Classroom Practicesand the Validity of Teaching Mathematics in Botswana Senior Secondary Schools

by

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Abstract

Poor teaching short-chains learning in terms of under-equipping the learners with the knowledge and skills as intended by society through the curriculum. Curriculum is the ultimate criterion when it comes to any attempt at validating the syllabus, teaching, learning, and even testing. Teaching owes its validity to how well it is designed and carried out to reflect all the objectives and contents of the syllabus which operationalizes the curriculum. A situation which performance on a test demands, to a significant level, abilities other than that which the test item was design to measure calls to question the validity of the teaching as well as that of the testing. Testing is valid to the extent that it takes care of the demands of the curriculum via the syllabus, Poor teaching deflects the validity of testing because it stands on the way of performance on test items reflecting the demands of the syllabus. Both the learner and the society are cheated by ineffective coverage,through poor teaching,of the syllabus in terms of its objectives and contents. Through content analyses, the study determines and compares the different validities as implied in the syllabus-teaching-testing continuum. The findingsare discussed and relevant recommendations are made.

Key words: Curriculum, syllabus, validity of teaching and testing; content analysis;

Introduction

"We have a perennial problem of unsuitably qualified teachers. Indeed, in some cases teachers are teaching at a level where they would have failed exams themselves. A

> good teacher is often an equaliser between poor and rich children. He argued that poor infrastructure and hunger is no excuse for failure as a good teacher, regardless of the conditions, will always produce results" (Matota, 2016)

Nenty (2001) elaborated how during a test or examination, students' ability is pitched against the cognitive demand of each test item. These items then act as stimuli to elicit from the students the cognitive behaviour or ability called for by the course objectives in relation to the content. He pointed out that the examinee response to each of the items is a reflection of; a) how well the desirable specified behaviour has been developed, b)how well the course content has been taught and understood, c) examinees cognitive ability, d) the cognitive demand-level of the item, and e) other influencing factors, with each having varying impact on the response to each of the test items. However, the examiner summoned score hide a lot more than it reveals as it does not reflect these influences (Nenty, 1987 & 2001). There have been discussions centered on whether the resultant score or mark is an indicator of the learner's true ability. The total score on an examination may not give a fair indication of the differences in student achievement. Wenglinsky (2002) observed that a group of examinees could be perceived as low achieving when in fact the instructional process really is inefficient or the objectives covered in the class are underrepresented on the examination.

Eisemon and Schwille (1991) revealed that testing in academic subjects like language arts and mathematics is seldom designed to assess any skills and knowledge of practical importance and more often, subjects with content that helps schools leavers to both think about and perform tasks in daily life, examples being nutrition, home economics, modern agriculture and science, are not examined.

Over the years, Botswana has chosen to invest vast resources on the education system with commendable efforts. There appears to be significant national support for advancing the education of the citizens (UNESCO, 2002). Botswana's educational system is heavily pegged

to the development and socio-cultural needs of the country as a whole. However, embedding the educational requirements to the needs of the society requires that skills that are relevant to a developing nation with specific goals and visions be emphasized in the process of teaching and learning. Thus, the question remains whether the quality of education has improved to actualize this vision or there is no difference.

In highly competitive situations, external examinations are usually preferred because these allow greater standardization of tasks and conditions and, hence, greater comparability of results. Where rigorous grading is not required, school-based assessment is usually preferred because it allows the teacher to match the assessment more closely to both the curriculum and the individual student. Wegner (n.d.) state that in many respects, the overall structure of the first-year American law curriculum is relatively simple and relatively uniform. Most schools would cite the goal of instructing students in "thinking like a lawyer" (commonly understood to include skills in analysis and synthesis) as the overarching goal of the first year.

The mathematical problem solving has been the focus of concern in the area of mathematics. Problem solving, which involves the application of previously acquired knowledge to new and unfamiliar situations, has been emphasized as the main reason for studying mathematics. As society becomes more technological, it is increasingly important for students to rely on problem-solving abilities to solve the problems of today. Most educators agree that there is less need for drill exercises and more need for posing and solving interesting problems. Although students can perform basic mathematical computations adequately, they do not exhibit adequate problem-solving skills. In order to improve students' problem-solving achievement, teachers need to know more about student behaviours and which instructional approaches help students develop their problem-solving abilities. One of our key education goals is for *all* students to become independent thinkers and learners and to

have the confidence, skills, and knowledge to solve problems. There can never be equality of education opportunity as long as some educators maintain attitudes that low achievers have less need for thinking skills than high achievers. We need to empower *all* students with the thinking skills that will help them help themselves (Padron & Waxman, n.d.).

