

Using Teachers' Knowledge of Bloom's Taxonomy in Determining the Quality of Classroom Assessment in Secondary Schools

Mwakamele, M. I.

The Open University of Tanzania

imani.mwakamele@out.ac.tz, imanikingdom@gmail.com

Abstract

The Taxonomy of Educational Objectives provides the basis for curriculum and test development. A sound knowledge and the internalization of the Bloom's Taxonomy of Educational Objectives is paramount for any item writer to be able to construct fair and high-quality test items and other assessment tools in the classroom. Based on the syllabus, a specified number of questions are constructed depending on the weight accorded each topic area within the table of specification, which must span all the six levels of the instructional objectives. A test as an assessment technique is a tool or device that is used to obtain information about achievement, aptitude or intelligence level of learners. Teachers in schools who write test items and the professional item writers employed by both private and government schools must, as a matter of necessity, be versed in this aspect for them to measure accurately what they aim to measure so as to lend credence to the testing exercise. This study focused on the competence of secondary school teachers in assessing their students by finding out whether they are guided by Bloom's levels of cognitive objectives. The purpose of the study was to find out how adequate the teachers spread their test items to cover the six levels of cognitive objectives that Bloom (1956) identified and were later revised by Anderson and Krathwohl (2001). The study aimed to determine how adequately the test items developed by the teachers cover the lower and higher levels of thinking in regard to the action verbs used in the test items. Three important questions were formulated to guide the study. The first one was; How satisfactory are teachers' test items reflect the six levels of objectives? Secondly; to what extent do teachers test items measure thinking at lower and higher levels? Thirdly; how satisfactorily do teachers employ the use of action verbs in constructing test items? Two instruments were used to collect data; one was documentary review that is using past papers from two

selected secondary schools in Makongo Ward. The second was structured questionnaire for 40 teachers. The data was analyzed qualitatively using content analysis. The findings revealed that secondary school teachers do not adequately employ the Bloom's cognitive levels objectives in classroom assessment. Furthermore, the results from both documentary review and from the questionnaires indicated that most teachers were not sure whether they had the skills and competences for designing tests in their subjects using Bloom's Taxonomy. Only few experienced teachers indicated that they had the skills and competences of test construction using both levels of Bloom's cognitive objectives. From this study, it is concluded that classroom assessment is an area that requires more emphasis because most teachers are not trained in test construction skills.

Keywords: Teacher, Bloom's Taxonomy, classroom assessment, test construction.

Introduction

Assessment of students is an essential part of instruction in both teaching and learning. With the recognition of alternative assessment methods, classroom assessment has gained attention focusing on improving learning of students. Well constructed test items are valuable tools for motivating students to learn. Owing to this factor, a well-prepared test paper or examination guarantees an effective teaching-learning process. Classroom assessments have undergone radical changes in the past fifty years due to improvements in measurement techniques and better understanding of the learning processes (Saeed & Noor, 2011). Assessing student learning is something that every teacher has to do, usually quite frequently too. This is why a typical teacher can spend more than one-third of his class time engaged in one form or another type of assessment activity (Stiggins, 1994). However, despite the amount of time teachers spend assessing student learning, it is a task that most of them dislike and that only a few do well. One reason is that many teachers have little or no in-depth knowledge of assessment principles. It is also believed

that teachers with more training in assessment use more appropriate assessment practices than do teachers with less training (Bielhler & Snowman, 1997).

Effective assessment, which is the bedrock of effective teaching, demands that the teachers be very familiar with the taxonomy of educational objectives. This leads us to the issue of why teachers should have a good understanding and internalization of these cognitive levels? Obviously, the rapid changes being experienced globally has increased tremendously the volume of knowledge that the students need to learn. This has become necessary to meet the world standard of education. UNICEF (2016) also states that the answer to this question is multifaceted and lies in the fact that Bloom's framework provided one of the first systematic and easy-to-understand classifications of thinking and learning. Bloom's Taxonomy provides a clear and robust tool for guiding the development of teaching and learning. Additionally, there is the concept of continuous assessment, which requires lots of formative assessments and these entail more than one examination in a term as well as class assignments and projects to assess different types of learning. Writing Higher-Level questions has been a major defect for many teachers. As Benjamin Bloom and others point out, teachers have a disappointing tendency to write test items that reflect mostly the lowest level of the taxonomy which knowledge.

