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Comparison of Exit-Level Examinations in Four African Countries

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ABSTRACT Exit-level assessment at the end of schooling determines access to higher education, or employment, or other life chances. This case study compares the demands of the 2004 Biology examination papers in Kenya, Zambia, Ghana and South Africa. The 2004 South African exit-level examinations were differentiated into Higher Grade and Standard Grade. Other countries' examinations were compared with both grades. A major curriculum reform in South Africa in 2008 marked the end of the differentiated system. Post-reform examinations of 2010 were included in this study. Question papers were analysed in terms of a number of factors that contribute to the demands of an examination. Revised Bloom's taxonomy was used to analyse cognitive demand. All of the papers were heavily weighted in the cognitive skills of remembering, understanding and applying, and in factual and conceptual knowledge. Only South Africa examined just the final year of schooling, and omitted a practical examination. The South African examinations were much longer than those of the other countries. Kenyan examinations provided a fair and valid assessment of theory and practical aspects of the subject. This article reveals that the demands of Biology examinations are comparable among the four countries; this comparability is crucial for international recognition of qualifications.

INTRODUCTION

Public examinations conducted in the final year of schooling are used for a number of different purposes in most education systems:

- They set the standards to be achieved by teachers throughout a country by a central specification of the objectives and curriculum to be assessed. Such a document becomes public knowledge, and permits comparability across countries.
- The results are used to select students for further education, or for entry into the workforce. This role plays a crucial part in future careers and life chances for school-leavers.
- Examinations provide certification of achievement at the end of schooling. Job opportunities often depend on possession of the certificate confirming successful completion of schooling.
- Examination results are released very publicly, and may be used to ensure accountability of schools and the educational system. In some countries, pass rates in the final examinations are powerful political tools.
- Examinations can be used to modify and control curriculum and methods of teaching in positive and negative ways. Curriculum is designed so that it is "examinable", and teaching in the final years of schooling may be examination-dominated (Eckstein and Noah 1989; Atkin and Black 2003; Kellaghan and Greaney 2004; Harlen 2007).

The comparability role of school-leaving assessment, either through public examinations or school-based assessment, influences the mobility of students between countries. Articulation and portability of qualifications has been the subject of the Bologna Process (started in 1999), which set out to promote recognition of qualifications between member states of the European Union. The ideal is that all countries within the European Union should develop their national frameworks to be compatible with an overarching framework of qualifications. Progress has been slower than anticipated. Two broad cultures have emerged: countries that wish to protect their own qualifications, and are overly concerned that 'foreign' qualifications should match

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and exceed the requirements of their own equivalent qualifications, and countries that are more concerned to recognise potential to succeed, and tend to recognise qualifications that are clearly below the level of the equivalent qualification in their own country (Bergan 2010).

In Africa, successive World Bank Reports (Kellaghan and Greaney 2004; World Bank 2008) have pointed to the challenges still facing education in sub-Saharan Africa, and the failure of most countries to achieve the goals of the Jomtien Declaration of 1990 or the Dakar Declaration of 2000. Both Reports comment on the dominance of public examinations in the education systems of most sub-Saharan African countries. It is argued that examination dominance has increased motivation of both pupils and teachers and accountability of schools. Educational success is measured in terms of pass rates in the national examinations, and this applies from the national education ministry to individual schools and teachers. The backwash effect of examination dominance is that 'teaching for examinations' is widespread, and encourages extrinsic motivation in students. Any part of the curriculum that cannot be examined formally is likely to be left out of the taught curriculum. On the other hand, well-constructed examinations can be a constructive force in education, particularly if they encourage higher-order thinking skills instead of rote-learning and memorisation of facts (World Bank 2008).

Black and Wiliam (2006) have questioned the reliability and validity of public examinations, yet they enjoy the confidence of policy-makers, those responsible for access to higher education, and the general public. Black and Wiliam (2006) illustrate some problems of reliability of examination results between years, and from one day to another for individual examination candidates. From their research, they estimate that there is a 20-30% chance that a candidate's result is wrong by one assessment level in England. Standardised tests such as those used in international studies have higher reliability than commercially produced educational tests, which have higher reliability than school-produced tests. Assessment experts are better able to meet the requirements of fairness, validity and reliability than generalist teachers. The overall intention of Black and Wiliam's paper is to raise awareness of the unreliability of tests and examinations, but they inadvertently provide an argument in favour of external, large-scale examinations rather than school-based tests.

Despite the unreliability of public examinations pointed out by Black and Wiliam (2006), it is highly unlikely that high-stakes examinations will be discontinued in African countries for many years to come (World Bank 2008). They play a highly significant role in the life chances of children. Access to secondary education and thereafter tertiary education is determined by the results of public examinations, and hence they are a powerful motivating force in education. These examinations are used to determine recognition of qualifications for access to higher education in countries other than the home country. Thus comparability of examination results and qualifications is still an important issue for mobility of students between African countries and between Africa and other parts of the world.

The British Office of Qualifications and Examinations Regulation (Ofqual) claims that comparisons of qualifications between years and between examining systems are often conducted by qualification evaluators, but they are rarely quantitative or systematic (Ofqual 2011). The National Recognition Information Centre (NARIC) for the United Kingdom (UK) and European Network of Information Centres in the European Region (ENIC) accredit qualifications from other countries for the purposes of employment and access to higher education in the UK and Europe. They use a comprehensive set of criteria applied to the whole qualification. The result is a qualitative judgement of the comparability of the whole qualification, rather than of individual subjects (ENIC-NARIC 2010).

Eckstein and Noah (1989) compared school-leaving examinations in eight northern hemisphere countries, and provided an overall description of the examination systems and methods of examination, with a subjective evaluation of the level of difficulty inherent in a whole qualification. Kellaghan and Greaney (2004) and the World Bank (2008) provide comparative descriptions of overall assessment and examination practices in sub-Saharan Africa, with details of pass rates in some countries, but did not evaluate the qualifications against each other or against an external benchmark. The purpose of the two World Bank studies was to provide recommendations for improving assessment in the countries studied.

Detailed and comparative analyses of examined curriculum and examination papers have been conducted in South Africa, covering the three years before and one year after the introduction of the new curriculum in 2008 (Umalusi 2009). A similar detailed study conducted jointly by Higher Education South Africa and Umalusi[1] compared selected international and Namibian qualifications with those of South Africa (Grussendorff et al. 2010). The studies of 2009 and 2010 used an analytical instrument developed by Umalusi to make judgements about comparative demand and difficulty of the qualifications.