The ideal picture of syllabus-exam relationship is shown in Figure 1. The syllabus is central to teaching and testing. It should fulfil the development/ millennium goals of Botswana by providing for all the necessary skills expected of students when they graduate from school. Using the syllabus as the criterion, Botswana General School Certificate

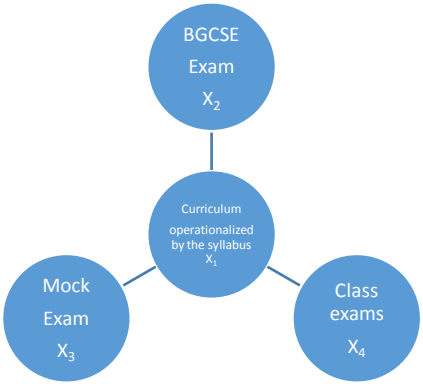

Figure 1. *Ideal representation of syllabus - examination relationship (Adopted from Nenty, 2006, p.3)*

Examinations (BGSCE) should be aligned to the syllabus; test items should reflect instructional objectives and should be representative of the population of skills and knowledge included in the syllabus. Similarly mock, classroom exams and classroom teaching should reflect what the syllabus demands. Classroom tests, classroom activities and teaching strategies should fulfil the requirements of the syllabus.

Figure 2 shows that in practice, content of mock and school mid-year examinations which should be dependent on the syllabus, is dependent on the content of BGSCE examinations. For any validation purposes, all examinations should have the syllabus as their criterion instead of BGSCE. The validity of BGCSE examination given the syllabus is Validity 1; that

of classroom examination given the syllabus is Validity 2, and that of mock examination given the syllabus is Validity 3. The validity of classroom examinations given the syllabus is Validity 4 and that of classroom examination given BGSCE is Validity 5.Variables X_1 to X_4 have been identified. The task is to determine Validity 1 and test it for significance; to determine Validity 2 and Validity 5 and compare them for significant difference; and to determine Validity 3 and 4 and compare them for significant difference.

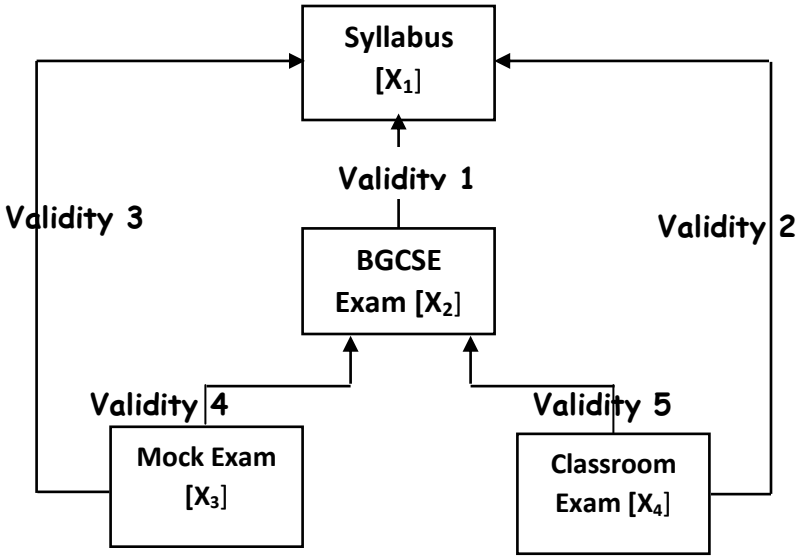

Figure 2 Validity of Examining Syllabus Content (Adopted from Nenty, 2006)

Another probable but important task is to content-analyse the goals/objectives of development/millennium goals or goals of education of Botswana and then compare the results with those of the syllabus. We want to be able to attempt an answer to the question "to what level has the syllabus of Botswana provided for that which will guide the production of school leavers that are able to contribute to the development of the society?"

Statement of the problem

The basic problem of concern to this study is that examiners, because ofthe nature of the assessment instruments they develop, act as gate keepers to learners' success and furthereducation and therefore good employment of graduates. They exert more influence on

the curriculumthan curriculum developers and implementers. This is because bothteachers and students tend to pay more attention to what is examined thanwhat is in a syllabus. Wherever and whenever there is a divide between the curriculum and evaluation or assessment this problem will remain (Nkosana, 2008).