The Taxonomy of Educational Objectives is a framework for classifying any curriculum objective in terms of its explicit or implicit intellectual content. Curriculum objectives describe the intended outcomes of instruction in terms of goals. The framework was conceived as a means of facilitating the exchange of test items among faculties at various universities in order to create banks of items which each measuring the same educational objective (Krathwohl, 2002). Benjamin S. Bloom, then the Associate Director of the Board of Examinations of the University of Chicago, initiated the idea as he hoped that it would reduce the labour of preparing annual

comprehensive examinations. To aid in his effort, he enlisted a group of measurement specialists from across the United States, many of whom repeatedly faced the same problem. This group met about twice a year beginning in 1949 to consider progress, make revisions, and plan the next steps. Their final draft was published in 1956 under the title, *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain* (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956).

As Krathwohl (2002) aptly put it, Bloom saw this Taxonomy as more than a measurement tool. He believed it could serve as a

- i. Common language about learning goals to facilitate communication across persons, subject matter, and grade levels.
- ii. Basis for determining for a particular course or curriculum the specific meaning of the broad educational goals, such as those found in the currently prevalent national, state, and local standards.
- iii. Means for determining the congruence of educational objectives, activities, and assessments in a unit, course, or curriculum.
- iv. Panorama of the range of educational possibilities against which the limited breadth and depth of any particular educational course or curriculum could be contrasted.

As of the time it was introduced, the term *taxonomy* was unfamiliar as an education term. Potential users did not understand what it meant; therefore, little attention was given to this Taxonomy at first. However, as readers saw its potential, the framework became widely known and cited and eventually translated into 22 languages. One of the most frequent uses of the Taxonomy has been to classify curricular objectives and test items in order to show the breadth, or lack of breadth of the objectives and items across the spectrum of categories (Anderson & Krathwohl, 2002).

Statement of the Problem

The continuous mass failure of students in national examinations (form four and form six) while their continuous assessment (CA) records show remarkable good results is a source of concern to the researcher. Education stakeholders seek to find out why there is no high correlation between student performances in internal and external examinations. The so called Continuous Assessment (CA) includes quizzes, assignments, tests, midterm exams and end of term exams. The stakeholders also seek to determine whether the discrepancy could be attributed to teachers not fully understanding the basics of test development which is essentially hinged on the taxonomy of educational objectives. Furthermore, teachers made tests are generally criticized for lack of depth while those of the NECTA go through a lot of processes for standardization. The study therefore sought to investigate the competence of secondary school teachers in assessing their students and find out whether they are properly and correctly guided by Bloom's levels of cognitive objectives.

Objectives of the Study

The main purpose of this study was to find out if teachers can internalize and use knowledge of Bloom's Taxonomy of Educational Objectives for them to be able to construct valid, fair and reliable test items for classroom assessment. Specifically, the study sought to find out:

- i. If teachers spread their test items to cover the six levels of cognitive objectives that was proposed by Benjamin Bloom (1956) and were later revised by Anderson and Krathwohl (2002).
- ii. To determine how adequate, the test items developed by secondary school teachers cover the lower and higher levels of objectives.
- iii. To determine how do teachers make use action verbs in developing their test items.

Research Questions

The study sought to answer the following important questions:

1. How adequate are teachers' test items reflect the six levels of objectives from Bloom's Taxonomy?
2. To what extend do teachers test items measure thinking at lower and higher levels of Bloom's taxonomy?
3. How satisfactorily do teachers employ the use of action verbs in constructing test items?

Literature Review

According to the Karen L. Smith Faculty Centre for Teaching and Learning (KLSFCTL) (2014), Bloom's Taxonomy was developed to provide a common language for teachers to discuss and exchange learning and assessment methods. Specific learning objectives can be derived from the taxonomy, though it is most commonly used to assess learning on a variety of cognitive levels. It defines each cognitive level from higher-to lower-order thinking. The goal of any educator using Bloom's taxonomy is to encourage higher-order thinking in their students by building up from lower-level cognitive skills (KLSFCTL, 2014).