Ofqual (2011) has embarked on an international comparison of assessment in senior secondary schooling, including 11 examining authorities in countries outside Britain, three international qualifications, and two types of qualifications available in Britain. No African countries are included in their study. The focus of their analysis is the extent to which each qualification prepares students appropriately for entry into an honours degree level course at a UK university. The study investigates three main foci: contextual factors, such as the purpose of the qualification, take-up rates and pass rates; the nature of subject matter prescribed for the qualification, breadth and depth of subject coverage; and an analysis of the assessment instruments to make judgements about demand and difficulty (Ofqual 2011).

The breadth and depth of curriculum coverage were also considered in a comparison of international qualifications with those of Namibia and South Africa (Grussendorff et al. 2010). Findings for the subject of Biology were that the subject matter examined in South Africa had less breadth than in other examining bodies, except for Cambridge AS Level, which is the first year of the two-year A-Level curriculum. The depth of subject matter was judged to be similar to the Cambridge AS Level, but lower than the International Baccalaureate Higher Level and Cambridge A Level.

The cognitive demands and level of difficulty of examined curriculum and examinations are separate factors to be evaluated in comparability studies (Pollitt et al. 2007). Many factors impact on examination demand, including the amount of time assigned to writing examinations, number of questions to be answered, amount of reading and writing to be done, level of reading difficulty, amount of choice given in the paper, and demand on long-term memory. However, demand also includes the cognitive processes that a candidate must activate in order to answer a question. Pollitt et al. (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" 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 students' mind as they make sense of a question and construct a response to it. Difficulty derives from the ability of the student and the level of difficulty of an assessment task, estimated by analysis of students' scores on an examination or test. Put simply, marks are lower for difficult questions than for easier questions. This analysis can only be conducted after the examination process, since many unexpected factors intervene when students actually respond to questions (Pollitt et al. 2007).

The level of difficulty of General Certificate of Secondary Education (GCSE) examinations in different subjects in the UK has been compared by applying the Rasch model (Coe 2008). This study showed that examinations in foreign languages were experienced by students as more difficult than subjects like Drama, Media Studies and English. Coe (2008) points out that examination results are used as an indicator of a linking construct (general ability), and as such subject choice could have a significant effect on life chances if the level of difficulty of the examinations in different subjects is ignored. This is illustrated when one considers that a B grade in a foreign language is equivalent to an A grade in English or Drama and a C in Latin, given the differences in levels of difficulty. The chances of being awarded a scholarship may be affected by subject choice if all subjects are treated as equally difficult.

Demand and difficulty overlap, in the sense that tasks that require complex mental procedures are more difficult than those requiring simple mental procedures (Crisp and Novaković 2009). However, the presentation of a question may obscure the mental procedure required to solve it, so that a question requiring a simple mental procedure may become difficult because of its presentation. Visual literacy, defined as the ability to interpret and make meaning of im-

ages, may affect the ability of a candidate to make sense of a question. The performance required by the student to answer a question is a further factor affecting the level of difficulty (Pollitt et al. 2007). Students writing an examination in a language other than their home language experience difficulty in answering free-response questions, even where the mental procedure is simple. Constructing an extended written response is the most difficult task for such students (Howie 2001; Reddy 2006).

Most examining authorities specify a weighting for different types of cognitive demand in exit-level examinations. The descriptions of cognitive demand can be matched to Bloom's taxonomy, with ordered levels of cognitive demand (from least demanding to most demanding) as knowledge, comprehension, application, analysis, synthesis and evaluation. Examining authorities frequently collapse the six levels of cognitive demand into three or four levels. As students progress through the schooling system, the weighting on higher-order cognitive demands increases.

This study compares examinations in four African countries, Ghana, Kenya, Zambia and South Africa. The vast majority of students in these countries have selected English as the medium of instruction and assessment, although most do not speak English as their home language. All four countries have their own examination boards or belong to a regional grouping of countries with a common examining body. South Africa's education system has undergone extensive reorganisation, from 19 departments of education catering for different ethnic groups prior to 1994, to a single national department overseeing nine provincial departments. South Africa implemented a major curriculum change in 2006, which was examined at exit level for the first time in 2008.

In Ghana, Kenya and Zambia less than half of the primary school-leavers proceed to secondary school (World Bank 2008). The period of compulsory schooling ends at about 13 years of age in these countries. South Africa differs in that most students proceed from primary school to secondary school. The low levels of participation by African students in tertiary level studies in sciences, technology, and mathematics-related fields has been a cause for concern in all African countries, given that economic development depends partially on production of scientists, engineers and technologists (World Bank 2008). Entry to tertiary level study depends on the results of the school-leaving assessments written at the end of the senior secondary phase of schooling (Kellaghan and Greaney 2004; World Bank 2008).

The duration of senior secondary schooling differs in the four countries. In Ghana, Zambia and South Africa, senior secondary schooling is of three years' duration, with exit-level examinations taking place at the end of the third year. In Kenya, senior secondary schooling is of four years' duration. Until 2008 the South African senior secondary system offered differentiated courses, with a Higher Grade (HG) and a Standard Grade (SG) examination offered in each subject. This differentiated system was phased out in 2008 with introduction of the National Senior Certificate based on the National Curriculum Statement (Umalusi 2009).

Sub-Saharan African countries have rarely participated in the Trends in International Mathematics and Science Studies (TIMSS), but in 2003 three countries (Botswana, Ghana and South Africa) did so. They occupied the lowest three positions on the table of results in both Mathematics and Sciences, with South Africa the worst performer of all participating countries. Ghana's position was higher than that of South Africa in both Mathematics and Sciences (Reddy 2006). Kenya, Zambia and South Africa have participated in Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) studies of literacy and numeracy at Grade 6 level. Kenyan Grade 6 children have consistently outperformed South African children, who have outscored Zambian children. The Kenyan average score is above the average of all participating countries, while South Africa and Zambia both score below the average (Hungi et al. 2010).

The present study investigates whether school-leaving Biology examinations in Ghana, Kenya, Zambia and South Africa are comparable. Since Biology has a large enrolment in all four countries, it provides an indicator of comparative demands of the school-leaving examinations in the four countries. The research is concerned with investigating a particular problem, and therefore falls within the pragmatic paradigm (Cresswell 2009). As such, it uses all approaches available to understand the problem. It is a case study of the school-leaving examina-

tions in Biology of four countries in the year 2004, since relevant information was available for that year. The post-reform South African curriculum and examinations of 2010 were included in the analysis, to investigate changes in examination demand between 2004 and 2010, and to compare the 2010 examinations with Ghana, Kenya and Zambia.