Furthermore, the performance of students in senior secondary schools continues to decline given government effort by allowing students to transit to senior secondary schools even when they did not do well in junior secondary school.To government, we rather have quantity rather than quality education in tertiary institutions and eventually a society unable to make meaningful contribution of its own socio-economic development. The results is that those who have passed through secondary education lack important skills to sustain their livelihood; are not able to provide for human resource needed for development of their society and in the long run the developmental goals of the nation have high chances of not being realised. Were students taught the content of the subject or where there simple prepared to answer items during examinations? What students were taught falls short of what there were supposed to be taught. Determining how well students are prepared for tertiary education will inform and empower policy makers and teachers to ensure the development of desirable skills for society.

Purpose of the study

The purpose of this study is to rather analyse the subject matter and the cognitive goals of the BGCSE Mathematics and mathematics syllabi, as well as the content, the level of cognitive demand of related items in the mock and final BGCSE examinations. The curriculum as provided by the government and/or society during planning could lower validity if they are taught but not examined as per the syllabus but could raise validity if the curriculum is implemented as there have been taught and examined accordingly. Since

content and skill of public examinations in secondary schools tend to determine what is taught in the classrooms, there is a need to find out if this will be reflected in by the examination papers

Research Hypothesis

H_1: The validity of measuring mathematics performance through mock examinations given the mathematics syllabus as the criterion is significantly higher than that of measuring mathematics performance through mock examinations, given BGCSE mathematics as the criterion.

H_1: $\rho_{val3} - \rho_{val4} \neq 0$

H_2: The validity of measuring mathematics performance through mock examinations given BGCSE examinations as a criterion is significantly different from that of measuring mathematics performance throughmock examinations given the syllabus as a criterion.

Ho: $\rho_{val4} - \rho_{val3} \neq 0$

Literature Review

As affirmed by Nenty (2000), fundamental interpretations of assessment results can shift traditional use of assessment scores from mere selection, placement and graduation tool, to a driving force that re-directs the educational standards to an upward trend. This is characterized by a situation where students are made to bear the whole blunt and consequences of grades or marks that appear against their names (Nenty, 2001). Consequently, such examination results fail to bring any significant contribution and changes to educational policies, practices and hence to the quality of education. He however cautioned that nation-wide assessments practices must continue to be fair and standards secure so that public confidence is sustained. Hence, the daunting challenges of using large scale assessment as a strategy to improve quality of education (Nenty, 2000).

In developed countries, specifically the United States of America, education policymakers and professionals often use test results for multiple purposes;measuring educator effectiveness and development,connecting assessments and learning, monitoring the educational system, aiding instructional planning, motivating students to perform better, acting as a mechanism to change instructional content, and holding schools and educators accountable. Tests are also used to certify students as having attained specific levels of achievement (NCME, 2013). Detailed analysis of testing results can give very useful feedback that can improve teaching and learning hence the quality of education. For example, analyzing the incorrect answers to test items can give important information on student's preparation and influence of other background factors. Identifying such factors and resolving them would add invaluable benefits toward quality education (Nenty, 2000).

Turner, Cox and Dicintio (1998) used student self-report of involvement in mathematics and related them to instructional strategies observed in their upper – elementary classrooms. The study revealed that there are specific discourse strategies associated with low and high student involvement (participation). Strategies with less student involvement have this teaching sequence where a teacher initiates, responds to students' queries and evaluates students work. In this process of Initiation–Response–Evaluation (I–R–E) the teacher evaluates student's response as right or wrong, asks a known answer question and establishes the authority of the textbook himself/herself. There are teaching procedures where a teacher gives directions, implements procedures and tells students how to think and act. The teacher gives extrinsic support by uttering superficial statements of praise where focus is not on learning goals and objectives. The discourse analysis of instruction in high–involvement classrooms revealed that teachers' scaffolded instruction, that is, negotiated understanding, transferred responsibility and fostered intrinsic motivation. Students respond to errors constructively and the teacher's comments are focused on student progress toward the

learning goals and objectives and teachers support development of strategic thinking, they encourage autonomous learning and hold students accountable for understanding; while in low-involvement classrooms, instruction was characterised by I–R–E sequence, emphasis on procedures, and extrinsic motivation strategies.

Fetogang (2015) in his survey through a questionnaire to solicit the extent to which teachers teach and assess as required by the curriculum and ended up recommending that teachers should perceive classroom teaching practices through following the curriculum/syllabus as a means of enhancing quality of education in Botswana schools and they should be motivated to do so.