The Structure of the Original Taxonomy

1.0 Knowledge

- 1.10 Knowledge of specifics*
- 1.11 Knowledge of terminology*
- 1.12 Knowledge of specific facts*
- 1.20 Knowledge of ways and means of dealing with specifics*
- 1.21 Knowledge of conventions*
- 1.22 Knowledge of trends and sequences*
- 1.23 Knowledge of classifications and categories*
- 1.24 Knowledge of criteria*

1.25 Knowledge of methodology

1.30 Knowledge of universals and abstractions in a field

1.31 Knowledge of principles and generalizations

1.32 Knowledge of theories and structures

2.0 Comprehension

2.1 Translation

2.2 Interpretation

2.3 Extrapolation

3.0 Application

4.0 Analysis

4.1 Analysis of elements

4.2 Analysis of relationships

4.3 Analysis of organizational principles

5.0 Synthesis

5.1 Production of a unique communication

5.2 Production of a plan, or proposed set of operations

5.3 Derivation of a set of abstract relations

6.0 Evaluation

6.1 Evaluation in terms of internal evidence

6.2 Judgments in terms of external criteria

The Revision of the Taxonomy

As Krathwohl and Anderson (2009) declares, advances in cognitive psychology suggested a need for revision. Thus, in 1995, Krathwohl, one of the pioneer members and Anderson formed a committee composed of P. W. Airasian, K. A. Cruikshank, R. E. Mayer, P. R. Pintrich, J. Raths, and M. C. Wittrock. The outcome was published in 2001 as *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives (Complete edition)*. New York: Longman. The revision of the original Taxonomy is a two-dimensional framework: Knowledge and Cognitive Processes. In the original Taxonomy, the *Knowledge* category embodied both noun and verb aspects. The noun or subject matter aspect was specified in

Knowledge's extensive subcategories. The verb aspect was included in the definition given to *Knowledge* in that the student was expected to be able to recall or recognize knowledge. This brought unidimensionality to the framework at the cost of a *Knowledge* category that was dual in nature and thus different from the other Taxonomic categories. This anomaly was eliminated in the revised Taxonomy by allowing these two aspects, the noun and verb, to form separate dimensions, the noun providing the basis for the Knowledge dimension and the verb forming the basis for the Cognitive Process dimension. Another one by Krathwohl and Anderson (2013) is also displaying similar outcomes with few amendments.

Structure of the Cognitive Process Dimension of the Revised Taxonomy

1.0 Remember - Retrieving relevant knowledge from long-term memory.

1.1 *Recognizing*

1.2 *Recalling*

2.0 Understand - Determining the meaning of instructional messages, including oral, written, and graphic communication.

2.1 *Interpreting*

2.2 *Exemplifying*

2.3 *Classifying*

2.4 *Summarizing*

2.5 *Inferring*

2.6 *Comparing*

2.7 *Explaining*

3.0 Apply - Carrying out or using a procedure in a given situation.

3.1 *Executing*

3.2 *Implementing*

4.0 Analyze - Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.

4.1 *Differentiating*

4.2 *Organizing*

4.3 *Attributing*

5.0 *Evaluate* - Making judgments based on criteria and standards.

5.1 *Checking*

5.2 *Critiquing*

6.0 *Create* - Putting elements together to form a novel, coherent whole or make an original product.

6.1 *Generating*

6.2 *Planning*

6.3 *Producing*

The revision, according to Krathwohl and Anderson (2009), made 12 major changes that fall in three categories, changes in emphasis, terminology and structure.

Changes in Emphasis

First, the primary audience is elementary and secondary teachers. Secondly, instead of providing many sample test items, the revision emphasizes the alignment of curriculum, instruction, and assessment. Thirdly, rather than providing models, the sample assessment tasks illustrate and clarify the category's meaning. Finally, subcategories are used to define the major categories.

Changes in Terminology

First, the nouns forming the categories on the cognitive process dimension were rewritten as verbs. Secondly, the term *Knowledge* became *Remember*, but remained the least complex cognitive process. Thirdly, *Comprehension* and *Synthesis* were renamed as *Understand* and *Create*. Finally, the subcategories were completely renamed, reorganized, and were written as verbs.

Changes in Structure

The grammatical structure of educational objectives is subject-verb-object. In numerous elementary classrooms, the letters TLW, standing

for “The Learner Will,” written as a lead-in to objectives written on chalkboards or whiteboards. This is because the subject of educational objectives is the student or the learner. The first structural change was to classify each objective in two dimensions according to the verb and object. Secondly, the verb—what is to be done with or to knowledge—became the cognitive process dimension with Remember, Understand, Apply, Analyze, Evaluate and Create categories. The object—what content is dealt with—became the Knowledge Dimension with Factual, Conceptual, Procedural, and Metacognitive categories. Thirdly, the two dimensions became the basis for the Taxonomy Table. Lastly, the claim that the cognitive process dimension was a cumulative hierarchy was eliminated (Krathwohl & Anderson, 2009).

