range of previously acquired facts/information.

Table 41: Weighting of cognitive levels

	Conceptual knowledge (basic, easy items)	Comprehension & application	Problem-solving, analysis & evaluation
SAG 2008	30%	50%	20%
ERCO 2011	34%	51%	16%

8.8 Model for future use

Most of the questions can be used as an item in future examinations. However, discrepancies were found between the English and Afrikaans papers, for example:

- Q2.1 mark allocation differs
- Q2.2 in the Afrikaans paper differs from Q2.2 in the English paper
- Q2.5.1 and Q2.5.2 (Afrikaans) do not appear in the English paper
- Q2.8 in the Afrikaans paper appears as Q2.6 in English paper; Q2 in the Afrikaans paper goes up to Q2.10, while the English paper goes up to Q2.8, and so on.

Caution should be taken with the formatting and structure of both the Afrikaans and English papers.

The memorandum is incomplete, for example

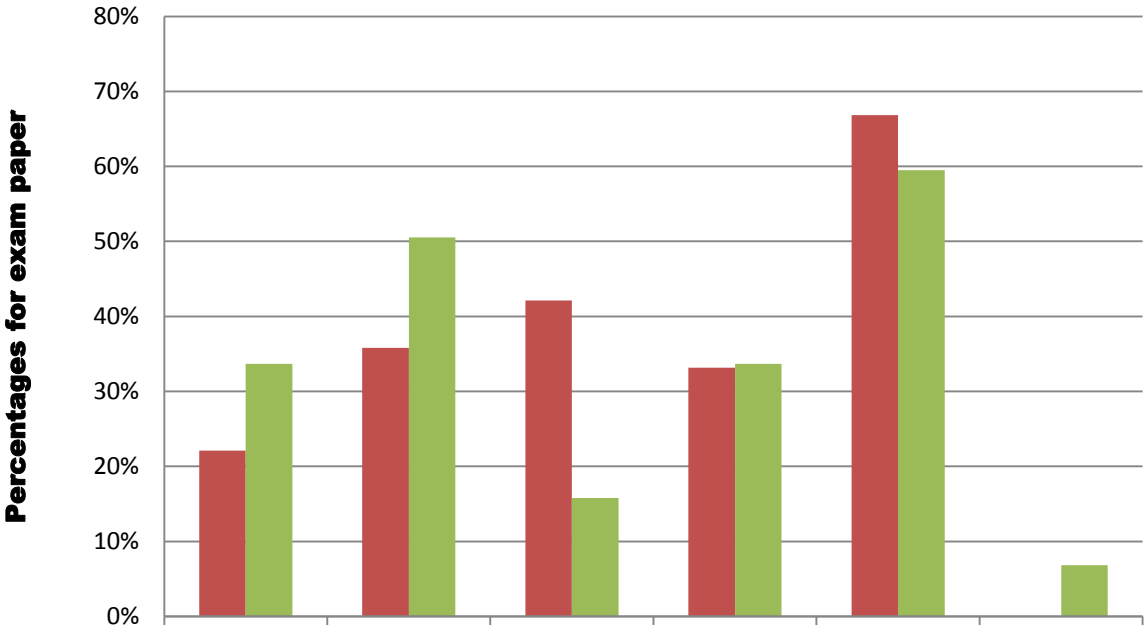
- Q8 is not included and the "Nasienriglyn" could be more detailed.

The English memorandum and the "analise ruit" were not available this year.

8.9 Standard and quality of papers

The format of the question paper is compliant with the SAG. More attention could be given to the general appearance of the paper, for example in terms of formatting and structure. The average learner could find the paper reasonable, since the level of difficulty comprises 34% easy and 59% moderate level questions. In addition, the 16% problem-solving questions are at an easy (PE = 4%) and moderate (PM = 12%) level of difficulty.

8.10 Comparison of 2010–2011 papers



	Conceptual Knowledge	Comprehension & Application	Problem solving & Evaluation	Level 1 (Easy)	Level 2 (Moderate)	Level 3 (Difficult)
2010 ERCO	22%	36%	42%	33%	67%	0%
2011 ERCO	34%	51%	16%	34%	59%	7%

Graph 27: Comparison of cognitive demand and level of difficulty 2010–011

No analysis for the ERCO paper was done in 2009. Compared to 2010, the basic factual recall questions increased by 12%, and the comprehension and analysis questions increased by 15% (Graph 27). However, the problem-solving questions in 2010, albeit of an easy to moderate level of difficulty, were 26% higher than in 2011. In 2010 there were no difficult questions, whereas in 2011 the difficult questions amounted to 7% of the paper.

CONCLUSION

As indicated in the introduction of this report, the findings presented herein should be read and understood within the context of the purpose of the Post-Exam Analysis project – to provide Umalusi with a statement on the quality and standard of the current year's question papers, as well as how they compare with the previous years' papers. This information forms part of the basis of the standardisation decisions.

There were a few subjects where an improvement was noted in the quality of the 2011 ERCO question papers as compared to those of the previous years:

- **English FAL.** It was observed that the 2011 ERCO papers have greatly improved compared to the 2010 papers. Having said this, however, the question papers were perceived to have been slightly difficult and this level of difficulty was exacerbated by the elevated and, in some instances, verbose and archaic use of language.
- **Life Sciences.** The evaluators felt that the format of the ERCO Life Sciences papers is very similar to that of the DBE papers, owing to the fact that these question papers were developed using the DBE SAG. This is a satisfactory format for examinations.
- **Accounting.** The evaluators believed that the quality of the 2011 paper is better than the 2010 paper based on the cognitive levels and degrees of challenge, as well as the significant improvement in the quality of the questions in the 2011 paper.
- **Business Studies.** It was noted that the format of the question paper is compliant with the SAG. More attention could, however, be given to the general appearance of the paper, for example in terms of formatting and structure.

Be that as it may, the findings generally indicate that the ERCO question papers contained a few flaws in terms of cognitive challenge, content, structure and format that would not make them good models for future use. The examples cited below serve to illustrate this:

- **Mathematics.** The team felt that a number of the questions asked focused on work that was emphasised in the old NATED curriculum, which has subsequently been de-emphasised in the NCS, for example the work on logs in Q4.7 of Paper 1 and the testing of concurrency in Q1.3 of Paper 2. In addition, there was an overemphasis on problems that lead to simultaneous equations.
- **Physical Sciences.** It was found that, generally, the exams lacked questions which probe deep conceptual understanding. The papers had a low percentage of conceptual questions (34%), and a large percentage of easy and factual questions (42%).
- **Geography.** Overall, as the analysis shows, the paper has too many lower order and easy questions. Paper 2, in particular, is very basic and does not require much more than simple map reading.
- **Economics.** The SAG stipulate a 30;40;30 distribution of questions across the cognitive levels and difficulty levels. However, an analysis of the distribution of marks for 2011 reveals a substantial shift from the SAG stipulations. This shift is evident for both the level of difficulty and the cognitive level requirements. Questions in the basic category, in particular, are 26% higher than the expected norm, whereas questions in the problem-solving/analysis category are 25% lower than they should be.
- **Life Sciences** In terms of the standard and quality of the 2011 final exam papers, especially with regard to language level, format of questions, the contextualisation of questions and the use and appropriateness of text and stimulus material for the questions, we found the following:

    - There were numerous spelling and grammatical errors.
    - Not all diagrams had been reproduced clearly.

- **Accounting.** The evaluators generally felt that the paper could be used in the future. However, there needs to be more questions of a problem-solving nature and further questions that analyse financial information. These higher-order type questions would improve the quality of the paper.