Olusegun (2015) states that understanding, identifying, and nurturing the creative potential is relevant in education if we want students able to solve academic and personal problems and challenges, to find innovative solutions and alternatives, and to have better tools and resources for success in a fast-changing world. Creative thinking not only enhances our ability to adapt to our environment and circumstances but also allows us to transform those environment and circumstances. Creativity has been identified as a key component for survival and resilience. If our goal is to teach and nurture future scientists, artists, engineers, entrepreneurs we need to understand and nurture the creative potential because creativity has provided thefoundation for art, science, philosophy, and technology. If we want to teach children to become productive human beings, and more satisfied with what they do with their lives we need to support them in the process of discovering and enjoying their creative potential.

Review of literature show contradictory results on gender and mathematics achievement. Some show a cutback in gap performance over a decade. It has been reported that boys no longer have the advantage they had over girls when it comes to performance in mathematics. Botswana Ministry of Education records show that girls generally perform

better in mathematics than boys. More girls were awarded higher grades (A, B and C) than boys in 2008 while fewer girls were awarded lower grade D than boys (MoE, 2009).

Conversely, other researchers content this argument warn that to conclude that gender differences in mathematics performance is no longer a concern, could be premature conclusion. Research has over the years revealed that there are gender disparities in mathematics performance. Gender differences in mathematics performance are said to develop during secondary school phase and tends to favour boys (Leder & Fennema, 1990). Nenty's (2001) study revealed that locality also exerts significant influence of student's response patterns. In the location factor, urban schools as well as schools in educationally advantaged LGAs tended to have more consistent response patterns.Most studies reveal that teachers often ask lower order questions. In their study, Williams, Alley and Henson (1999) found that 95% of teachers' questions are classified as low level usually requiring a yes or no response. Results further revealed that lower status pupils receive fewer questions from the teacher, and these rare questions are more often closed–ended, relative to higher status children.Several content validity studies done in Malawi and that conducted by Mbunge (1986) found out that the examination did not cover the syllabus quite enough in his assessment of the 1980 and 1982 final mathematics examinations papers. Some topics were over examined others not examined at all. In addition, most items were on the high level cognitive skill which was difficult for average students. Similarly, a study done by Mbunge as he examined the content validity of the cognitive domains behaviour measured by the Malawi Geography O Level exams revealed that content coverage was low and questions repeatedly asked from the same content areas and cognitive skills.

Methodology

The study is descriptive survey based on quantitative content analysis of the syllabus, public examinations and a mock examination, which is the key data collection method for the

study, can be seen as a method for descriptive survey for which the subjects are documents whose characteristics were described quantitatively. Documents being the BGCSE and mock examination papers including the syllabi of mathematics subject.

The population in this study consists of agriculture syllabi as well as mathematics BGCSE and Mock examination papers from 2007 to 2012. Mathematics BGCSE and Mock examination papers were requested from randomly 20 sampled schools since they are exactly the same across the country. Six Paper 1 and 6 Paper 2 final examination papers and mock examination papers respectively were collected between 2000 and 2012. Examination of documents is good if intention is to expand insight into a teaching approach and assessing movement, outline, and uniformity in teaching documents. Content analysis from the syllabus was analysed based on cognitive domain as outlined in table 1, instructional objectives outlined were categorised under one of the 13 subcategories of skill, and each skill was given a numerical value. Mathematics Papers 1 and 2 were paired before any processing was done. These papers were analysed item by item to determine the cognitive abilities called for each student per item. The mark awarded to the item was translated as the mark awarded to the skill being measured and then recorded. Marks awarded to similar categories were added up for the entire test to make 13 numerical values representing each of Bloom cognitive subcategories. Codes derived from the syllabus and from the examination papers were correlated using Pearson's r. Further correlations were done by correlating the codes derived from the examination to each of the other codes. Analysis of data is essentially translation of an arrangement of the data in a different layout for an improved thoughtfulness and this is termed data processing20. Similarly, content codes in the examinations, subtopics addressed in the syllabi were extracted. Each subtopic was assigned a figure that showed how many times it ismentioned in the syllabus. Examination papers were analyseditem by item and subtopics addressed in the examination itemswere paired with the mark awarded for the item

in question. Codes resulting from the syllabus and those from the examination papers were then correlated using Pearson's r. Correlating codes from various examination papers with every other exam were further analysed. Unprocessed data analysis was necessary to appropriately take out the sequence of information with fewer mistakes. All figures were analysed using SPSS.