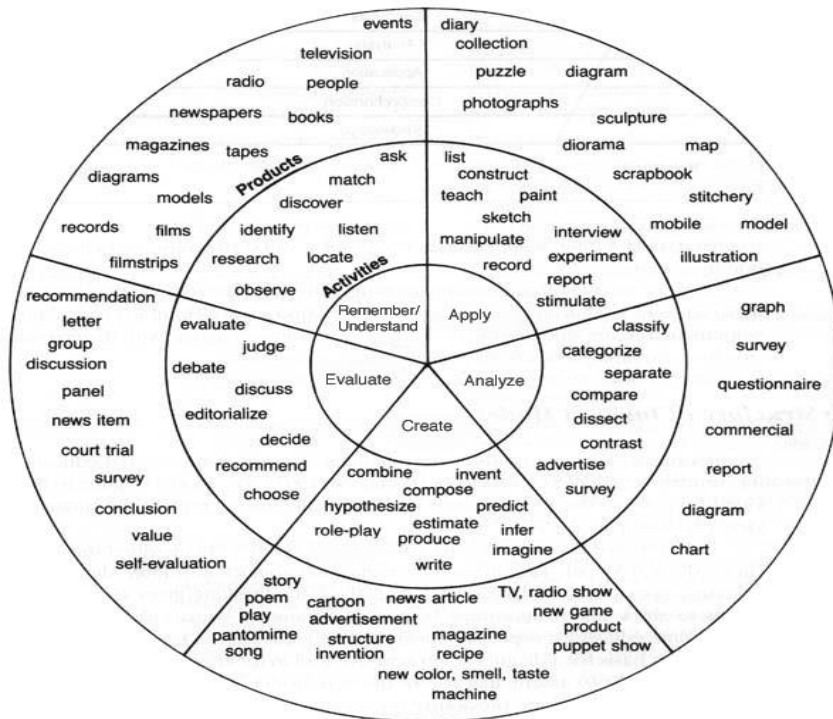


Figure 1: The Taxonomy Wheel of Relevant Verbs, Teaching Aids and Activities

Source: Churches, (2011).

Applications of the Revised Taxonomy

The new Taxonomy Table mirrors the grammatical structure of objectives, thus, it can be used (1) to increase understanding of educational objectives, (2) to design assessments that are aligned with specified educational objectives and (3) to develop instruction that is aligned with both the objectives and the assessments (Krathwohl & Anderson, 2009).

Increased Understanding of the Objectives

The Taxonomy Table provides a framework for showing the underlying similarities across subjects and grades. Consider the following objective: "The learner will compare democracies and autocracies." In this objective, "compare" means the student will understand the similarities and differences of two forms of government. Because "compare" is a cognitive process associated with "Understand" in the Taxonomy Table and because "democracies" and "autocracies" are forms (classifications) of government, this objective would be classified as "Understand Conceptual Knowledge".

Designing Valid Assessment

Krathwohl and Anderson (2009) also states that educators focus mostly on the objects of the objectives with only a secondary concern for the verbs included in them. Numerous test items can be written about democracies and autocracies or weather and climate. To conform to the objective's real meaning, however, the items cannot ask students to provide or identify memorized concept definitions (which would be less complex, cognitively speaking), nor can the items ask students to evaluate the relative merits of each concept (which would be much more complex, cognitively speaking). If they are to be valid, the items need to determine whether students can compare two forms of government or two meteorological categories in terms of their similarities and differences. One method of

improving the alignment between objectives and test items, which is consistent with the Taxonomy Table, is to build items using item formats designed to test complex objectives (Haladyna, 1999).

Planning Effective Instruction

One of the insights many educators gain from using the Taxonomy Table to plan instruction is that objectives that are classified into the same cells of the Table are taught in much the same way. For example, both of the objectives used as examples in the previous section would be classified as “Understand Conceptual Knowledge.” Based on a great deal of research, much is known about teaching students to understand conceptual knowledge. Teaching concepts in context, teaching defining features, and using examples and non-examples are all empirically verified ways of teaching concepts.

