UNDERSTANDING AND APPLICATION OF BLOOM TAXONOMY BY SENIOR SECONDARY SCHOOL TEACHERS IN BOTSWANA

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ABSTRACT

The decline in performance of students' results over years in Botswana secondary schools has been a concern to every stakeholder. If the curriculum goals takes into consideration the levels of cognitive skills, the expectation is that the assessment and learning should do likewise. The level to which teachers take into consideration the cognitive skills for each student when assessing and teaching determine the quality of education. This research is concerned with the extent to which cognitive skills are assessed and taught by teachers from a sample of 20 senior secondary schools. The study is inferential involving surveying with a questionnaire instrument the views and perceptions of a sample of 334 teachers as regards their understanding and application of Bloom's taxonomy during teaching and test development. The instrument was checked for face and content validity by expects in measurement. Single factor repeated measures were used to analyze data using SPSS at .05 level of significance. The analysis of data from teachers have indicated that there is a significant difference in the level of emphasis they lay on imparting of various skills to learners, assessment by teachers does not favour any particular Bloom's cognitive skill yet teachers have indicated that there is a significant difference in the level to which they perceive each of the cognitive skills as being desirable for development. Findings were discussed as well as recommendations.

Key words: Understanding and application of cognitive skills, Teaching and assessment, Quality of education

INTRODUCTION

The proportion of candidates reaching the standard required for Grade C or better in all core subjects decreased by 0.25% from 9.47% in 2010 to 9.22% in 2011(Botswana Examinations Council, 2011). Determining the level to which essential skill has been developed can be linked to the achievement of learning outcomes which give student every opportunity possible to become educated and informed adults that could easily sail across the transition from school to work successfully.

In particular, it has been observed that examinations are limited in the areas of knowledge and skills that they assess; they contain little reference to the knowledge and skills that students need in their everyday life outside the school; and they tend to measure achievement at a low taxonomic level. The educational system of Botswana has been modelled to a large extent by the National Commission on Education of 1978 and the Revised National Policy on Education (RNPE) of 1994.

Nenty (2001) elaborated how in a test or examination, students' ability is pitched against test items. 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 item.

However, when teachers are given the freedom to teach as they wish, curriculum coverage and emphasis can be expected to vary not only from one school to another but also from one classroom to another (Miller, 1986).

Hughes (2014) argues that the active, creative side of critical thinking should feature more prominently in the subject if it is to cover critical thinking comprehensively: students should be put in situations where they exercise thinking not only to answer essay questions or reflect on how knowledge is constructed but also to suggest solutions to complex problems, test hypotheses and explore likelihood and uncertainty. It is perhaps here that the change would be the most meaningful and lead to a course that would not only cover critical thinking in a more balanced manner but also stimulate thinking aligned with the challenges and opportunities that we face today.

An overview of Bloom's Taxonomy

According to Bloom's taxonomy, cognitive skills are organize from those of a typical of a beginner through to typical of a person with advanced skills. One of the strengths of this classification of skills is that taxonomy, unlike a straightforward classification, is based on an objectively-determined framework, whereas a classification in its more general sense may be based on arbitrary criteria.

Manaris, Wainer, Kirkpatrick, Stalvey, Shannon, Leventhal, Barnes, Wright, Schafer and Sanders (2007) indicate that Bloom's taxonomy provides a way to organize topics and identify their depth of coverage within the curriculum and that without it, it is difficult for educators know the extent to which a given topic should be discussed.

There have been numerous controversies about the measurement of intelligence and the use of test scores to describe a child's performance. There is much more to a child, and to intelligence, than can be easily measured with any set of tasks. The tasks on intelligence tests have, however, been carefully selected to represent a range of abilities that are related to successful problem-solving and functioning in educational settings. In addition to providing scores that enable statistical comparison with children of the same age, the child's unique approach to the test offers invaluable information about responses to challenge, level of anxiety, impulse control, persistence, and enthusiasm for learning. Their experience with a wide variety of children enables us to place these behavioral aspects of a child's performance within a broad context, and to give parents feedback about their child's behavioral style in the face of challenge.

