International Journal of Entrepreneurship and Business Innovation
Volume 2, Issue 1, 2019 (pp. 12-20)

www.abjournals.org

IMPLEMENTATION OF BLOOMS TAXONOMY IN THE CONSTRUCTION OF TEACHER MADE BIOLOGY TEST IN PUBLIC SENIOR SECONDARY SCHOOLS IN RIVERS STATE, NIGERIA

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ABSTRACT: *This study focused on the implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Senior Secondary Schools in Rivers State. A descriptive survey design was adopted for the study. The population of the study comprised all the Biology teachers and administrators in the 243 secondary schools in Rivers State. From this population, 120 and 40 biology teachers and administrators respectively were purposively selected. An instrument titled "Implementation of Bloom Taxonomy in Biology Survey Questionnaire" (IBTBSQ) was used for this study. The instrument was face validated by two experts in department of Science Education of Rivers State University, Port-Harcourt. The reliability of the instrument was determined through Cronbach Alpha reliability coefficient method. The reliability coefficient achieved was 0.86. Mean and Standard Deviation were used to answer the research questions while z-test statistical tool was used to test the hypotheses. The study found that Blooms taxonomy is not fully implemented in the construction of Biology test in Senior Secondary Schools in Rivers State due to most biology teachers not being acquainted with Blooms taxonomy. It was recommended that the association as well as school administrators should imbibe or introduce an effective use of Blooms taxonomy and that training centres should be built for science teachers in developing the skills of constructing test in relation to Blooms taxonomy.*

KEYWORDS: Bloom's Taxonomy, Teacher Made Test, Implementation, Biology Teachers

INTRODUCTION

Education has been regarded as the bedrock of development in the World today. On this premise, countries have keyed into strengthening their educational system. Through education, the knowledge of science, which is the study of nature, is being passed on from one generation to another. This has made it possible for scientist in different fields like biology, physics, chemistry, mathematics, among others to be trained. The essence of this to the society could not be over stressed. Oriahi, Uhumuaavbi and Aguele (2010) opined that in Nigeria, the inclusion of science subjects in the school curriculum is to promote national development as the nation adopts more science-oriented policies and programmes in education. For instance, one science subject that has contributed to human and national development is Biology.

Biology is the science of living beings (Muttaqui, Banu, Hasan and Ahmed, 2009). The term Biology comes from two Greek words (bios means life and logos means knowledge). Biology is divided into two branches: Botany and Zoology. Botany deals with theoretical discussion

and research about characters and other features of plants, while Zoology is limited in subjects relating to animals. Basically, the study of Biology is very important. Just like other subjects, Biology requires regular evaluation of students so that students' performance can be assessed to know if the aims of including the subject in the curriculum are being achieved or not. Consequently, teachers evaluate their students using teacher made test to prepare them for standardized examinations that will be given to them before graduation.

According to Evans (2009), teacher-made tests are test constructed by the teacher. Therefore, test made test could be further described as the test constructed by the teacher for the purposes of assessing students' performance daily, weekly, monthly, termly or at the end of the session. Teacher-made tests play a very significant role in that they are part of the teaching and learning process. As Madziyire (2010) posits, teacher-made tests help the teacher to identify the content (knowledge or skills) which has been mastered by pupils and the teacher knows through the results of the tests the areas where the pupils have difficulties and then finds ways of overcoming the difficulties so that these pupils can do better. Results from teacher-made tests also enable teachers to assess their strengths and weaknesses. For this type of test to be effective in terms of covering the scope of the subject whereby all the required skills are considered, the Bloom Taxonomy was recommended for teachers to make use of.

Blooms taxonomy according to Chandio, Pandhiani and Iqbal (2016), Bloom's Taxonomy is the benchmark for developing tests and assessment. This taxonomy originated from Benjamin Bloom with collaboration with others in the 1950's. The Bloom taxonomy describes six (6) levels of cognitive learning using measurable verbs indicating what the student must do in order to demonstrate learning. In learning, there are three domains which include: cognitive (deals with the head), affective (deals with the heart) and psychomotor (deals with the hands). Alamina (2008) stated that a well-directed set of objectives should be aimed at developing the three domains of educational objectives in the child. These sets of objectives play an important role in the teaching and learning encounter as this brings about behavioural changes in the learner (Asuru, 2015). Asuru further stated that the objectives guide both teaching and assessment process and they are usually stated in action verbs which clearly indicate specific and directly observable behaviours.