The breadth and depth of examined subject coverage were investigated. The examinations were analysed qualitatively and quantitatively, and judgements were made about comparability of the demand of each examination. Students' marks were not available, and so analysis of levels of difficulty - as distinct from demand - was not conducted.

METHODOLOGY

This study collected qualitative and quantitative data about the examined curriculum and examinations in the four African countries, through an analysis of relevant documents. Analysing the demands of examination papers permits defensible judgements about the comparability of qualifications. Eckstein (1994) made a subjective judgement about examination papers from a number of different countries, rating them as "difficult", "very difficult" and "easy". Pollitt et al. (2007) reviewed various approaches to analysing the demand of examination papers, and proposed that a consistent system for doing so would help various stakeholders, such as examiners and independent researchers trying to make judgements about comparability of examinations between years, between qualifications, and between different subjects. They turned to cognitive psychology and theories of learning and thinking before arriving at a scale of demands that provided a qualitative description of the demand of an examination paper. The analytical scale of demand that they proposed was successfully trialled (Crisp and Novaković 2009), after which some modifications were made. It has subsequently been applied in a number of comparative research projects conducted in the UK by the Qualifications and Curriculum Authority (QCA) and its successor, Ofqual (for example, QCA 2008a, 2008b; Ofqual 2011). The scale of demand is known by the acronym CRAS, and rates assessment items on each of four factors:

- **Complexity** of each component operation or idea and the links between them;
- **Resources:** the use of data and information provided or generated by the student;
- **Abstractness:** the extent to which the student deals with ideas rather than concrete objects or phenomena;
- **Strategy:** the extent to which the student devises (or selects) and maintains a strategy for tackling and answering the question (Ofqal 2011:17).

Each question is assigned a level on each factor, using a set of descriptors for each level. For example, a project comparing senior secondary assessment in 18 examining authorities used a scale of 1-4, from lowest demand to highest demand. On the factor "abstractness", the descriptor for 1 was "deals with concrete objects, avoids the use of technical terms", while 4 was described as "highly abstract, requires use of technical terms" (Ofqual 2011:17). This analytical instrument provides a quantitative description of examination papers, enabling calculation of a single index of demand for each examination. However, Pollitt et al. (2007) are clear that the results of a CRAS analysis do not necessarily translate into a scale of difficulty, although demand is often related to difficulty (Crisp and Novaković 2009).

Moseley et al. (2005) reviewed 35 taxonomies of cognitive skills, and found potential in the revised Bloom's taxonomy (Anderson and Krathwohl 2001), but eventually rejected it. They constructed a three-level taxonomy which contained common elements of almost all the taxonomies they reviewed. No literature was found that showed the three-level taxonomy in use for curriculum analysis or analysis of the demand in examination papers.

Pollitt et al. (2007) cite the revised Bloom's taxonomy (Anderson and Krathwohl 2001) as a possible instrument for analysing examinations, but say that it had not been used for this purpose before. It was designed as a taxonomy of educational objectives, with application to teachers' classroom activities and assessment tasks (Anderson and Krathwohl 2001). The present study used the revised Bloom's taxonomy to analyse examination papers from the four African countries. This instrument provides a detailed and nuanced analysis of demand expressed in educational objectives, instruction and assessment, by using a two-dimensional array. The columns on the array represent six

cognitive skills, which are arranged hierarchically. These are remember, understand, apply, analyse, evaluate and create. The rows represent four types of knowledge that students engage with: factual, conceptual, procedural and metacognitive knowledge. Each task can be allocated to a cell corresponding to the cognitive skill (usually indicated by the verb used) and the type of knowledge required to carry out the task. Thus, there are 24 possible categories into which an assessment item can be placed (Anderson and Krathwohl 2001).

Curricula and examination papers from the four countries for 2004 were obtained directly from the various examining bodies. Documents consulted are listed in Table 1.

The intended curriculum was extracted from the documentation provided. The examined curriculum was extracted from the intended curriculum by calculating the proportion of examination marks awarded to each section of the curriculum. Where choice was available within an examination paper, the weighting was calculated on the total number of marks, including all options available to students. The answered curriculum would have varied for different students, and would have been narrower than is presented here, since students were able to make choices. The analysis permitted an estimate of the breadth of the examined curriculum in each case.

Two analysts studied the format of the examination papers, including number of pages, number of individual questions, number of diagrams, and types of questions asked. Each question was analysed using the revised Bloom's taxonomy as described by Anderson and Krathwohl (2001) and Anderson (2005). The analysts debated questions at length before deciding on a cognitive and a knowledge category for each question. The number of marks allocated to each question, and its categorisation in terms of the revised Bloom's taxonomy, was entered on a spreadsheet. The marks were totalled for each

Table 1: Documents consulted for this study

Country	*Documents consulted*	*Source*
Ghana	Teaching Syllabus for Biology (Senior Secondary School), September 2003	Ministry of Education, Ghana
	Senior Secondary School Certificate Examination Biology 1 and Biology 2, July 2004 Final marking scheme Biology 1 and Biology 2, July 2004	West African Examinations Council, Ghana
Kenya	Biology Syllabus undated	Kenya Institute of Education
	Kenya Certificate of Secondary Education Biology Paper 1 and Paper 2, Oct/Nov 2004 Marking Scheme Paper 1 Updated Final Marking scheme Paper 2, Oct./Nov. 2004	The Kenya National Examinations Council Curriculum
Zambia	Biology High School Syllabus Grades 10-12 undated	Development Centre, Lusaka
	Joint Examination for the School Certificate and General Certificate of Education Ordinary Level Biology: Paper 1 Multiple Choice; Paper 2 Theory; Paper 3 Practical, Nov. 2004 Marking Scheme Paper 2, Paper 3, Nov. 2004	Examinations Council of Zambia
South Africa	Interim Core Syllabus and Provincialised Guide for Biology Grades 10-12 Higher Grade and Standard Grade (undated)	Originally KwaZulu-Natal Department of Education and Culture (1996); adopted as the national curriculum from 2003 Department of Education, Republic of South Africa
	National Curriculum Statement FET Life Sciences 2003 Examination Guidelines FET Life Sciences 2009	
	Senior Certificate Examination Biology HG Paper 1 and Paper 2; SG Paper 1 and Paper 2, Nov. 2004 Final Version – Memo Biology HG Paper 1 and Paper 2; SG Paper 1 and Paper 2 National Senior Certificate 2010 Life Sciences Paper 1 and Paper 2 Final Version Memo Life Sciences Paper 1 and Paper 2	Department of Education, Republic of South Africa National Department of Education, Republic of South Africa

FET = Further Education and Training

category in the revised Bloom's taxonomy table, and converted to a percentage, since the total number of marks for each country differed substantially.