To help every child meet the highest standards in history, we must insist on rigorous alignment of standards, curricula, and assessments. Standards need to be connected to classroom learning and assessments. We must also match this commitment with resources and demand quality teachers, safe and modern schools, and extra learning support for students in need.

The curriculum is based on all levels of cognitive skills of Bloom taxanomy in order to ensure the development of all levels of cognitive skills. The society expects that a child should be taught how to think critically, but the teacher may not be able to do that.

As for skill assessment, in this study is the cognitive domain U1, as outlined by Bloom et al. (1956) as well as Nenty and Umoinyang (2004). U was divided into categories and further into sub categories as shown on Table 1. The major idea of the taxonomy is that what educators want students to know (encompassed in statements of educational objectives) can be arranged in a hierarchy from less to more complex. The levels are understood to be successive, so that one level must be mastered before the next level can be reached. This taxonomy of learning behaviors may be thought of as "the goals of the learning process."

That is, after a learning episode, the learner should have acquired a new skill, knowledge, and/or attitude.

The cognitive domain involves knowledge and the development of intellectual skills (Bloom, 1956). This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories of cognitive and processes, starting from the simplest to the most complex as shown by Table 1.

Table 1. Levels of Cognitive Skills (Adopted from Nenty & Umoinyang, 2004)

U1 (Cognitive skills)	Subcategory
Memory	Memory of specifies (terminology and facts)
	Memory of ways and means of dealing with specifics
	Memory of universal categories (laws, theories)
Comprehension	Comprehension
Application	Application
Analysis	Analysis of elements
	Analysis of relationships
	Analysis of organizational principles
	Production of a unique communication
Synthesis	Production of a plan
	Derivation of a set of abstract relationships
Evaluation	Judgment in terms of internal criteria
	Judgment in terms of internal criteria

PROBLEM AND PURPOSE OF THE STUDY

Botswana over several years until today has financed the education system tremendously including efforts in improving quality of education. However, the nation expect students to be taught skills that will allow them to cope with educational demands as they transit from secondary to tertiary but that has since not been achieved.

Kellaghan (2004) highlighted that the role of examinations in secondary education is key in dictating what is taught in schools, acting as gatekeepers guarding entry into the schools, selecting students during the course of their careers, and providing an evaluation of students when leaving school that is likely to have very important implications for their further education and even their life chances. Botswana has arrived at the crossroads in so far as the delivery of relevant and quality education for all is concerned.

Botswana need to examine the extent to which the education system supports life-long learning, including educational opportunities for students leaving schools at all stages of education. Isaacs (2007) indicated that educational opportunities for the junior secondary schools graduates are scarce, only 50.8% are admitted to senior secondary schools.

According to the Ministry of Education, assessment is supposed to evaluate students learning and performance on clearly defined set of curriculum objectives to allow for performance on a clearly defined set of curriculum objectives to allow for performance of the education system to be compared over time (Wiggett, Chilambampani & Mwandila, 2001), in order to pave way for improvement. Thus this study is conceived from the need to assess and determine how teachers understanding and application of Bloom Taxonomy affect the validity of public examinations so as to contribute towards the quality of education in Botswana.

RESEARCH HYPOTHESIS

H_1: There is a significant difference in the degree of emphasis given to each level of Bloom-based cognitive skill when teachers in Botswana are teaching

H_2: There is a significant difference in the level of emphasis given to each level of Bloom-based cognitive skill during classroom assessment by teachers in Botswana

H_3: In the perception of Botswana secondary school teachers, there is a significant difference in the level of desirability of each level of Bloom-based cognitive skill.

SIGNIFICANCE OF THE STUDY

Cognitive skills of subject role in influencing quality of education through assessment and teaching, thus teachers will be able to develop as well as organize sound instructional plans that encourages student educational development as informed by the curriculum.

REVIEW OF RELATED STUDIES

Nenty, Adedoyin and Major (2006) found out that though teachers and teacher trainees in Botswana agreed that the nature of classroom assessment practices can contribute significantly to the attainment of high quality of education in Botswana, their perception of the quality of current practices in classroom assessment as a means of attaining high quality of education was not significantly high. They confirmed that their current level of classroom practices contribute significantly to the current level of quality of education in the country. The low level of classroom assessment practices they blamed significantly on lack of adequate training on classroom assessment, and significantly agreed that most teachers lack the skill to enhance quality of education through classroom assessment practices. Student teachers and teachers, as well as teachers with different levels of experience did not differ in their perceptions on these issues.