Data analysis and Interpretation of Results

Analysis of the Mathematics Cognitive Skills called for by the Syllabus and Measured by Examinations in Botswana Senior Secondary Schools

H_{O1}: Validity of cognitive skill measurement for mathematics Mock examinations given the syllabus as a criterion is not significantly different from validity of cognitive skills measurement in mock examinations given BGCSE examinations as a criterion.

Ho: $\rho_{val3} - \rho_{val4} = 0$

Table 1

Z-test Analysis of the Differences in the Coefficients of Pearson Correlation of Cognitive Skill Between CSBMMYE & CSBPS and Between CSBMMYE & CSBMBGCSE in Mathematics for 2000 – 2012

Year	Variables	r-value	Z_r (Z-transformed) value	Z-test value
2000	CSBMMYE & CSBPS	.311	.3220	-0.4677
	CSBMMYE & CSBMBGCSE	.385	.4060	
2001	CSBMMYE & CSBPS	.350	.3650	-0.1058
	CSBMMYE & CSBMBGCSE	.366	.3840	
2002	CSBMMYE & CSBPS	.522	.5788	-0.0624
	CSBMMYE & CSCMBGCSE	.530	.5900	
2003	CSBMMYE & CSBPS	.569	.6464	-0.2205
	CSBMMYE & CSBMBGCSE	.542	.6068	
2004	CSBMMYE & CSBPS	.356	.3722	-1.0156
	CSBMMYE & CSBMBGCSE	.504	.5546	
2005	CSBMMYE & CSBPS	.468	.5076	-0.7818
	CSBMMYE & CSBMBGCSE	.570	.6480	

2007	CSBMME & CSBPS	.25	.25	-1.34
	CSBMME & CSBMBGCSE	.48	.53	
2008	CSBMME & CSBPS	.19	.19	-1.77
	CSBMME & CSBMBGCSE	.50	.55	
2009	CSBMME & CSBPS	.14	.14	0.01
	CSBMME & CSCMBGCSE	.14	.14	
2010	CSBMME & CSBPS	.31	.33	-1.30
	CSBMME & CSBMBGCSE	.38	.56	
2011	CSBMME & CSBPS	.03	.03	-1.91
	CSBMME & CSBMBGCSE	.45	.48	
2012	CSBMME & CSBPS	.28	.29	-0.16
	CSBMME & CSBMBGCSE	.30	.31	

To test this hypotheses, a Z–test of comparing Fisher's transformed r–values from dependent sample was done (Hakstian & Kansup, 1975). The results as presented in table 16 in measurement of cognitive skill indicate that the validity of the mathematics by mid-year examinations, given the mathematics syllabus as the criterion, is not significantly higher ($Z_{.05}$< 1.96, -.1058 to - .2205) than the validity of the mathematics mid-year examinations, given the mathematics BGCSE as the criterion in Botswana senior secondary schools (see Table 16).

Analysis of Content of Mathematics called for by the Syllabus and Measured by Examinations in Botswana Senior Secondary Schools

Ho_2: *In the measurement of subject matter content, the validity of mathematics mid-year examinations given the mathematics syllabus as the criterion, is significantly higher than the validity of the mathematics mid-year examinations given the mathematics BGCSE as the criterion.*

$Ho_2: \rho_{v3} - \rho_{v4} = 0$

Table 3

Z-test Analysis of the Differences in the Coefficients of Pearson Correlation in Content Between SMCMMYE & SMCPS and between SMCMMYE&SMCMBGCSE in Mathematics for 2000 – 2012