RESULTS

In Ghana and Kenya candidates wrote a theory examination and a separate practical examination. In Zambia candidates wrote a theory examination and either a multiple- choice examination or a practical examination. South African candidates wrote two theory examinations in both 2004 and 2010.

Examined Curriculum

The examined curriculum addresses the scope of content examined in the 2004 examinations for each country, and the 2010 examination papers for South Africa. Only theory papers were included in this analysis, since the practical examinations were limited to a few specific topics due to time constraints. Table 2 shows the breadth of the examined curriculum in each country, and the weighting per generic content area. The generic content areas were cell biology,[2] form and function in plants,[3] form and function in animals,[4] diversity,[5] ecology,[6] heredity and evolution,[7] and social applications of biology.[8]

Social applications of biology include human health and disease, environmental issues, biotechnology, and indigenous knowledge systems.

Ghana, Kenya and Zambia examined all years of Senior Secondary school. The proportion of marks per year of study increased between the first and third years of study, with the fourth year in Kenya contributing a smaller proportion of marks. In South Africa only the final year was examined. Ghana, Kenya and Zambia included questions on all of the generic topics, with the exception of social applications of Biology in Kenya. South Africa did not examine diversity and heredity and evolution in 2004, and the 2010 examinations omitted cell biology, ecology and had a very small weighting on diversity. The examined curriculum in South Africa 2010 was much narrower than in other examinations. In all countries the highest weighting was on the form and function of animals, except the South African 2010 examination, where heredity and evolution was most heavily weighted. Form and function in animals included variable numbers of life processes in the different countries. In South Africa reproduction was the only life process in plants and animals that was included in the 2010 examined curriculum. All other examinations included almost all the life processes, with the exception of support and locomotion. The South African 2010 examinations included questions on DNA structure and functioning, which were omitted in other examinations. There was a marked difference between countries in the proportion of marks for social applications of Biology. This topic included mostly current environmental and human health issues. The South African curriculum examined in 2010 had

Table 2: Breadth of examined curriculum as indicated by number of years of study examined, and weighting per generic content topic (expressed as a percentage of total marks allocated to each year and content topic)

		Ghana	*Kenya*	*Zambia*	*South Africa HG and SG 2004*	*South Africa 2010*
Weighting per year of SSC	1	24.0	10.8	16.1		
	2	32.0	27.5	32.2		
	3	44.0	44.2	51.7	100	100
	4		17.5			
Weighting per generic subject area	Cell Biology	12.0	13.2	3.5	15.5	0.0
	Form and function in plants	25.5	24.0	13.9	17.2	2.7
	Form and function in animals	28.5	28.9	22.9	54.5	10.0
	Diversity	2.0	1.7	0.7	0.0	0.3
	Ecology	4.0	16.5	13.2	6.8	0.0
	Heredity and evolution	22.0	15.7	17.3	0.0	51.7
	Social applications	6.0	0.0	28.5	6.0	35.3

SSC = Senior Secondary Certificate

Table 3: Comparison of examination papers

	Ghana	*Kenya*	*Zambia*	*South Africa 2004*	*South Africa 2010*
Papers	Theory and Practical	Theory and Practical	Theory and either MCQ or Practical	Two theory papers	Two theory papers
Total Examination Time	5 h	4.75 h	2.6 h (MCQ option)3 h (practical option)	HG: 4 h SG: 4 h	5 h
Number of Pages	11 in theory paper. Answers written in separate booklet	14 for theory paper, including space to write answers	8 for theory paper, including space to write answers	HG: 36 SG: 32 Answers written in separate booklet	23 Answers written in separate booklet
Total Marks Per Paper	Theory: 140 Practical: 60	Theory: 100 Practical: 60	Theory: 120 Practical or MCQ: 40	HG: 200 x 2 SG: 150 x 2	150 x 2
Average Marks Per Question Answered	.9	2.3	1.8	HG: 3.2 SG: 2.7	2.4
Structure of Theory Paper	Section A: 60 MCQ (60); Section B: 4 'essay' questions out of possible 7 (80)	Section A: short answers (20) Section B: 5 questions, 8 marks each. Section C: Data response question (20), choice of two essays (20).	Section A: Five questions, short answers (Total: 84) Section B: Extended response; choice of 3 out of 5 questions (12 marks each).	Each paper: Section A: Short answers (HG: 60, SG: 50) Section B: Mostly short answers (HG: 104, SG: 100) Section C (HG only): Data response (17), mini-essay (18)	Each paper: Section A: short answers (50) Section B: Mostly short answers (60) Section C: Data response (22); mini-essay (18)
Weighting of School-based Assessment	30%	Not included	Not included	25%	25%

a strong applied Biology focus, but Zambia also included many questions related to environmental and health issues. Diversity of life received a small proportion of marks in all countries, or was not examined, as was the case in South Africa in 2004. Some questions were difficult to allocate to any topic, since they were designed to assess skills such as drawing a graph from given data, describing precautions to be taken when setting up an experiment, and interpreting information given in tables of data or graphs. The context may have been biological, but the cognitive skills required were generic to all sciences. These questions were allocated to the closest generic topic indicated by the context of the question.

Structure, Layout and Format of Examination Papers

The examination papers varied with regard to length, types of questions, and use of diagrams, which are factors that could affect the demand of examinations. Table 3 compares the structure, layout and format of the examination papers in the four countries.

Types of Questions Asked in Examination Papers

In Ghana the questions were text only, with no diagrams, tables or graphs. No experiments or data sets were included in the questions. Sec-

Table 4: Percentage of marks allocated to each category in knowledge and cognitive dimensions

