AN EVALUATION OF SECONDARY SCHOOL TEACHERS’ COMPETENCY IN EVALUATING STUDENTS’ COGNITIVE AND PSYCHOMOTOR ACHIEVEMENT IN BASIC SCIENCE AND TECHNOLOGY (BST.)

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Abstract
The study assessed the competency of the secondary schools teachers in evaluating students’ cognitive and psychomotor achievement in BST with the teachers gender, years of experience and qualification as variables. The study is a descriptive research of the survey type. The population of the study consisted of all secondary school teachers in Ondo state but the study was delimited to 4 Local government Areas of the state. out of which 20 public secondary schools and 5 private secondary schools were selected. The total number of the teachers used in the study were 90 out of which 57 male and 33 female were selected through stratified random sampling technique. The instrument used was a self-developed 25-item instrument. One research question and three hypotheses were raised and tested using descriptive and inferential statistics respectively. The study is significant in that it aims at identifying the competencies required and acquired by BST teachers for successful and comprehensive assessment of their students’ achievements and reveal gaps on which suggestion for filling the gap are made. The results of the study indicated that teachers’ qualification and their years of experience does not have any effect on how to determine the objective of the test, constructing table of specification and evaluate students’ learning outcome but there was a significant difference in teachers’ gen, and their competency in evaluating sciences learning outcome. Some recommendations were made after the study.

Keywords: Evaluation, Teachers Competency, Students Cognitive Achievement, Student Learning Outcome, Basic Science Technology, Test Construction.

INTRODUCTION
Evaluation is defined by Goldstein (1993) as the systematic collection of descriptive and judgemental information necessary to make effective decision related to the selective, adoption, value and modification of various instructional activities. Thackway (1997) in his own opinion defined evaluation as a process of finding out and agreeing if what you are doing is worth doing, if you are doing it well and how you can do it better.

The importance of good evaluation in the teaching/learning process that goes on in science classroom cannot be over-emphasized. (Adodo 2013) It is well established fact that the status and the kind of evaluation teacher uses in the classroom has far reaching implications not only for students achievements specially but also for the nature of instructional procedure and feedback assessment reports on such students. There is abundance of empirical evidence to support the concept that students learn the way they are examined. A corollary to this concept is that if a teacher test always for factual knowledge, the students will soon learn to expect only knowledge oriented questions where as if he or she always tests for higher cognitive abilities the students learn to prepare for such questions. In other words, the way teachers test affects the pattern or style of learning by their students and consequently their achievement.

Educational programmes are established for specific purposes. Programme evaluation in education, according to Nworgu (1987) is indispensable, as evaluation serves to provides and objective basis for effecting necessary modifications and evolving strategies for improving performance commenting on the importance of evaluation (Akpan, 1999), p. 117) asserts that ‘one important reason for evaluation amongst others, is to diagnose students weaknesses with a view to improving future performance’. Past performances in science have not been encouraging but rather disheartening. There had been public criticism and disappointment over the students performances in science WAEC examinations. This situation has not changed creditably as Olutu 1992) also expressed the same view, attributing these failures to bad teaching. The poor performance of students in Science is further highlighted in the resent Chief examiners report on the poor performance in science by students is attributed to among other deficiencies; carelessness in evaluating derived data, mixed up of tests observation and inference, inappropriate test in organic analysis and poor descriptive ability, and poor calculative ability etc.

The poor performances of students in science calls for a re-examination of current strategies in science education. Such a re-examination will lead to desirable modifications towards making science education relevant to the needs of the individual as well as the Nigerian society.

There have been a wide and divergent conceptions of the term science over the years, however a core of commonly accepted operational meaning of the term has emerged. To paraphrase Phoenix (1964) science is one of several distinctly different. ‘Realms of meaning’ or ways of thinking and as such the knowledge that we associate with science has a set of unique properties that
Thus the structure of science is conceived of as an intricate combination of the processes and product of science. The process consists of the methods of approach and the attitudes of mind which guide scientific inquiry. Explicitly, the scientific approach to inquiry and problem solving involves observation, hypothesis generation, hypothesis testing, experimentation, data collection analysis and evaluation with regard to their relevance to the solution of whatever problems is under investigation.

Western education as presented to Africa emphasized the growth and development of the cognitive, affective, psychomotor power of the individual learner. As such it calls for the teacher to show high degree of competencies and skills in evaluating cognitive and non-cognitive behaviour of students. A close observation and analysis of typical teacher- made test in any of our secondary schools reveals to the level of in-competency exhibited by these teachers.