Tsheko (n.d.) in her survey study using a questionnaire to 120 teachers determined the perceptions of senior secondary teachers' on the role school based assessment plays and the contribution of school based assessment towards the final grade indicated that developing critical thinkers has become central to education systems. This development will require changes in the assessment of students both at classroom and school levels and large-scale and high stakes assessment. The changed focus in the skills and knowledge needed have direct implications for the relationship that exists between assessment and instruction. Student assessment is an important component if not a fundamental one, in improving or reforming education.

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. In their study in Botswana, Fuller and Snyder (1991) focused on the amount and form of social interaction observed between teacher and student in science classes at primary and junior secondary schools. They found out that vast teacher questions are closed - ended, demanding simple recall of facts, students rarely speak up in class with any queries of their own. The teacher in most classrooms is vocal and dominant and yet pupils are not always passive and silent. They acknowledged that there was great variation among different teachers and classrooms.

Mwendwa (2003) did a study on relevance of Kenya's education to the cultural and socio-economic realities of its citizens today. He found out that the content of Agriculture text books are biased towards farming therefore being of minimal importance to pastoralist in Kenya. Kenyan citizens are told education is key to development and yet the kind of education they receive is limited in terms of the development needs of the country. On examining the human resource skills needed by Kenyan tour operating sector and the extent to which current training provision is adequate, Makaya and King (2002) found out that expert's dissatisfaction of skills displayed by employees at the supervisory and managerial level. It was then concluded that the education system failed to produce human resources required at higher occupational levels considering that that tourism sector is important in the Kenyan tourism industry.

In practice, teachers who have few skills to utilize questioning strategies tend to use teachers guides and text books which are generally of little help because they have no planned sequence of questioning and these materials are too cumbersome to be logically used (Brophy & Good, 1997). Cazden (1998) suggested that teachers need training in questioning strategies. He argued that knowledge of effective questioning sequence and of cognitive levels of questions might help teachers to ask questions to establish the facts first, to elicit convergent thinking and finally to obtain divergent or evaluative thought. Most of the times teachers still ask questions at lower level of Bloom's taxonomy; they repeat their own questions and student's answers; they answer their own questions and they interrupt students' responses just because the level of difficulty of questions is not appropriate. This is supported by C'esar 2000; Taole & Chakalisa, 1995 that one of the critical instructional goals of any mathematics curriculum is to instill problem solving skills in the learners. This can only be achieved if learners are active participants in the social construction of mathematical concepts and meanings. Therefore, effective questioning practices must take this goal on board.

METHODOLOGY

The study is inferential involving surveying with a questionnaire instrument the views and perceptions of a sample of teachers as regards their understanding and application of Bloom's taxonomy during teaching and test development and generalizing the findings based on such survey to general senior secondary school teachers in Botswana. All the teachers were randomly requested to participate in the study of which all must have undergone formal teacher training possessing a Bachelor's Degree in Education as a minimum qualification to reduce the level of variance.

The basis of the study was to test theory of Bloom cognitive skills, thus, the questionnaire was constructed to obtain opinion on skill teaching and assessment with respect to development of citizens of Botswana. The items were statements intended to represent all possible perceptions of classroom and test-setting behaviour of teachers. As stated by Alreck and Settle (1995), should help place the responses on a single continuum, making analysis and interpretation easier. Six items addressed skill teaching, 6 addressed skill measurement and 6 addressed skill desirability on 6 point-Likert scale questionnaire. The adopted

questionnaire was the one phrased in the first person singular with Cronback alpha of .948, however, the pilot allowed the researcher to edit some items in the questionnaire. The researcher got permission to involve teachers in this study from the Ministry of Education, Division of Teaching Service Management and from the teachers themselves. Answers to the tool items were scored and added up to operationalize the variables called for in the hypotheses and SPPS used for analysis. These hypotheses were tested using one factor repeated measures; the hypotheses were accepted or rejected at an alpha level of 0.05 and if it is significant, a pairwise comparism was done.