Cognitive process	*Knowledge type*	*Ghana*	*Kenya*	*Zambia*	*SA HG*	*SA SG*	*NSC*
Remember	Factual	52.3	42.8	41.1	31.8	46.5	39.3
	Conceptual	2.7	5.0	0	0	0.7	1.7
	Procedural	6.9	0	0.6	1.3	2.3	0
Understand	Factual	1.5	7.2	20.0	19.8	13.6	5.3
	Conceptual	23.5	25.6	11.7	25.0	19.9	26.3
	Procedural	1.2	0	2.2	6.5	4.3	9.3
Apply	Factual	2.3	0	0.6	0	0	0.3
	Conceptual	0.8	0	2.8	0	0	0
	Procedural	8.1	17.2	14.4	11.3	4.0	15.3
Analyse	Factual	0	1.1	0	0	0	0
	Conceptual	0	1.1	2.8	1.8	6.0	0
	Procedural	0	0	0	0.5	0.7	1.3
Evaluate	Factual	0	0	0	1.3	0	0
	Conceptual	0.8	0	0	0	1.3	0
	Procedural	0	0	0	0	0.7	1.0
Create	Factual	0	0	0	0	0	0
	Conceptual	0	0	3.9	0	0	0
	Procedural	0	0	0	1.0	0	0

tion A contained 40 multiple- choice questions, each worth one mark. “Essay” questions were subdivided into two to six sub-questions. The practical exam contained three questions, each divided into sub-questions, and no choice was allowed. Students had to draw and interpret graphs from information in tabular form, interpret data in a table, identify specimens, and draw and label specimens. In the Kenyan theory paper, students were required to answer short questions, construct written answers to questions, draw and interpret graphs, interpret data in a table, label a diagram, explain/interpret a diagram, and write an essay. The question paper contained two diagrams and one table of data. The practical examination consisted of three questions, which required students to identify specimens, draw and label specimens, carry out an experimental procedure, and record procedures and observations in a table.The Zambian optional multiple-choice questions (MCQs) paper consisted of 14 A4 pages, with each question worth one mark. Students had 50 minutes to complete the paper. Among the questions there were nine diagrams, nine tables and nine graphs. The compulsory theory paper required students to answer questions related to a diagram (three questions), or an experimental set-up (two questions). There were five diagrams and one table of data in the paper. Section B consisted of five short two-part free-response questions, from which students could choose three. The optional practical paper contained two questions, one of which required students to carry out an experimental procedure and complete two tables of observations. The second question required students to identify, draw, label and answer questions about specimens.The South African examinations were divided into two papers, each questioning different topics. Examination guidelines specified that the two papers should not be written on the same day. The same format was followed for HG and SG, with short questions, free response, data analysis and, for HG, a mini-essay. The two HG papers together contained eight tables of data, four graphs, 18 diagrams and 12 experiments. The two SG papers contained six tables of data, four graphs, 17 diagrams, and five experiments. The South African National Senior Certificate examination of 2010 followed a similar format to that of the 2004 examination paper. Most questions contained introductory material in the form of a diagram, data table, description of an experiment, or an extract of text, followed by a number of questions, some related to the introductory material and some not. Section C contained one question, divided into many sub-questions. The questions required interpretation of diagrams and tables of data, and answers to questions related to an everyday issue. A mini-essay, worth 18 marks, was the last question on each paper. The two papers together contained five tables of data, five graphs, nine diagrams, and one described experiment.

Comparison of Examination Papers

The South African examinations stood out as being worth the greatest number of marks of all the countries, with a similar time for examinations as in the other countries. However, the examination time in Ghana and Kenya included a generous allocation for the practical exam. Zambia had the shortest overall examination time. The South African examinations were the most demanding in terms of marks per time allowed. However, the 2010 exams were less demanding than the 2004 exams in that more time was allowed for the same number of marks as in the 2004 SG papers. All examination papers were characterised by a low average number of marks per question. The implication is that the candidates were required to read and answer a large number of individual questions in the Biology examinations. The reading and visual literacy demand was particularly high in the South African exams of 2004, but less so in the 2010 papers. The volume of the examination papers in terms of number of pages was much greater in the South African examinations than in other countries, but again, this was reduced in the 2010 examinations. The South African examinations were the most demanding in terms of reading demand and visual literacy. Comparing the types of questions asked, Zambia appears to have the lowest demand in terms of output required, since there are no questions requiring an extended response in the form of an essay. Ghana has a section called "Essay", but all questions in that section were subdivided, limiting the requirement for construction of an extended piece of writing. The Kenyan and South African examination papers included an essay worth 20% of the total theory marks in Kenya, 12% of the total marks in the South African 2010 examinations, and 10% of the 2004 papers. The Kenyan exams were the most demanding on this factor. The practical examinations conducted in Ghana, Kenya and Zambia were authentic tests of skills required for conducting practical investigations in Biology. Skills of data analysis and interpretation were incorporated into the South African theory examination papers, but ability to physically conduct investigations was not assessed. Overall, the South African examination papers were the most demanding but the least authentic, since they did not assess the ability to conduct practical investigations. The Zambian examinations were the least demanding of all four countries. Kenya achieved a good balance of curriculum coverage, variety of question types and authentic assessment of practical skills. The South African 2010 papers were less demanding than 2004's HG and SG papers, in that they were shorter, required less visual literacy and reading, and had a more generous time allocation. A substantial proportion of marks in the 2010 papers could be obtained without specialist knowledge of the subject; an example is a nine-mark question requiring candidates to construct a pie chart from a given table of data.

Cognitive Demand of Examinations

All questions in all examination papers, including the practical examinations, were analysed using the revised Bloom's Taxonomy. Metacognitive knowledge was not identified in any question paper, and was omitted from the analysis.

One aspect needs to be mentioned in connection with the analysis: Anderson (2005) clearly indicates that questions that learners have experienced previously would be placed in the Factual Recall cell of the taxonomy table, rather than in higher-level categories. This knowledge was not available to the analysts, although we are aware that examination questions are recycled in most examining systems, and from personal experience we know that students are frequently coached for the final exams by working through previous exam papers. Since the analysts did not know which questions had been used previously, and how much coaching takes place in the selected countries, we attempted to grade questions as if the candidates were encountering the questions for the first time. Results are shown in Table 4.

Marks for all examinations were concentrated in four cognitive process-knowledge type combinations. These were Remember and Factual Knowledge, Understand and Factual Knowledge, Understand and Conceptual Knowledge, and Apply and Procedural Knowledge. A small percentage of marks were allocated to Analyse and Conceptual Knowledge and other higher-order questions. The proportion of marks allocated to the various cognitive process-knowledge combinations was compared using the Pearson chi-squared test, and the result was highly significant ($P<0.001$). The weighting of different