Blooms taxonomy suggests that setting educational objectives should progress from the simple to complex which should be categorized into the following:

- Knowledge: The recall method and processes
- Comprehension: Type of understanding of apprehension such that the individual knows what has been communicated
- Application: The use of learnt materials in particular and concrete situations
- Analysis: The breakdown of a communication into its constituent elements or parts
- Synthesis: The putting together of elements as arts so as to form a whole
- Evaluation: Judgement about value of material and method of giving purposes on definite materials

The Bloom taxonomy is divided into higher and lower cognitive skills (HOCS and LOCS). It is also accepted that memorization and the recall of facts are lower order cognitive skills (LOCS) that requires only minimum level of understanding, whereas the application of knowledge and critical thinking are higher order cognitive skills (HOCS) that requires deep conceptual understanding. Academic success according to Zoller in Crowe, Clarissa and Mary (2008) should be measured not just in terms of what student can remember, but what the student are able to do with their knowledge. Therefore, constructing teacher made test requires good knowledge of Bloom taxonomy so that wider coverage of the scheme can be assured during testing. According to Crowe, Clarissa and Mary (2008) Bloom taxonomy makes it possible for teachers to better align their assessments with their teaching activities to help students enhance their study skills and meta-cognition.

However, despite the relevance of Bloom taxonomy in easing the stress of constructing a test, it has been observed that some teachers do not have the competence to implement it. From a study carried out by Gichuhi (2014), a total of thirty (30) teachers, out of the thirty-eight (38), that is 78.9%, were not sure whether they had the skills and competences for designing tests in their subjects. Only eight (8) teachers indicated that they had the skills and competences of test construction. This reveals that even if most teachers had heard about the Blooms Taxonomy only 10.5% of the total used it in their testing techniques. Because of this, Gichuhi (2014) opined that secondary school teachers do not adequately employ the Bloom's cognitive levels objectives in constructing their test items. It also revealed that teachers do not adequately make use of the action verbs in constructing test items. This has been attributed to so many factors. According to Kubiszyn & Borich in Chinyoka, Kufakunesu and Ganga (2011), different factors that contribute to poor implementation of Bloom taxonomy include the difficulties in establishing teacher made test, accuracy and dedication of different time and energy in the preparation and administration of the tests. However, Gichuhi (2014) suggested that training and retraining of teachers in test construction could help in improving teacher made tests for effective learning assessment. Considering the important of Bloom taxonomy in test construction, the researcher deemed it fit to examine the implementation of Bloom taxonomy in the construction of teacher made Biology test in public secondary schools in Rivers State, Nigeria.

Statement of the Problem

Nigerian educational system is one system that was structured to build her youths academically with the aim of developing the country. This system was designed to equip students from one level of education to another. For instance, a secondary school student should be well equipped to perform very well at the higher institutions. However, the situation with some students in tertiary institutions in some science subjects like Biology is indeed pathetic. Some students who could be said to be at the average may be good in one aspect of a course and the other aspect they may tend to be deficit. One could wonder what could be the problem when the curriculum of secondary school is designed to cover the introductory aspect of what is done in the Universities. When a child performs poorly in one aspect of a subject suggests that maybe the teacher who taught the child at the secondary level failed to evaluate the child in that aspect or that the teacher did not counsel or work on the child after noticing the poor performance of that child in that aspect. Basically, constructing a test requires good knowledge of Bloom taxonomy which is a model for test construction. This makes it easier for a teacher to cover the scheme during testing. With this also, the teacher may identify students' weakness and then guide the student better on that.

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Purpose of the Study

The study examined the implementation of blooms taxonomy in the construction of teachers made Biology test in Public Secondary Schools in Rivers State. Specifically, this work sought to;

1. Ascertain how often biology teachers utilize the six cognitive levels of Bloom taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.
2. Examine the factors responsible for poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.
3. Proffer possible solution to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.