Criticism of the Taxonomies

Critics of the original taxonomy have questioned whether human cognition can be divided into distinct categories, particularly sequential or hierarchical categories. Most criticism is focused less on the system itself and more on the ways in which educators interpret and use the taxonomy. Furst (1994) questioned the assumption that *The Taxonomy* was a “purely descriptive scheme in which every kind of goal could be represented in a relatively neutral way.” (p. 28). He also questioned whether *The Taxonomy* was sufficiently comprehensive, suggesting that omitting the term understanding was an error. Bereiter and Scardamalia (1998) criticized the placement of knowledge on the same continuum as intellectual skills and abilities, particularly its placement at the lowest end of the continuum. The taxonomy revision attended to many of these criticisms, including a separate knowledge dimension as well as understanding as a primary cognitive process category. Other systems or hierarchies have been developed but Bloom’s taxonomy is easily understood and is probably the most widely used approach in education fields. Despite their age, the taxonomies have provided a basis for test and

curriculum development throughout the world (Chung, 1994, Lewy and Bathory, 1994). *The Taxonomy* was cited as one of the significant writings influencing curriculum in the twentieth century (Kridel, 2000).

Methodology

Research Design and Sampling Procedures

The study employed Evaluative Survey Design. According to Meyer (2015) evaluative survey design is concerned with collecting data from members of a population in order to make judgements about conditions that exist, opinions that are held, processes that are going on and effects that are evident regarding a phenomenon. It is sometimes known as investigation design. The sample was purposely selected from two schools in Kinondoni District. The purposive sampling was done in order to save time and get in-depth information, that why only two schools were selected. A total of 40 teachers were included in the study and were seen to be enough to provide in-depth information about the use of Bloom's Taxonomy in classroom assessment.

Data Collection and Instrumentation

Two main instruments were used to collect data for this study. The first one was documentary review. A total of 60 past papers were collected. The teachers were requested to provide some tests they had constructed in their teaching subject. For uniformity purposes the researcher requested from the teachers for an end of term test on each subject for the form two and form four classes preferably the recently done test. The past papers were as Table 1 indicates:

Table1: Number of Past papers across the subjects

S/n	Subjects	No of past papers
1.	Geography	20
2.	History	10
3.	Civics	10

4.	Biology	10
	TOTAL	60

The second instrument that was used in this study to tape information was questionnaires. Closed Questionnaire was designed. This was for the purpose of obtaining clear and direct information from the respondents and also to save time which was not enough for the study. Again responses would have come in different forms and this would have led to answers that cannot be systematically coded for analysis. Forty (40) questionnaires were distributed among teachers in the two selected schools. Questionnaires were used to get the information from the teachers to establish their extent of competence in test construction. The questionnaires were designed in simple and clear language with precision to ensure validity of the responses. The questionnaire was divided into three parts; part A contained questions on teachers' personal information that helped the investigator to understand teachers experience and training. Part B contained questions that helped to establish the levels of teachers' competences in test construction.

The respondents were required to tick the chosen response representing their viewpoint from several answer categories. This means the structure of the questions was closed questions. The advantage of closed questions is that they are manageable since the respondent is restricted to a finite set of responses. Part C contained items on a five point Likert Scale where the respondents were required to indicate their levels of agreement or disagreement on statements that were used to guide the researcher in establishing how adequately test items constructed by teachers reflected the six cognitive levels objectives of the Bloom's Taxonomy. Part C also helped to find out how adequately teachers employed the use of action verbs in their test items. Each category of verbs was chosen to cover the six levels of cognitive objectives in a proportional manner. The verbs used helped to establish the mostly tested or untested levels of the cognitive objectives. Respondents were required to

indicate how often they used a list of verbs in the tests. The respondents in this case were selected as table 2 below indicates:

Table 2: Number of Teachers who responded the questionnaires across the subjects

SUBJECT	NO. OF TEACHERS
Geography	8
History	8
Civics	6
Biology	4
Other Subjects	14
TOTAL	40

Data Analysis and Presentation of Results

Data Analysis

Data was analyzed qualitatively using content analysis. Themes were arranged in accordance with each research question. Data description, percentages and tables were used to help in answering the research questions. Each research question was answered separately by analyzing data pertaining to it. Data from the teacher made tests was analyzed by description method; interest being on identifying the levels of knowledge the teachers often tested their students on.