Year	Variables	r-value	Z_r (Z-transformed) value	Z-test value
2000	SMCMMYE&SMCPS	.748	.9686	8.4398
	SMCMMYE&SMCMBGCSE	.315	.3260	
2001	SMCMMYE&SMCPS	.546	.6124	6.0206
	SMCMMYE&SMCMBGCSE	.153	.1540	
2002	SMCMMYE&SMCPS	.881	1.3804	14.4394
	SMCMMYE&SMCMBGCSE	.274	.2810	
2003	SMCMMYE&SMCPS	.986	2.4838	29.0312
	SMCMMYE&SMCMBGCSE	.267	0.2734	
2004	SMCMMYE&SMCPS	.350	.3650	3.2703
	SMCMMYE&SMCMBGCSE	.115	.1160	
2005	SMCMMYE&SMCPS	.521	.5774	4.9436
	SMCMMYE&SMCMBGCSE	.198	.2010	
2007	SMCMME&SMCPS	-.10	.10	-0.98
	SMCMME&SMCMBGCSE	.19	.19	
2008	SMCMME&SMCPS	-.13	.13	-2.74
	SMCMME&SMCMBGCSE	.35	.37	
2009	SMCMME&SMCPS	-.07	.07	-2.85
	SMCMME&SMCMBGCSE	.31	.32	
2010	SMCMME&SMCPS	.01	.01	-5.18
	SMCMME&SMCMBGCSE	.40	.42	
2011	SMCMME&SMCPS	-.06	.06	-2.14
	SMCMME&SMCMBGCSE	.27	.28	
2012	SMCMME&SMCPS	-.00	.00	-4.75
	SMCMME&SMCMBGCSE	.36	.38	

To test this hypotheses, a Z–test of comparing Fisher's transformed r–values from dependent sample was carried out (Hakstian & Kansup, 1975). The results as presented in Table 3 in measurement of content indicated that the validity of mathematics by mock examinations given the mathematics syllabus as a criterion was significantly higher ($Z_{.05} > 1.96$) than the validity of the mathematics mock examinations given the mathematics BGCSE as the criterion in Botswana senior secondary schools from year 2000 to year 2005 (see Table 3).

Content Validity of Mock and Public Examinations

H_{O3}: Content measured in BGCSE mathematics examinations does not significantly reflect the content material in the instructional objectives outlined in the syllabus.

Ho_3: $\rho_1 = 0$

This hypothesis was tested by correlating scores resulting from content coding the mathematics syllabus with content coding from BGCSE mathematics examinations (Validity 1).

Resultant correlation values are not significant at .05 alpha level showing that content set in the BGCSE mathematics examinations is significantly different from that outlined in the mathematics syllabus. Correlation values are very low (ranging from r = -.07 to r = .05).

Values derived from coding items from mathematics Mock examinations and values derived from the syllabus coding were correlated. Correlation analysis shows that values are not significant at .05 alpha level. The null hypothesis that content measured by mathematics Mock examinations does not significantly reflect the content material in the instructional objectives outlined in the syllabus is retained. Content in mathematics Mock examinations does not significantly reflect content in the syllabus, however, the correlation is also very low (r = -.10 to r = .01).

H_{O4}: Content measured in mathematics Mock examinations does not significantly reflect content measured by BGCSE examinations.

$Ho_4: \rho_{v3} = 0$

Values were derived from content coding the Mock examinations, these were correlated to those of BGCSE to depict Validity4. It was found that all the correlation values are significant at .05 alpha level, therefore, the null hypothesis that content measured in mathematics Mock examinations does not significantly reflect content measured by BGCSE examinations is rejected. The correlation values are low (r = .22 to r = .46).

H_{O5}: Content validity of mathematics Mock examinations given BGCSE examinations as a criterion is not significantly different from content validity of Mock examinations given the syllabus as a criterion.

$Ho_5: \rho_{v3} - \rho_{v4} = 0$

Codes derived from content coding Mock examinations were correlated with those derived from content coding the syllabus to represent Validity 3. Validity 4 on the other hand was found by correlating Mock examinations with BGCSE examinations of the equivalent year. Validity 4 shows that it is higher (r = .22 to r = .46) than Validity 3 (r = -.10 to r = .01). To test the above hypothesis, the correlation values were compared.

To test this hypothesis, a Z–test of comparing Fisher's transformed r–values from dependent sample was carried out. The results as presented on Table 19 in measurement of content indicated that the validity of mathematics by Mock examinations given the mathematics syllabus as a criterion is not significantly higher ($-1.96 < Z_{.05} < + 1.96$) than the validity of the mathematics Mock examinations given the mathematics BGCSE as the criterion in Botswana senior secondary schools for year 2007 (see Table 19). Results reveal that Validity 4 is not significantly different from Validity 3 for 2007 mathematics mock examinations. For 2008, 2009, 2010, 2011 and 2012 years, correlation values for Validity 4

are higher than correlation values for Validity 3, it is concluded that mathematics Mock examinations are more test valid than they are curricular valid.

Validity of Skill measurement in Mock and Public Examinations

H_{O6}: Validity of cognitive skill measurement for mathematics Mock examinations given the syllabus as a criterion is not significantly different from validity of cognitive skills measurement in mock examinations given BGCSE examinations as a criterion.