Research Questions

1. How often biology teachers utilize the six cognitive levels of Bloom taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State?
2. What are the factors responsible for poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State?
3. What are the possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State?

Hypotheses

1. There is no significant difference between the mean responses of biology teachers and administrators on how often biology teachers utilize the six cognitive levels of Bloom taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.
2. There is no significant difference between the mean responses of biology teachers and administrators on the factors responsible for poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.
3. There is no significant difference between the mean responses of biology teachers and administrators on the possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.

METHODOLOGY

The design of this study was a descriptive survey based on the fact that a large sample size of teachers and administrators was collected to determine the implementation of bloom taxonomy by biology teachers. The study was carried out in Rivers State. Rivers state is in the southern part of Nigeria with a projected population of 6,966279 people (National Population Commission, 2007). The state is bordered in the south by the Atlantic Ocean, in the north by Anambra, Imo and Abia states, in the east by Akwa-Ibom state and in the west by Bayelsa and Delta states. There are 23 Local Government Areas in the State. As at the time of the study, there were about 2,805 and 243 primary and secondary schools respectively in the 23 Local Government Areas of Rivers State (Rivers State Ministry of Education). Therefore, Rivers State was suitable for this study. The population of the study comprised all the biology teachers and administrators in Public Secondary Schools in Rivers State. From this population, 120 and 40 Biology teachers and administrators respectively were selected through purposive sampling method. An instrument titled "Implementation of Bloom Taxonomy in Biology Survey Questionnaire" (IBTBSQ). The instrument was sectioned into three (A, B & C). Sections A & C were structured in the pattern Likerk 5 point of Strongly Agree (SA- 5), Agree (A- 4), Undecided (U-3), Disagree (D- 2) and Strongly Disagree (SD-1), while section B was structured in the pattern of 4-point rating scale of More Frequent (3-4), Frequent (2-2.99), Less Frequent (1-1.99), and Not at all (0-0.99). The instrument was face validated by two experts in department of Science Education, Rivers State University, Port-Harcourt. The reliability of the instrument was determined through Cronbach Alpha reliability coefficient method for a measure of internal consistency of the instrument. In order to do this, 14 teachers who were part of the population but not part of the sample size were randomly selected and their responses were analysed using the Cronbach Alpha reliability coefficient. The reliability coefficients achieved was 0.86. Copies of the instruments were administered and retrieved by the researchers. Mean and Standard Deviation were used to answer the research questions while an inferential statistics of z-test statistical tool was used to test the hypotheses. For sections A and C, mean responses equal or above 3.00 were accepted, otherwise rejected, while for section B, mean values equal or above 2.50 were accepted otherwise rejected.

RESULTS AND DISCUSSIONS

Table 1: Respondent's Opinion and Hypothesis on how often biology teachers utilize the six cognitive levels of Bloom taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State.

		Biology Teachers (n=120)			Administrators (n=40)						
S/N	**Cognitive levels**	**M**	**Rank**	**SD**	**M**	**Rank**	**SD**	**GM**	**z-cal**	**z-crit**	**Remark**
1	Knowledge	3.45	1st	.27	3.80	1st	.81	3.63	2.68	1.98	S
2	Comprehension	2.63	2nd	.22	2.60	2nd	.61	2.62	.30	1.98	NS
3	Application	1.53	3rd	.27	1.98	3rd	.62	1.76	4.45	1.98	S
4	Analysis	1.06	5th	.33	1.27	4th	.53	1.17	2.26	1.98	S
5	Synthesis	1.07	4th	.33	1.15	5th	.54	1.11	.88	1.98	NS
6	Evaluation	1.05	6th	.34	1.04	6th	.73	.74	.21	1.98	NS