Teachers' Professional Training (Teacher Education)

The results from the questionnaires indicated that out of 40 teachers only 10 (25%) were degree holders while 25 (62.5%) were diploma teachers. Five (12.5%) of them did not have teacher education training but they are form six leavers. None of the teachers indicated to have masters.

Teachers' Skills and Competence on test items construction

The responses from the questionnaire helped in determining how skilled the teachers were in preparing tests for their students. Each response is analyzed in this section. In response to the question: Have

you attended any course or training or seminar on test construction? Out of the forty (40) teachers involved in the study 10 (25%) indicated to have attended a course, training or seminar on test construction, with 75% admitting to have had no training on the same. On asking the question on the time taken to construct test items, the answers varied. Generally, it seems they do not spent much time in constructing test. One of the teachers responded that:

“For me it only takes few minutes I am over, why should I take several hours for a simple work like that?”

The concern here is that the construction of a quality test requires ample time and competence to ensure that the learning objectives are accurately tested.

Use and Awareness of Bloom’s Taxonomy

On responding to the question “have you ever heard Bloom’s Taxonomy?” out of forty teachers, only 7(17.5%) stated that they never had heard that term and 33 (82.5%) teachers responded that they know Bloom’s Taxonomy. On the question whether they have used it or not, only few teachers 8(20%) claimed to use Bloom’s Taxonomy in constructing the test and other classroom assessment. Thirty two teachers admitted that they never use Bloom’s Taxonomy in developing the test or examination questions.

Bloom’s Taxonomy Levels of Knowledge

On responding to the question “if the teachers use action verbs as required by the syllabus as reflected from Bloom’s Taxonomy”, most teachers used lower levels of knowledge. From the table below it is revealed that the biggest percentage of teachers agreed to have been testing at the lowest levels of knowledge. The table reveals that most of the items constructed by the teachers do not employ the use of action verbs. On analyzing the past papers provided by teachers none of the subject teachers employed the use of action verbs on even half of the test items constructed. It is only in few items that action verbs

were used out of several test items in the four subjects. The syllabus states objectives in action verbs but the framing of the questions does not reflect the achievement of the instructional objectives.

Table 3: Employing Action Verbs on Test Items as per Bloom’s Taxonomy (1956)

Action Verbs	Very Often used	Often Used	Rarely Used	Very Rarely used	Never Used
a. List, define, name, outline	√				
b. Describe, explain, discuss, identify		√			
c. Interpret, Sketch, Illustrate, prepare			√		
d. Differentiate, examine, compare, criticize			√		
e. Argue, evaluate, predict, defend				√	
f. Propose, compose, prepare, organize, create					√

Classifying the action verbs into six levels of cognition as identified by Krathwohl (2002), the following analysis; table 4 presents the outcome. The outcomes were the same as those from Bloom’s Taxonomy.

Table 4: Employing Action Verbs on Test Items construction as per Krathwohl (2002)

Action Verbs	Very Often used	Often Used	Rarely Used	Very Rarely used	Never Used
--------------	-----------------	------------	-------------	------------------	------------

1.	Remembering		√	
	List, define, name, outline			
2.	Understanding	Describe,	√	
	distinguish, discuss, identify			
3.	Applying		√	
	Calculate, draw			
4.	Analyzing		√	
	Differentiate, examine, compare, criticize			
5.	Evaluating			√
	Argue, evaluate, predict, defend			
6.	Creating			√
	Propose, compose, prepare, organize, create			

Discussion

As it is shown from the findings of this study that the teachers' test items are not satisfactorily reflecting the six cognitive level objectives. Most of the test items functioned at the lower thinking levels at the expense of the higher thinking level. It is evident from the teachers' responses that most of teachers had their test items concentrating on areas where the students just need to recall what their teachers have taught them. Verbs that were identified to very often be used by the teachers were those that test the lower levels of cognitive abilities, like define, list, name, and outline. The second level of ability, understand, with verbs like classify, describe identify explain had also high percentages of use. The findings are in line with other researchers elsewhere in the world. Amua-Sekyi (2015) found out that most teachers in Ghana avoid developing test items that cover the higher levels of Taxonomy due to marking problems. Teachers were claiming that if you construct questions from higher levels, marking exercise become laborious.