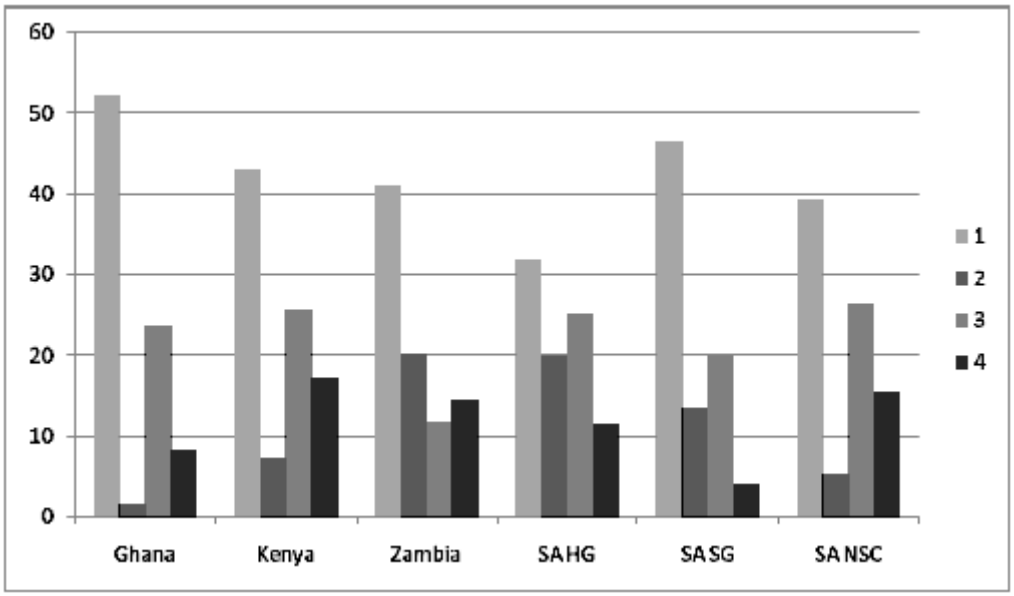

Fig. 1. Percentage of marks allocated to the four most common types of cognitive demand. 1= Remember Factual Knowledge; 2 = Understand Factual Knowledge; 3 = Understand Conceptual Knowledge; 4 = Apply Procedural Knowledge

cognitive process-knowledge combinations was thus significantly different in the different examining bodies.

Examples of each of these types of questions are given below.

Remember and Factual Knowledge: Name the main components of a DNA molecule (Ghana Paper 1).

Understand and Factual Knowledge: Explain why glucose must be present in the fluid surrounding the thin-walled plastic tubes in the kidney machine (Zambia Paper 2).

Understand and Conceptual Knowledge: What is the difference between Darwinian and Lamarckian theories of evolution? (Kenya Paper 1). *Apply and Procedural Knowledge:* Draw a pie chart to show the proportion of CO_2 emissions from the different countries, as shown in the table above. Show ALL calculations (National Senior Certificate 2010, paper 2).

Take the test tube labelled T3 and carry out the test for non-reducing sugar (Zambia Practical Test 2004).

Comparison Between Countries

Kenya's examination papers stand out as requiring higher levels of understanding conceptual knowledge and applying procedural knowledge than other countries. Ghana, on the other hand, had the highest levels of remembering factual knowledge, and lower levels of understanding conceptual and applying procedural knowledge. The analysis of Zambian examination papers included the compulsory theory paper and the two optional papers, the MCQ paper and the practical examinations. The profile of cognitive demand would be substantially different for different candidates, since the practical paper was heavily weighted in procedural knowledge, whereas the MCQ paper was more heavily weighted in other cognitive-knowledge combinations. The MCQ paper contained several higher-order questions requiring more than two steps of reasoning, yet the mark allocation was the same throughout, and only 50 minutes was allocated for the examination. A candidate electing to do the practical examination rather than the MCQ exam was at an advantage.

South African HG and SG papers were weighted differently, with the SG paper having a higher proportion of marks in remembering factual knowledge than the HG paper. The 2010 paper was intermediate between the HG and SG in terms of remembering factual knowledge, but had a higher weighting on applying procedural

knowledge than either of the previous HG and SG papers, although the procedures to be applied were rather simple.

Figure 1 supports the opinions of the World Bank (2008), that "Examinations allow for a limited measure of certain skills and knowledge only" (p. 64). There were very few questions in any country's examinations that required analysing, evaluating and creating. Although continuous assessment contributes to the final mark in Ghana and South Africa, it is not guaranteed to assess the skills intended, such as authentic practical skills in Biology.

The practical examinations of Ghana, Kenya and Zambia ensure that certain skills are indeed assessed, but this is not the case in South Africa. The two South African papers for 2004 contained many questions relating to standard laboratory experiments which were prescribed in the syllabus, but which were only rarely conducted in schools (Mkholo 2010). Such questions have doubtful validity, given that most candidates would never have seen the apparatus or conducted the experiments. These questions have disappeared from the 2010 examination papers. Although practical investigations are prescribed in the formal continuous assessment tasks for the 2010 curriculum, they are most often assessed as paper-and-pencil tests (Mkholo 2010). The effect is that students perform very little or no practical work in Biology classrooms in South Africa.

DISCUSSION

Pollitt et al. (2007) identified several features of examinations that would affect demand. These included the breadth of syllabus content examined, duration of examination time, number of questions in the examination paper, amount of reading and writing to be done to answer an examination paper, amount of question choice allowed, and the demand on long-term memory.

This study shows that the examined syllabus of Ghana, Kenya and Zambia is much broader than the examined syllabus of South Africa. Within South Africa, the examined syllabus was broader in 2004 than in 2010. In respect of breadth of content examined, the examinations of Ghana, Kenya and Zambia were more demanding than those of South Africa. In South Africa the examined syllabus of 2010 was less demanding than that of 2004.

The duration of examination time has a complex effect on demand. For example, if a lot of time is given because there are many questions or complex answers to be provided, then more time is equivalent to higher demand. If more time is given for the same number of questions, the demand is decreased (Pollitt et al. 2007). The number of marks in relation to total examination time is an indicator of this particular demand. Here the 2004 papers of South Africa were more demanding than those of the other countries, since there were many more marks to be gained in a shorter examination time. South Africa's 2010 examination papers increased the amount of time available by 1 hour, but kept the same total number of marks as the 2004 SG papers. On this measure, the 2010 papers were less demanding than the 2004 papers, at both HG and SG. A direct comparison between the South African exams and those of other countries is only valid if practical exams are excluded. Here the South African exams were much more demanding than other countries, and the narrower examined curriculum was assessed in much greater depth.

The total number of questions to be answered in a given time is a measure of the amount of work to be done to answer the examination paper. This factor is difficult to assess when different types of questions are asked, as was the case in Biology examinations. In this study the average number of marks per question was similar in all countries. However, it was noticed that MCQs in all countries except South Africa were awarded one mark each, whereas in South Africa they were awarded two marks. The MCQ paper of Zambia was distinctive in that a short time was allowed to answer the paper and questions requiring several steps of reasoning were included. It was considered more demanding than any other MCQ section.