Source: field survey, 2019

Table 1 shows Biology teachers and administrators' responses on how often biology teachers utilize the six cognitive levels of Bloom taxonomy in the construction of Biology test in Public Secondary Schools in Rivers State. The mean responses of Biology teachers show that knowledge cognitive level is more frequently utilized (3.45), comprehension cognitive level is frequently utilized (2.63), application, analysis, synthesis and evaluation levels are less utilized (1.53, 1.06, 1.07 & 1.05). On the other hand, the mean responses of Administrators show that knowledge cognitive level is more frequently utilized (3.80), comprehension cognitive level is frequently utilized (2.60), application, analysis, synthesis and evaluation levels are less utilized (1.98, 1.27, 1.15 & 1.04). Furthermore, the z-cal for items 2, 5 and 6 were < the z-crit of 1.98, while items 1, 3 and 4 were > the z-crit of 1.98. Therefore, items 2, 5 and 6 were considered accepted, which means that there was no significant difference between the mean responses of biology teachers and administrators on how often biology teachers utilize the six cognitive levels of Bloom taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State, while for items 1, 3 and 4 there was a significant difference. This is in conformity with Gichuhi (2014) that opined that secondary school teachers do not adequately employ the Bloom's cognitive levels objectives in constructing their test items. It also revealed that teachers do not adequately make use of the action verbs in constructing test items.

Table 2: Respondent's Opinion and Hypothesis on factors responsible for poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State

		Biology Teachers (n=120)		Administrators (n=40)					
S/N	**factors responsible for poor implementation of bloom taxonomy**	**M**	**SD**	**M**	**SD**	**GM**	**z-cal**	**z-crit**	**Remark**
7	Difficulty in the construction of biology test in relation to Bloom's taxonomy	4.29	.91	4.50	.59	4.40	1.68	1.98	NS
8	Time required for construction of biology test based on Bloom's taxonomy	3.43	1.25	4.35	.30	3.89	7.44	1.98	S
9	Ignorance	4.43	.27	4.23	.79	4.33	1.57	1.98	NS
10	A teacher teaching a subject that doesn't relate to his/her field of study	4.57	.27	4.35	.48	4.46	2.76	1.98	S
11	Lack of adequate test construction skill	4.43	.27	4.31	.54	4.37	1.35	1.98	NS
12	Ineffective supervision of teachers	3.71	1.14	3.54	.66	3.63	1.15	1.98	NS
13	Lack of training on Bloom's taxonomy implementation	4.23	1.02	3.89	.54	4.06	2.69	1.98	S

Source: field survey, 2019

Table **2** shows Biology teachers and Administrators responses on the factors responsible for poor implementation of bloom taxonomy by Biology teachers in Public Secondary Schools in Rivers State. The calculated mean from the responses elicited from Biology teachers shows that difficulty in the construction of biology test in relation to Bloom's taxonomy (4.29), time required for construction of biology test based on Bloom's taxonomy (3.43), ignorance (4.43), a teacher teaching a subject that doesn't relate to his/her field of study (4.57), lack of adequate test construction skill (4.43), ineffective supervision of teachers (3.71) and lack of training on Bloom's taxonomy implementation (4.23) are the factors responsible for poor implementation of bloom taxonomy by Biology teachers in Public Secondary Schools in Rivers State. On the other hand, the calculated mean from the responses elicited from the Administrators shows that difficulty in the construction of biology test in relation to Bloom's taxonomy (4.50), time required for construction of biology test based on Bloom's taxonomy (4.35), ignorance (4.23), a teacher teaching a subject that doesn't relate to his/her field of study (4.35), lack of adequate test construction skill (4.31), ineffective supervision of teachers (3.54) and lack of training on Bloom's taxonomy implementation (3.89) are the factors responsible for poor implementation of bloom taxonomy by Biology teachers in Public Secondary Schools in Rivers State. Furthermore, the z-cal for items 7, 9, 11 and 12 were < the z-crit of 1.98, while items 8, 10 and 13 were > the z-crit of 1.98. Therefore, items 7, 9, 11 and 12 were considered accepted, which means that there was no significant difference between the mean responses of biology teachers and administrators on the factors responsible for poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State, while for items 8, 10 and 13 there was a significant difference. This finding is in line with Kubiszyn & Borich in Kufakunesu (2011) that identified different factors that contribute to poor implementation of Bloom taxonomy to include the difficulties in establishing teacher made test, accuracy and dedication of different time and energy in the preparation and administration of the tests.