These percentages of use for the first lowest levels of cognitive ability are prove enough that most of the test items prepared by teachers concentrate in the level that require students to recall or recognize ideas, principles and theories in the form they are taught. This is at

the expense of testing the higher level thinking which involve creative, innovative and problem solving skills. The percentages of use reduce drastically as we move to the higher levels of cognitive abilities with rarely and very rarely scales of the likert responses getting high percentages for verbs that test the levels of analyze, evaluate and create (Shillingburg, 2016). It is the opinion of the researcher that students should get more challenging experiences to enable them explore and discover rather than to just recall and understand

The use of action verbs in the test items is not adequate from the analyses already done. With the syllabus stating objectives in measurable terms using verbs, it would be expected that tests, which are meant to find out whether the objectives are met, should also be in measurable form by use of action verbs. This would help the students to know what objectives are being assessed. Teachers should help student move up the levels of Bloom's Taxonomy in order to ensure that they become critical thinkers by letting them apply, analyze, synthesize and evaluate facts, ideas and theories. This would help them do well in school and beyond. Similar study was also conducted by Fong (2015) in Singapore which indicated that written assignments from teachers to student avoided the use of higher levels of objectives and also higher levels of action verbs.

Conclusion

There is no doubt that Bloom's Taxonomy of Educational Objectives for the cognitive domain has had a considerable impact on educational thought and practice all over the world. The taxonomy of educational objectives has given a sound base for the formulation and assessment of the educational objectives. Assessment as an aspect of the rigorous formative assessment cycle requires precision to be effective. Properly written items produce accurate data about student comprehension which guides teachers to make sound instructional decisions to sustain and improve student learning.

A sound system of education should be able to produce graduates who have a wealth of knowledge and are able to comprehend much of it, and are also able to apply their knowledge and engage in critical thinking, reflective thinking, divergent thinking, inductive-deductive processes and problem solving which are concerned with the higher categories of the cognitive domain. This is why these areas should form the bulk of assessment because they are the ones from where we expect the highest educational dividends. As revealed from this study, test construction is an area that requires more emphasis more so because most teachers are not trained in test construction skills. It is evident therefore that teachers need to be trained in test construction so as to adequately construct test items that would be sufficient in establishing the learning done at all levels of the Blooms Taxonomy.

Recommendations

Based on the findings of this study, the following recommendations are made:

- Regular training and retraining workshops, seminars and short courses should be organized to help the teachers gain competence in construction of tests in order to ensure quality assessment in schools.
- When teachers are developing tests or any other type of assessment in the classroom they should take Bloom's Taxonomy into consideration. Teachers should view the tests they create in a new light and be more critical about the questions they use to assess their students.
- When teachers are writing test questions, they must take into consideration the objectives that were covered in class. That is, teachers have to keep "at the end" in mind while writing the lesson plans that lead up to the test in the first place. "A well-written objective provides extremely strong clues about how to assess it" (Shank, 2005).

- Teachers should perfect the art and science of creating Table of Specification as a blueprint for test development. Smart teachers can draw the table or Bloom's Taxonomy on their office or boards.
- Teachers have to create activities and lessons that make sure they gain adequate understanding and practice to be able to perform at the desired level of assessments writing.
- Exposure to modern test theories and software would help teachers in maintaining high level validity and reliability of the test items.

References

- Amua-Sekyi, E.T (2015). Assessment, Student learning and Classroom Practice: A Review. University of Cape Coast. Retrieved on 02/02/2018 from <https://files.eric.ed.gov/fulltext/EJ1109385.pdf>
- Anderson, L. W., & Krathwohl, D. R. (Eds.). Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J. and Wittrock, M. C. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of Educational Objectives*. New York: Allyn Bacon Longman.
- Bereiter, C. & Scardamalia, M. (1999). Beyond Bloom's Taxonomy: Rethinking Knowledge for the Knowledge Age. In Hargreaves, A., Libermann, A., Fullan, M., & Hopkins, D. (Eds.), *The International Handbook of Educational Change* (pp. 675–692). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Bloom, B. S. (Ed.). Engelhart, M. D., Furst, E. J., Hill, W. H., Krathwohl, D. R. (1956). *Taxonomy of educational objectives: Handbook I: The cognitive domain*. New York: David McKay.
- Biehler, R. F. & Snowman, J. (1997). *Psychology Applied to Teaching*, Eighth Edition, Boston: Houghton Mifflin.
- Chung, B. M. (1994). The Taxonomy in The Republic of Korea. In L. W. Anderson & L. A. Sosniak (Eds.), *Bloom's Taxonomy: A Forty-Year Retrospective*. Ninety-Third Yearbook of the National