DATA ANALYSIS AND INTERPRETATION OF RESULTS

H_{O1}: *There is no significance difference in the level of emphasis given by teachers to each level of the Bloom-based cognitive skill when teaching in Botswana Secondary Schools.*

The hypothesis Ho: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ was tested to find out if the means are significantly different and the results are presented on Table 2. Application has come out as the most emphasized skill (M = 5.05) and memory as least emphasized (M = 3.99). The analysis of data from teachers have indicated that there is a significant difference (F (5) = F 67.42, p < .05) in the level of emphasis they lay on imparting of various skills to learners. Therefore, the null hypothesis is rejected. It concludes that the population means for the six cognitive levels are not equal. The probability that the observed differences in the means of the cognitive levels would have occurred by chance if the null hypothesis were true is less than .05. To find out where the differences lay, a post-hoc Least Significant Difference (LSD) test was performed in order to determine the levels or pairs of means that were significantly different.

Table 2. Single – Factor Repeated Measures ANOVA of Teachers' Level to Which They Teach to Impart Each of Bloom's Cognitive Skills in Botswana Senior Secondary Schools (n = 332)

Type of test Item	Mean Perception	Standard Deviation	Std. Error
Memory	3.99	1.49	.08
Comprehension	4.67	.95	.05
Application	5.05	.93	.05
Analysis	4.55	.95	.05
Synthesis	4.86	.97	.05
Evaluation	4.86	.90	.05

Source of Variation	Sum of Squares	df	Mean squares	F	$\rho <$
Columns	230.31	5	46.06	67.42	.00
Rows	1171.34	331	3.54		
Interaction	1130.69	1655	.68		
Total	2532.14	1991			

As Table 3 show, the level to which comprehension (mean difference = - .12, p < .05) skills is taught is significantly different from that of synthesis and that of evaluation. However, application is more significantly emphasized than synthesis (mean difference = .18, p <.05) and evaluation (mean difference = .19, p < .05). The perception of teachers is therefore that they lay significantly more emphasis on application and synthesis when teaching.

Table 3. Pairwise Comparisons - Level to which Cognitive Skills are taught

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.[b]
Memory	Comprehension	-.68[*]	.08	.00
	Application	-1.06[*]	.09	.00
	Analysis	-.56[*]	.08	.00
	Synthesis	-.88[*]	.09	.00
	Evaluation	-.87[*]	.08	.00
Comprehension	Memory	.68[*]	.08	.00
	Application	-.38[*]	.05	.00
	Analysis	.12[*]	.05	.01
	Synthesis	-.20[*]	.05	.00
	Evaluation	-.19[*]	.05	.00
Application	Memory	1.06[*]	.09	.00
	Comprehension	.38[*]	.05	.00
	Analysis	.50[*]	.05	.00
	Synthesis	.18[*]	.05	.00
	Evaluation	.19[*]	.05	.00
Analysis	Memory	.56[*]	.08	.00
	Comprehension	-.12[*]	.05	.01
	Application	-.50[*]	.05	.00
	Synthesis	-.32[*]	.05	.00
	Evaluation	-.31[*]	.05	.00
Synthesis	Memory	.88[*]	.09	.00
	Comprehension	.20[*]	.05	.00
	Application	-.18[*]	.05	.00
	Analysis	.32[*]	.05	.00
	Evaluation	.00	.04	.89
Evaluation	Memory	.87[*]	.08	.00
	Comprehension	.19[*]	.05	.00
	Application	-.19[*]	.05	.00
	Analysis	.31[*]	.05	.00
	Synthesis	-.00	.04	.89

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

H_{O2}: Public examinations in Botswana do not assess all levels of the Bloom-based cognitive skills equally.

The null hypothesis was tested by a one factor repeated measures ANOVA on teachers' perception on the level to which they assess each of the cognitive skills. Table 4 indicates the

means and standard deviation of the levels to which Bloom's cognitive skills are assessed and one will immediately notice the small range in mean (4.07 to 4.21) perception that it is quite small.

The hypothesis Ho: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ was tested to find out if the means are significantly different and the results are presented on Table 4. Teachers have indicated that there is no significant difference (F (5) = F 1.45, p < .05) in the level of assessment of each of the Bloom based cognitive skills. Therefore, the null hypothesis is retained. Therefore, it is

concluded that assessment by teachers does not favour any particular Bloom's cognitive skill.