Table 3: Respondent's Opinion and Hypothesis on possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State

		Biology Teachers (n=120)		Administrators (n=40)					
S/N	**Possible solutions**	**M**	**SD**	**M**	**SD**	**GM**	**z-cal**	**z-crit**	**Remark**
14	Awareness on the use of Bloom taxonomy	3.19	1.02	3.14	.94	3.17	.29	1.98	NS
15	Organization of seminars for teachers on Bloom taxonomy	3.00	1.03	3.13	.94	3.07	.74	1.98	NS
16	Provision of textbooks on Bloom taxonomy for teachers	3.81	1.32	3.85	1.32	3.83	.17	1.98	NS
17	Supervision of teachers on adherence to the use of Bloom taxonomy	4.38	.81	4.15	1.16	4.27	1.16	1.98	NS
18	Regular training of teachers on the use of Bloom taxonomy	4.50	1.03	3.92	.93	4.21	3.32	1.98	S

Source: field survey, 2019

Table 3 shows Biology teachers and Administrators responses on the possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State. The mean responses of Biology teachers shows that awareness on the use of Bloom taxonomy (3.19), organization of seminars on Bloom taxonomy (3.00), provision of textbooks on Bloom taxonomy for teachers (3.81), supervision of teachers on adherence to the use of Bloom taxonomy (4.38) and regular training of teachers on the use of Bloom taxonomy (4.50) are possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State. On the other hand, the mean responses of Administrators shows that awareness on the use of Bloom taxonomy (3.14), organization of seminars on Bloom taxonomy (3.13), provision of textbooks on Bloom taxonomy for teachers (3.85), supervision of teachers on adherence to the use of Bloom taxonomy (4.15) and regular training of teachers on the use of Bloom taxonomy (3.92) are possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State. Furthermore, the z-cal for each of the variables was < the z-crit of 1.98, except for item 18. Therefore, all the variables except for item 18 were considered accepted, which means that there was no significant difference between the mean responses of biology teachers and administrators on the possible solutions to poor implementation of Blooms taxonomy in the construction of teacher made Biology test in Public Secondary Schools in Rivers State. This finding is in consonance with Gichuhi (2014) that suggested that training and retraining of teachers in test construction could help in improving teacher made tests for effective learning assessment.

CONCLUSION

Conclusively, this study deduced that cognitive level is more frequently utilize, comprehension cognitive level is frequently utilized, application, analysis, synthesis and evaluation cognitive levels are less utilized by Biology teachers in Biology test construction in Public Senior Secondary Schools in Rivers State. This is as a result of certain factors such as: difficulty in the construction of biology test in relation to Bloom's taxonomy, time required for construction of biology test based on Bloom's taxonomy, ignorance, a teacher teaching a subject that doesn't relate to his/her field of study, lack of adequate test construction skill, ineffective supervision of teachers and lack of training on Bloom's taxonomy implementation. However, these factors could be ameliorated through awareness on the use of Bloom taxonomy, organization of seminars on Bloom taxonomy, provision of textbooks on Bloom taxonomy for teachers, supervision of teachers on adherence to the use of Bloom taxonomy and regular training of teachers on the use of Bloom taxonomy.

RECOMMENDATIONS

The following recommendations were made:

1. There should be proper awareness for Biology teachers on the importance of implementing Bloom's taxonomy in the construction of teacher made test in Secondary Schools in Rivers State.

2. It should be made mandatory for every Biology teacher to undergo training in the implementation of Bloom's taxonomy in the construction of test.
3. Association as well as school administrators should imbibe or introduce an effective use of Blooms taxonomy
4. Training centres should be built for science teachers in developing the skills of constructing test in relation to Blooms taxonomy.
5. Science Associations should incorporate Blooms taxonomy with the prospective verbs aligned to each cognitive level on the teachers guides produced annually in respect to those teachers with no educational background.

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