Only Kenya and South Africa included authentic essay-type questions (a single question that required an extended piece of writing), which were worth a substantial number of marks. This may increase the demand of these examination papers, especially given the large number of candidates writing in their second language, or it may reduce memory demand because students are able to avoid facts that they don't remember accurately (Pollit et al. 2007). South Africa's experience is that second-language students have difficulty writing extended responses in English (Howie 2001; Reddy 2006). Thus, any questions

that require extended responses increase the demand of examinations in African countries. In this respect Zambian examinations are easier than Ghana's, which are easier than in Kenya and South Africa. In the South African 2010 papers the essay was much reduced in its cognitive demand. Kenya's theory exam, with 20% of the marks from an essay, was more demanding than any other.

In terms of amount of reading and writing to be done, the South African examinations were substantially more demanding than other papers, given their sheer length. The 2010 papers were less demanding than the 2004 papers. The demand in terms of visual literacy and interpretation of data was also much greater than in other countries. The level of reading difficulty was not assessed in this study.

Question choice decreases demand when it allows candidates to avoid questions that they do not remember well, but may increase demand when candidates spend time reading all the possible questions and selecting which to answer (Pollitt et al. 2007). The South African examinations allowed no choice, while all other countries allowed some choice. The choice was significant in the Ghanaian long questions. Choice may have increased demand in Ghana, but not in Kenya and Zambia, and the lack of choice may have increased demand in South Africa.

The demand on long-term memory is reduced when examinations are "open-book", as well as when information is provided on the examination paper (Pollit et al. 2007). None of the examinations in this study was "open-book", but the 2010 South African paper was distinctive in that many questions required candidates to use information provided on the examination paper. Some questions required basic numeracy or literacy skills for their answers. Candidates for the 2010 examination obtained an average mark of 41.6%, compared to an average mark of about 35% in the two previous years. The 2010 Biology marks were adjusted downwards during the standardisation process, from a raw mean of 41.6% to a final average of 38% (Umalusi 2011). In this respect the South African 2010 paper was less demanding than the 2004 paper, and less demanding than those of other countries.

The South African 2010 examinations reflect a deliberate attempt to move away from reliance on rote-learning to use of provided information to answer questions. In the CRAS analysis of cognitive demand, such questions would score 1 for Resources (the use of data and information), since almost all the data/information needed is given (Ofqual 2011). In order to score a 4 for Resources, a candidate must generate all the necessary data or information. In the CRAS scale of demand, recalling complex information is more demanding than using provided information to construct an answer. Moseley et al. (2005) identified "Information-gathering" as their lowest-order cognitive skill, including comprehending messages and recorded information, in addition to remembering information. Thus, the new-style Biology examinations in South Africa have not achieved the intentions of encouraging higher-order thinking skills, because the questions are of low demand.

The lower cognitive demand of the new curriculum examinations compared with the 2004 examination is supported by a comparison of Mathematics and Physical Science marks in 2007 and 2008. Grade inflation had occurred between the 2007 Senior Certificate and the 2008 National Senior Certificate, to the extent of one grade difference at the top end of the scale in Mathematics (Centre for Development and Enterprise 2010).

CONCLUSION

This study provides a qualitative and quantitative description of the examined syllabus, structure and cognitive demand of examination papers in four countries. While there are some similarities between the countries, each has its own distinctive characteristics. Three countries examine a very broad curriculum in a relatively short period of examination time, while South Africa examines a narrow curriculum in a long period of examination time. More depth is evident in the South African examined curriculum of 2010 than in 2004, but this is offset by provision of much of the information on the examination papers. Consequently, the demand of the examination declined from 2004 to 2010.

Of all the examinations included in this comparative study, Kenya's stand out as providing a balance between theory and practical, breadth of examined curriculum, and variety of types of questions on relatively short examination papers. A range of cognitive demands is required to answer questions, and a range of types of answers is required, including a substantial component of structured answers.

In terms of recognition for entry into tertiary education, the South African HG examined curriculum and examinations of 2004 were more demanding on many factors than those of other countries. The 2010 examined curriculum and examinations were less demanding than in 2004, and substantially different from those of other countries. The emphasis on social applications within such a narrow examined curriculum detracts from preparation for further study, and is exacerbated by the lack of an authentic practical examination. On the positive side, the depth of examination in the limited range of topics is laudable.

One of the aims of this study was to provide an estimate of comparability of the demands of exit-level Biology examinations in South Africa, Ghana, Kenya and Zambia. Taking into account all factors that affect demand, the 2004 examinations of all four countries should be regarded as equivalent. The South African 2010 examination is somewhat different, with its narrower curriculum and less demanding examination papers. This will change in 2011, with examination for the first time of a broader, more demanding curriculum.

Other subjects need to be considered before a final decision about comparability of qualifications is made. In this regard, Mathematics was a compulsory subject in Ghana, Kenya and Zambia, whereas in South Africa it was optional until 2008. Thereafter, Mathematical Literacy or Mathematics became compulsory. Mathematics examinations in 2004 were considered to be of a comparable standard in the four countries.

Physics and Chemistry are taught as separate subjects, except in South Africa, where they are combined into one subject, Physical Science. Ghana and Zambia offer an integrated Science course, which in Ghana is a compulsory subject, and in Zambia a very popular elective. Ghanaian students may elect to study Physics or Chemistry in addition to the integrated Science course. Zambian students may elect to replace the integrated Science with Physics or Chemistry, but few candidates do so.

Kenya prescribes that candidates must offer two science courses out of Physics, Chemistry and Biology. The most popular combination is Physics and Biology. The various permutations available make it very difficult to compare the science subjects. However, Kenyan, Ghanaian and Zambian school-leavers who have elected to study Physics or Chemistry are likely have a greater depth of knowledge than South African candidates who studied Physical Science. The 2004 examination papers of South Africa and Kenya were considered to be comparable in terms of level of difficulty, while those of Ghana and Zambia were less demanding. A practical examination was included in all countries except South Africa.

The findings for Physical Sciences and Mathematics thus support those for Biology - that the subjects are broadly comparable in the four African countries.

RECOMMENDATIONS

The recommendation of this study is that the Biology examinations of all four countries should be recognised as equivalent to each other.

Kenya provides an example of good practice in the balance of questions across the examined curriculum, the importance placed on practical work, a manageable amount of reading and visual literacy required to answer the examination paper, and the range of cognitive demands assessed.

LIMITATIONS OF THIS STUDY

Examinations vary in terms of demand and difficulty from year to year, so this case study is limited by the fact that it compared examinations from only 2004 in three countries, and one year of the new curriculum in South Africa. It used the revised Bloom's taxonomy as the instrument of analysis of examination papers. This complex instrument was effective when the analysts worked together, but it was noticeable that when we worked separately our analyses diverged. It was particularly difficult to distinguish between factual and conceptual knowledge, in keeping with the finding of Crisp and Novaković (2009), who found that analysts had difficulty using the category "Abstractness" in the CRAS analysis scheme.