Table 4. Single – Factor Repeated Measures ANOVA of the Level to Which Teachers' have Provided for the Measurement of Each of Bloom's Cognitive Skills in their Test in Botswana Senior Secondary Schools (n = 273)

Type of test Item	Mean Perception	Standard Deviation	Std. Error
Memory	4.07	1.29	.08
Comprehension	4.04	1.02	.06
Application	4.21	1.10	.07
Analysis	4.15	.10	.06
Synthesis	4.10	1.18	.07
Evaluation	4.09	1.09	.07

Source of Variation	Sum of Squares	Df	Mean square	F	ρ <
Columns	5.18	5	1.04	1.45	0.20
Rows	1598.08	272	5.88		
Interaction	972.82	1360	0.72		
Total	2576.08	1637			

H_{O3}: Teachers in Botswana do not consider each Bloom-based level of cognitive skill as equally desirable.

The null hypothesis was tested by a one factor repeated measures ANOVA on whether teachers' consider each Bloom-based level of cognitive skill as equally desirable.Table 5 indicates the means and standard deviation of the levels to which teachers perceive each of bloom's cognitive skills as being desirable for development while Table 5 shows the least significance difference (LSD) test on the Levels to which teachers perceive each of Bloom's cognitive skills as being desirable for development in Botswana Senior Secondary Schools.

The hypothesis Ho: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ was tested to find out if the means are significantly different and the results are presented on Table 5. Synthesis has come out as the most emphasized skill (M = 5.28) and memory as least emphasized (M = 3.78). Teachers have indicated that there is a significant difference (F (5) = F 134.59, p < .05) in the level to which they perceive each of the Cognitive Skills as Being Desirable for Development.

Table 5. Single - Factor Repeated Measures ANOVA of Level to Which Teachers Perceive Each of Bloom's Cognitive Skills as Being Desirable for Development in Botswana Senior Secondary Schools (n = 334)

Type of test Item	Mean Perception	Standard Deviation	Std. Error
Memory	3.78	1.49	.08
Comprehension	4.79	1.08	.06
Application	5.24	.92	.05
Analysis	4.87	1.01	.06
Synthesis	5.28	.97	.05
Evaluation	5.23	.90	.05

Source of Variation	Sum of Squares	Df	Mean square	F	$\rho <$
Columns	543.25	5	108.65	134.59	0.00
Rows	1126.49	333	3.38		
Interaction	1344.49	1665	0.81		
Total	1344.08	2003			

Therefore, the null hypothesis is rejected. It concludes that the population means for the six cognitive levels are not equal. The probability that the observed differences in the means of the cognitive levels would have occurred by chance if the null hypothesis was true is less than .05. To find out where the differences lay, a post-hoc least significant difference (LSD) test was performed in order to determine the levels or pairs of means that were significantly different. As Table 6 show, the means for the level of skill desirability for memory is significantly different from all the other skill levels (p < .05). Thus, teachers consider memory less desirable for development than all the other skills.

The desirability of comprehension skills is not significantly different from that of analysis (mean difference = -.07, p > .05) and that of evaluation (mean difference = .05, p > .05). In addition, it has shown that the desirability of synthesis skills is not significantly different from the desirability of evaluation skills (mean difference = .05, p > .05) as shown by Table 6. This shows that teachers perceive higher order thinking skills more desirable like synthesis and evaluation.

Table 6. Pairwise Comparisons- Level to Which Teachers Perceive Each of Bloom's Cognitive Skills as Being Desirable for Development