Ho_6: $\rho_{v3} - \rho_{v4} = 0$

Correlation values derived from skill coding Mock examinations were correlated with those derived from skill coding the syllabus to constitute Validity 3. Validity 4 on the other hand was found by correlating Mock examinations with BGCSE examinations of the corresponding year. Validity 4 appears higher (range .20 to .45) than Validity 3 (range .03 to .28). To test the above hypothesis, the correlation values were compared as shown in Table 21.

To test this hypothesis, a Z–test of comparing Fisher's transformed r–values from dependent sample was done. The results as presented on Table 21 in measurement of cognitive skill indicate that the validity of the mathematics by Mock examinations, given the mathematics syllabus as the criterion, is not significantly higher ($-1.96 < Z_{.05} < +1.96$) than the validity of the mathematics mock examinations, given the mathematics BGCSE as the criterion in Botswana senior secondary schools. It is then concluded that for all the years, Validity 4 is not significantly different from Validity 3. There is no significant difference between validity 3 and validity 4. Thus, correlation values for Validity 4 were not significantly higher than correlation values for Validity 3, accordingly, mathematics Mock examinations for the same years are significantly more curricular valid than they are test valid.

Summary of findings

- The results shows that in the measurement of cognitive skill, the validity of mathematics by mid-year examinations given the mathematics syllabus as the criterion is not significantly higher than the validity of the mathematics mid-year examinations, given the mathematics BGCSE as the criterion in Botswana senior secondary schools.
- In measurement of content, results indicated that the validity of mathematics by mid-year examinations given the mathematics syllabus as the criterion is significantly higher than the validity of the mathematics mid-year examinations given the mathematics BGCSE as the criterion in Botswana senior secondary schools from 2000 to 2005.
- Results show that in measurement of cognitive skills, the validity of the mathematics by Mock examinations, given the mathematics syllabus as the criterion, is not significantly higher ($-1.96 < Z_{.05} < +1.96$) than the validity of the mathematics mock examinations, given the mathematics BGCSE as the criterion in Botswana senior secondary schools. It is then concluded that for all the years, Validity 4 is not significantly different from Validity 3.
- Results show that in measurement of content, the validity of mathematics by Mock examinations given the mathematics syllabus as a criterion is not significantly higher ($-1.96 < Z_{.05} < +1.96$) than the validity of the mathematics Mock examinations given the mathematics BGCSE as the criterion in Botswana senior secondary schools for year 2007. For 2008, 2009, 2010, 2011 and 2012 years, correlation values for Validity 4 are higher than correlation values for Validity 3, it is concluded that mathematics Mock examinations are more test valid than they are curricular valid.
- Generally, the results indicated an inadequate representation of midyear examinations and mock examinations for some years of the mathematics and agriculture syllabus respectively for with English language being the worst.

Discussion, Conclusions and Recommendations

The ideal situation however is that the skills called for in the mock examinations given syllabus should have a higher validity than the skills called for in mock examinations given the BGCSE examinations. This will be the case if the syllabus guides the teaching and testing. Teachers take past examinations and replicate them exactly as there are for students to take during school based assessment as shown by correlation values for Validity 4 which is higher than correlation values for Validity 3. This adversely compromises skill validity in mathematics. Students should do well as they progress with their education and so as to sustain their existence which is also important for the country's economy. The recommendation by Nenty (1997) that to teach for understanding, teachers must assess student's prior knowledge, skill and understanding and monitor their student's progress during the teaching- learning process has been disregarded. Ranku (2001) expressed that poor assessment may unfortunately be a depiction of poor instruction.

The Mock tests have a significantly higher validity with past examinations as a criterion than with the syllabus as a criterion. Weak relationships may fortunately be a depiction that teachers do not align their school based tests well with examinations. The skills that are not tested in the examinations are left out by the students and this does not serve the intended purpose of secondary education, which is to provide its recipient with the knowledge, skills and adaptability to enable them earn a living, contribute to the achievement of national development goals, to survive in the non-work environment, to participate in national affairs and to pursue further education. To realize these goals, the students should be exposed to all the cognitive levels, and the examinations and tests should similarly include items that measure all the cognitive skill levels.

On a positive note, in measurement of cognitive skill indicated that the validity of the mathematics mock examinations given the mathematics syllabus as the criterion was not

significantly higher than the validity of the mathematics Mock examinations given the mathematics BGCSE as the criterion in Botswana senior secondary schools from 2007 to 2012.