A further limitation to the study was a lack of knowledge about the preparation of candidates for examinations. Past papers with model answers are freely available in South Africa and probably in other countries, and are used extensively to coach candidates for the exams. The predictability of the exam format and recurrence

of questions are factors that would reduce demand in remembering factual knowledge.

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NOTES

1. Umalusi is the Council for Quality Assurance in General and Further Education and Training in South Africa. It is tasked with monitoring the standards of all pre-tertiary qualifications offered in South Africa.
2. Cell Biology includes the structure and functioning of cells. Cell ultrastructure, photosynthesis and cellular respiration are included in this topic.
3. Form and function in plants includes all whole-plant structure and function. It includes plant-water relations and plant responses to the environment.
4. Form and function in animals includes all whole-animal structure and function. It includes human anatomy and physiology.
5. Diversity includes the classification system, where the emphasis is on raising awareness of the diversity of life.
6. Ecology includes the biosphere, biomes, ecosystems, community and population ecology. Conservation is included in ecology.
7. Heredity and evolution includes the structure and function of DNA, genetics, and evolution by natural selection. Evidence supporting evolution is included in this topic.
8. Social applications of biology include human health and disease, environmental issues, biotechnology, and indigenous knowledge systems.

REFERENCES

Anderson LW 2005. Objectives, evaluation and the improvement of education. *Studies in Educational Evaluation*, 31: 102-113.

Anderson LW, Krathwohl DR (Eds.) 2001. *A Taxonomy for Learning, Teaching and Assessing: Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman.

Atkin P, Black JM 2003. *Inside Science Education Reform*. Buckingham: Open University Press.

Bergan S 2010. Preface. In: A Rauhvargers, A Rusakova (Eds.): Improving Recognition in the European Higher Education Arena: An Analysis Of National Action Plans. Council of Europe Higher Education Series No. 12 (pp. 7-13). From< http://book.coe.int/ftp/3391.pdf > (Retrieved July 8, 2011).

Black P, Wiliam D 2006. The reliability of assessments. In: J Gardner (Ed.): *Assessment and Learning*. London: SAGE Publications, pp. 9-25.

Centre for Development and Enterprise 2010. *The Maths and Science Performance of South Africa's Public Schools*. Johannesburg: Centre for Development and Enterprise.

Coe R 2008. Comparability of GCSE examinations in different subjects: An application of the Rasch model. *Oxford Review of Education*, 34: 609-636.

Cresswell JW 2009. *Research Design.* 3rd Edition. Thousand Oaks: SAGE Publications.

Crisp V, Novakoviæ N 2009. Is this year's examination as demanding as last year's? Using a pilot method to evaluate the consistency of examination demands over time. *Evaluation and Research in Education*, 22: 3-15.

Eckstein MA, Noah HJ 1989. Forms and Functions of Secondary-School-Leaving Examinations. Comparative Education Review. 33: 295-316. From< http://www.hku.hk/cerc/Publications/CERC_5.htm> (Retrieved July14, 2011).

Eckstein MA 1994. Great Expectations: An International Comparison of End-of-Secondary School Examinations. Background Paper Prepared for a Conference of the Office of Educational Research and Innovation, Department of Education, Washington, D.C. From< http://www0.hku.hk/cerc/Publications/CERC_5.htm> (Retrieved July14, 2011).

Grussendorff S, Booyse C, Burroughs E 2010. *Evaluating the South African National Senior Certificate in Relation to Selected International Qualifications: A Self-Referencing Exercise to Determine the Standing of the NSC*. Pretoria: HESA and Umalusi.

Harlen W 2007. *Assessment of Learning*. London: SAGE Publications.

Hungi N, Makuwa D, Saito M, Dolata S, van Capelle F 2010. Pupil Achievement Levels in Reading and Mathematics. SACMEQ Working Paper Document Number 1. From< http://www.sacmeq.org/downloads/sacmeqIII/WD01_SACMEQ_ III_ Results_ Pupil_Achievement.pdf> (Retrieved July 6, 2011).

Howie S 2001. *Mathematics and Science Performance in Grade 8 in South Africa 1998/1999*. Pretoria: Human Sciences Research Council.

Kellaghan T, Greaney V 2004. *Assessing Student Learning in Africa*. Washington, DC: World Bank.

Mkholo BSM 2010. *Assessment in Further Education and Training (FET) Life Sciences: An Analysis of Assessment Tasks in Three Selected Schools in the Mpumalanga Province*. M. Ed. Thesis, Unpublished. Pietermaritzburg: University of KwaZulu-Natal.

Moseley D, Elliott J, Gregson M, Higgins S 2005. Thinking skills frameworks for use in education and training. *British Educational Research Journal*, 31: 367-390.

Ofqual 2011. *International Comparisons in Senior Secondary Assessment: Progress Report*. London: Ofqual.

Pollitt A, Ahmed A, Crisp V 2007. The demands of examination syllabuses and question papers. In: P Newton, J-A Baird, H Goldstein, H Patrick, P Tymms (Eds.): *Techniques for Monitoring the Comparability of Examination Standards*. London: Qualifications and Curriculum Authority.

Qualifications and Curriculum Authority 2008a. *Inter-subject Comparability Studies. Study 1b: GCSE, AS and A Level Sciences.* London: Qualifications and Curriculum Authority.

Qualifications and Curriculum Authority 2008b. *Inter-subject Comparability Studies. Study 2a: A Level Biology, Psychology and Sociology.* London: Qualifications and Curriculum Authority.

Reddy V 2006. *Mathematics and Science Achievement in South African Schools in TIMSS 2003*. Cape Town: HSRC Press.

Umalusi 2007. *Learning from Africa: Umalusi's Research Comparing Syllabuses and Examinations in South Africa with those in Ghana, Kenya and Zambia*. *Umalusi Research Report*. Pretoria: Umalusi.

Umalusi 2009. *2008 Maintaining Standards Report. Umalusi Research Report*. Pretoria: Umalusi.

Umalusi 2011. How Umalusi Adjusted the 2010 Matric Results. Text of Briefing by Chairperson Sizwe Mabizela 27 February 2011. From< http://www.politicsweb.co.za/politicsweb/view/politicsweb/en/> (Retrieved October 10, 2011).

World Bank 2008. Curricula, Examinations, and Assessment in Secondary Education in Sub-Saharan Africa. *World Bank Working Paper No. 128.* Washington DC: The World Bank.