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.[b]
	Comprehension	-1.01[*]	.10	.00
	Application	-1.46[*]	.09	.00
Memory	Analysis	-1.08[*]	.09	.00
	Synthesis	-1.50[*]	.10	.00
	Evaluation	-1.45[*]	.09	.00
	Memory	1.01[*]	.10	.00
	Application	-.44[*]	.06	.00
Comprehension	Analysis	-.07	.05	.14
	Synthesis	-.49[*]	.05	.00
	Evaluation	-.44[*]	.05	.00
	Memory	1.46[*]	.09	.00
	Comprehension	.44[*]	.06	.00
Application	Analysis	.37[*]	.06	.00
	Synthesis	-.05	.05	.37
	Evaluation	.00	.06	.96
	Memory	1.08[*]	.09	.00
	Comprehension	.07	.05	.14
Analysis	Application	-.37[*]	.06	.00
	Synthesis	-.42[*]	.06	.00
	Evaluation	-.37[*]	.05	.00
	Memory	1.50[*]	.10	.00
	Comprehension	.49[*]	.05	.00
Synthesis	Application	.05	.05	.37
	Analysis	.42[*]	.06	.00
	Evaluation	.05	.05	.34
	Memory	1.45[*]	.09	.00
	Comprehension	.44[*]	.05	.00
Evaluation	Application	-.00	.06	.96
	Analysis	.37[*]	.05	.00
	Synthesis	-.05	.05	.34

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

DISCUSSIONS

Teachers have indicated that there is a significant difference in the level of emphasis they lay on imparting of various skills to learners. Application and synthesis skills are significantly more emphasized than all the other skills. Memory, comprehension, interpretation are the basic skills students need in order know facts and understand what the information means, however, synthesis and evaluation are the higher order skills students need to make connections between seemingly unconnected information and make judgments grounded in sound knowledge.

Although teachers believe they do not favour any of the cognitive skill levels when assessing, they actually teach least evaluation and analysis. If the teachers believe they are teaching at a mentioned level while in actual fact they are teaching at a different level, then they probably are not able to identify cognitive levels correctly or they are not able to relate their teaching correctly to the desired cognitive levels. The study by Haynie (1990) confirms this when it found out that teachers were not able to match test items to taxonometric levels and the curriculum. This could be because their training did not enable them to develop such skills or probably because after some time of teaching, teachers were no longer able to identify and apply desired cognitive levels. Concurring is Stiggins, Griswold and Wikelund (1989) study that looked at the extent to which assessment of thinking skills varied across a wide range of grade levels and several schools subjects including the use of several data collection tools. The findings indicated that the largest percentage of items in all the test papers (49%) assessed recall of facts and information.

Finally, teachers have indicated that there is a significant difference in the level to which they perceive each of the cognitive skills as being desirable for development. We need to empower all students with the thinking skills that will help them help themselves (Padron & Waxman, n.d.).

CONCLUSION

It concludes that Botswana teachers see assessment of cognitive skills as a significant factor in improving quality of education but they do not teach them equally and this is not principled.

Teachers have indicated that there is a significant difference in the level of emphasis when imparting various skills to learners. If the syllabus addresses these national development goals for quality education, then final examinations would address them too. If final examinations were addressing national goals of development then teaching would address these goals too. Application and synthesis skills are significantly more emphasized than all the other skills when teaching and yet teachers claim they assess all levels of the skills equally.

RECOMMENDATION

Teachers should see classroom teaching as a means of providing quality education in Botswana and should be inspired to ensure that they impart skills at different levels. Teachers should use the syllabus as a reference when teaching and assessing, this will expedite domain representation as expected.

REFERENCES

[1]. Botswana Examination Council (2011). Summary of results. Retrieved from http://www.bec.co.bw/past-results/2011/2011_bgcse_book_version.pdf/view

[2]. Nenty, H.J. (2001). Student-problem (S-P) skill analysis of pupils' mathematics performance: A strategy for enhancing quality of education. *Ife Psycologia: An International Journal, 9, 173-192.*

[3]. Miller, M.D. (1986). Time allocation and patterns of item response. *Journal of Educational Measurement. 23 (2), 147-156.*

[4]. Manaris, B., Wainer, M., Kirkpatrick, A. E., Stalvey, R. H., Shannon, C., Leventhal, L., Barnes, J., Wright, J., Schafer, J. B., & Sanders, D. (2007). Implementations of the CC001 Human – Computer interaction guidelines using Bloom's Taxonomy. Retrieved from http://web.ebscohost.com/ehost/detail?vid=4&hid=105&sid=3b66e22b-93e7-49ca-81cf-3ed5237d6358%40sessionmgr7

[5]. Bloom, B.S., Englhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (Eds.) (1956). *Taxonomy of educational objectives, the classification of educational goals, Handbook I: cognitive domain.* New York: Longmans.