- Society for the Study of Education (pp. 129–186). Chicago: University of Chicago Press.
- Churches, A. (2011). Social Learning systems. Kristin School; Auckland. Retrieved on 10/02/2018 from <http://sociallearningsystems.typepad.com/home/2009/07/tips-for-writing-instructional-objectives-blooms-taxonomy-job-aids.html>
- Fong, W. L. (2015). A Study of Mathematics Written assessment in Singapore. *The Mathematics Educator*. Retrieved on 02/02/2018 from http://math.nie.edu.sg/ame/matheduc/tme/tmeV16_1/TME16_2.pdf
- Furst, E. (1994). Bloom's Taxonomy: Philosophical and Educational Issues. In Anderson, L. and Sosniak, L. (Eds.) *Bloom's Taxonomy: A forty years Retrospective* (p.34) Chicago: The national society for the Study of Education
- Gichuhi, C. (2014). *Teacher's competence in tests construction within Bloom's Taxonomy for effective learning*. University of Nairobi: Nairobi.
- Haladyna, T. H. (1999). *Developing and validating multiple-choice test items*. Mahwah, NJ: Erlbaum.
- Karen L. Smith. Faculty Centre for Teaching and Learning. (2014). Retrieved on 05/02/2018 from <http://www.fctl.ucf.edu/TeachingAndLearningResources/CourseDesign/BloomsTaxonomy/>
- Krathwohl, D. R., & Anderson, L. W. (2009). *Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Education Objectives, Revised Edition*. Retrieved on 7th February 2018 from <https://thesecondprinciple.com/teaching-essentials/beyond-bloom-cognitive-taxonomy-revised/>
- Krathwohl, D. R., & Anderson, L.W. (2013). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Education Objectives, Abridge Edition*. Retrieved

on 10/02/2018 from [https://www.amazon.com /gp/product/1292042842?ie=UTF8&tag=secondprincip-20&camp=1789&linkCode=xm2 &creativeASIN=1292042842](https://www.amazon.com/gp/product/1292042842?ie=UTF8&tag=secondprincip-20&camp=1789&linkCode=xm2&creativeASIN=1292042842)

Kridel, C. (2000). Some books of the century. *Education Week*. 19 (16), 40–41, 60. Retrieved on 05/02/2018 from [https://books.google.co.tz /books?id=402k3JvksZUC &pg=PA416&lpg=PA416&dq=Kridel](https://books.google.co.tz/books?id=402k3JvksZUC&pg=PA416&lpg=PA416&dq=Kridel)

Meyer, W. (2015). *Introduction to Evaluations Design*. CEVAL Consult, Chicago.

Lewy, A. & Bathory, Z. (1994). The Taxonomy of Educational Objectives in Continental Europe, the Mediterranean, and the Middle East. In L. W. Anderson & L. A. Sosniak (Eds.), *Bloom's Taxonomy: A Forty-Year Retrospective*. Ninety-Third Yearbook of the National Society for the Study of Education (pp. 129–186). Chicago: University of Chicago Press.

Saeed, R. R. & Noor, M. (2011). Manual on Test Item Construction Techniques. Retrieved on 5/02/2018 from [http://www.hec.gov.pk/ InsideHEC Divisions/ LearningInnovation/ Documents/ Learning%20Portal/NCES/Manual%20on%20Test%20Item%20Construction%20Techniques.pdf](http://www.hec.gov.pk/InsideHEC/Divisions/LearningInnovation/Documents/Learning%20Portal/NCES/Manual%20on%20Test%20Item%20Construction%20Techniques.pdf)

Shank, P. (2005). Developing learning assessments for classroom, online, and blended learning. Workshop Materials. Denver, CO: Learning Peaks.

Shillingburg, W. (2016). Understanding Validity and Reliability in Classroom. Retrieved on 05/02/2018 from <https://cms.azed.gov/home/GetDocumentFile?id=57f6d9b3aadebf0a04b2691a>

Stiggins, R. J. (1994). *Student-centered Classroom Assessment*. New York: Macmillan Publishing Company.

UNICEF (2016). *Education Equity and Quality*. UNICEF Tanzania. Dar es Salaam.