For years 2008 to 2012, the validities in content for mathematics of Mock examinations given the BGCSE examinations as a criterion, is significantly higher than that with the syllabus as a criterion. Teachers consider the past examinations more than the syllabus, which is they teach more to the test than the syllabus.In measurement of content, results indicated that the validity of mathematics by mock examinations given the mathematics syllabus as the criterion was significantly higher than the validity of the mathematics mock examinations given the mathematics BGCSE as the criterion in Botswana senior secondary schools from 2000 to 2005.

Findings that could be conventional could be like those of Stevens, Johnson and Soller (2004) who indicated that the correlations between overall problem solving ability, the final examination, and discussion section grades were moderate. High similar correlations are due to the fact that there is a lot of repetition in the task or test items tested, which could be due to lack of proper item banking in schools. This should be discouraged because if there have been some errors with the items, they will be used again and again, which is not challenging for students. The findings tend to agree with the literature that schools based tests are becoming easier from year to year because of the repetition of the tests items in most schools

As shown by the test theory in this study, both BGCSE and mock examinations should be aligned to the syllabus and test items must reflect instructional objectives and should be representative of the population of the skills and knowledge included in the syllabus. That means that content set in the Mock examinations is significantly test valid than curricular validfrom 2008 to 2012. If assessment is an indication of the degreeof instruction, then instructional validity in secondary schools inBotswana is inadequate (Fetogang, 2015). The

consequences of these shortfalls ofthe syllabi on the quality of education cannot be overemphasized since the national development goals cannot besuccessfully achieved.Nenty (1996) indicated that test validity is actually the level of confidence with which an examinee's test score could be used to infer the ability under measurement possessed by the examinee. The ideal circumstance is that each examination is constructed independent of the other examinations but the current study has shown that school examinations are repeatedly using the same test items from year to year, thus, sampling from the sample repeatedly.

From this study, it is evident that the test theory can provide a framework for content and skill analysis of past examinations papers student set for, hence contributing towards the improvement of validity of public examinations in Botswana. The content and skills in the Mock tests portrayed more of the examinations than the syllabus probably because there is replication of past examinations papers than syllabus-based teaching and learning

That is why it is not surprising when Mock examinations are seen reflecting more content and skills tested in the national examinations than those of the syllabus. The quality of teaching in Botswana would generally be advanced by advancing the quality of the syllabus, final examinations, teacher made test by training teachers in proper test development practices.

If the syllabus were putting emphasis on all the cognitive skill levels particularly those beneficial to a nation's development, then there would be a great probability of BGCSE examinations covering all the skills especially in subjects where there is a high relationship of content and skill in the syllabus in the BGCSE examinations. If the syllabus addresses these national development goals, then the BGCSE examinations would address them too and if the BGCSE examinations were addressing the national goals of development, then teaching would address these goals too. It is clear that teachers never set tests items of their own but depend entirely on past items to prepare mock examinations. For the millennium development

goals to be achieved, up to standard or quality tests items need to be set to ensure that students have a broad aspect of the skill and content of the concerned subject.

Conclusions

The content and skills in the Mock tests portrayed more of the examinations than the syllabus. It is concluded that in the measurement of cognitive skills, the mock examination is more public examination valid than syllabus valid. In measurement of cognitive skill mathematics BGCSE examinations were set with minimal reference to the cognitive skills called for by the syllabus for almost all the years. In the measurement of cognitive skills, the mock examination for mathematics is more public examination valid than syllabus valid in Botswana senior secondary schools.

Findings of the study have shown that there is little alignment between the syllabus and public examinations in Botswana. Subsequent classroom instruction and testing is tailor made to fit the projected topics. Validity of examinations is compromised as the examination tests material are limited compared to that outlined in the syllabus. The findings imply that there is poor item construction for mathematics for school based examinations.

Recommendations

- The Ministry of Education should provide in service training for teachers in item construction and item banking in senior secondary schools. There should be more intensive in-service training programmes, which would enable all the teachers to know the recent developments in the practice of teaching.
- Teachers should aim at enabling the students to develop all the cognitive skill levels. It is important that the public examinations cover all the topics and skills in the syllabus to make them worth teaching to improve on the quality of assessment practices. Regions should have committees that are responsible for Mock examination setting to improve on the quality of the items and ensure that every year students do sit for such

an important examination. An assessment policy that guides test development by the ministry will assist schools to improve on the quality of assessment by schools.

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