[6]. Nenty, H.J., & Umoinyang, I. E. (2004). *Principles of test construction.* Calabar-Nigeria: Helimo Associates.

[7]. Kellaghan, T. (2004*). Public examinations, national and international assessments and educational policy.* Dublin: Educational Research Centre. St Patrick's College.

[8]. Isaacs, S. (2007). ICT in education in Botswana: Survey of ICT and education in Africa: Botswana Country Report. Retrieved from www.infodev.org_BOTSWANA_ICTed_survey1.pdf

[9]. Wiggett, R., Chilambapani, T., & Mwandila, N. (2001). Review of the implementation of criterion referenced testing and continuous assessment in Botswana primary schools. In D.T. Letsholo, P, G. Moanakwena, C. D. Yandila, B. G. Matenge, P. T. Slave, W. Dikole, M. K. Sebogodi, R. M. Senwelo, &S. Y. Khama (Eds.) *Advocating instructional improvement in the new millennium:* developing strategies for teacher education in Botswana. Selected papers presented at the 4th Biennial Conference on Teacher Education, Gaborone, 8-10 February 2000.

[10]. Nenty, H. J., Adedoyin, O. O., & Major, T. E. (2006). *Analysis of the perceptions of* classroom assessment practices as means of providing quality education by teachers and teachers trainees in Botswana schools. Educational Foundations, University of Botswana, Gaborone

[11]. Tsheko, G. N. (n.d.). A teacher with a vision and school based assessment. Retrieved from http://www.iaea.info/documents/paper_1162a169d3.pdf

[12]. Williams, P. A., Alley, R. D., & Henson, K. T. (1999). *12 Questioning strategies that minimize classroom management problems.* Retrieved from http://findarticles.com/p/articles/.

[13]. Fuller, B., & Snyder, C, W. Jr. (1991) *Vocal teachers, Silent pupils? Life in Botswana classrooms.* Retrieved from http://www.jstor.org/view

[14].   Mwendwa, N. (2003). The challenges of education and development in post-colonial Kenya. *Council for the Development of Social Science Research in Africa*, 28 (3&4), 211-228

[15].   Makaya, M., & Kings, B. (2002). A quality assessment of educational and training for Kenya's tour operating sector. Retrieved from www.multilingual_matters.net/cit/005/0112/cit0050112.pdf

[16].   Brophy, J., & Good, T. L. (1997) *Looking in classrooms*. New York: Longman

[17].   Callahan, T. C. & Hobbs, R. (2010). Research ethics. University of Washington. Retrieved from http://depts.washington.edu/bioethx/topics/resrch.html

[18].   Cazden, C. B. (1998) *Classroom discourse: The language of teaching and learning*. Portsmouth: Heinemann Educational Books.

[19].   C'esar. M. (2000). *Social interactions and mathematics learning. Educational Studies in Mathematics*, 42 (2), 115 – 140.

[20].   Taole, J. K., & Chakalisa, P. A. (1995). Implications of the national commission on education for mathematics education, *Mosenodi*, *3* (1 – 2), 15 – 22.

[21].   Alreck, P., & Settle R. B. (1995). *The survey research handbook.* Chicago: Richard D. Irwin, Inc.

[22].   Haynie, W. J. (1990). Effects of tests and anticipation of tests on learning via videotaped materials. *Journal of Industrial Teacher Education, 27*(4), 18 - 30

[23].   Stiggins, R.J., Griswold, M., & Wikelund, K. (1989). Measuring thinking skills through classroom assessment. *Journal of Education Measurement, 26,233-246.*

[24].   Padron, Y. N., & Waxman, H. C. (n.d.). Teaching and learning risks associated with *limited cognitive mastery in science and mathematics for limited English proficient Students*. Third National Research Symposium on Limited English Proficient Student Issues: Focus on middle and high school issues. Retrieved from http://www.ncela.gwu.edu/pubs/symposia/third/index.htm

[25].   Hughes, C. (2014). Theory of knowledge aims, objectives and assessment criteria: an analysis of critical thinking descriptors. *Journal of Research in International Education, 13(1) 30–45*