If Bloom (1974) taxonomy of education objectives is to come into play, it could be observed that the higher taxonomical level is completely ignored by these teachers. This calls for concern because for a child to attend full development in all the three domains, namely; the affective, cognitive and psychomotor must be reflected while trying to measure educational objectives. This could be as a result of the teachers not being well equipped with the skills to handle evaluation of all these abilities of students. This problem according to Adodo (2009) may be partly due to the inherent difficulty of the test and measurement course which is fundamental course and ground work for effective evaluation of different cognitive abilities or partly due to un-willingness on the part of the teachers to apply the knowledge and skills learnt in school.

It could be observed that most countries in Africa including Nigeria have been plagued by the shortage of well qualified teachers. The most acute shortage (Crowmbs, 1968) of these well-qualified teachers has been prominent in the science field.

Although disparity exists in the qualifications of teachers, one gets worried of how well they are thought. Whatever they have gained is apt to be transferred to the students in the process of conveying knowledge and in the consequence the final performance of the students in external examinations.

On teachers qualification, Hassan (1975) cited in Adodo (2001) agrees that teacher should be qualified so that they can handle materials, equipment and apparatus competently. According to Akinlua and Adodo (2001), the success of any human endeavour is closely related to the quality of the personnel who performs the task. The message from this is that, with the adequate provision of the required facilities in the schools coupled with content and values in the schools, all still require the helping hands of teachers to direct, interpret and organise the student, the curriculum and facilities to arrive at the desirable goal. Therefore the quality of teacher personnel cannot be overlooked or under estimated.

In considering the effectiveness and dedication of teachers Adodo 2007 quoting Fagbamiye(1977) observed that our problem in Nigeria lies on the unavailability of truly qualified, committed, dedicated, and vocationally spirited teachers to achieve the schools objectives and national goals on Education. Teachers may be qualified and not efficient, this is not normal. Nevertheless, it is then realistic that learning will be at an optimum when teachers are well trained and well educated in various evaluation techniques. It is therefore a serious mistake to entrust the teaching of BST to those who have little or no knowledge of objective of philosophy of BST teaching.

ibrahim (2000) share the believe that, science teachers qualification, exposure to seminar, workshop, in-service training has a long way in improving the interaction pattern in the classrooms and teachers competency in evaluating students learning outcome. 

Teachers Competency

Competency in teaching refers to the ability of a teacher to exhibit on the job skills and knowledge gained as a result of training.(Adodo 2013)a. These skills and knowledge prescribed in the training programme are apparently calculated by the curriculum planners to relate to be instrumental to achievement of the desired education objectives unfortunately not.

Much attention has been paid to the area of teacher competencies, and so ‘of all the competencies an instructor needs, probably none is neglected as that of evaluating student progresses. He went further that it is not unusual to find instructors/teachers who lack a grasp of basic principles of assessing or who lack the ability or skills necessary to produce a classroom test in evaluating students learning outcome in BST.

It is therefore important to know that teachers and others associated with the classroom teaching evaluation programme and c should possess appreciations, knowledge and abilities such as; . appreciation of the usefulness of evaluation instruments in education, the ability to construct and evaluate instruments that are capable of revealing the degree to which pupil have attained pertinent educational objectives, the ability to interpret properly the data yielded by evaluation instruments to use them in diagnosing and remedying pupil deficiencies, and to report them efficiently and accurately to the pupils, their parents and possibly the entire community and also the knowledge of the characteristics of a satisfactory evaluation instrument.

Recently, Rosenfeld (1985), on the basis of his research findings, arrived at the following six categories as important core functions of American Teachers:

1. Managing and influencing students behaviour
ii. Clerical, administrative, and other professional functions.
iii. Assessing, grading and recording students learning progress and evaluating instructional effectiveness.
iv. Planning lessons, selecting materials and previewing instructional programs.
v. Implementing planned instructional programs using a variety of approaches.
vi. Identify students with individual or similar instructional needs and teaching them accordingly

The NUC minimum Benchmark (BM) for the training of teachers in the faculty of Education of Universities in Nigeria and the goals of teachers education in the BM are not unrelated to those redefined submission but the problem is the competencies dedication and commitment required from the educators and the educatee to work contentiously toward realizing these goals.

MEANING / CONCEPT OF EVALUATION
Evaluation is a very important part of education. Education has always been the greatest hope for both individual and society and for education to be functional evaluation is needed. Educational Evaluation therefore refers to the collection of data and the use of such data to assess the quality of students’ performance and the effectiveness of a programme.

PROBLEM
The adequacy of the act of teaching must be judged in terms of the degree of which the students fall short of their potentials, the onus must be borne by the teacher and other responsible agents who constitute the educational environment. The present poor performance of most secondary students in science as evidence by the WASC results and the fewness of the number of candida UTME in Nigeria in basic science may not argue well for a country aims at making progress in Science and Technology. All these deficiencies in students progress are seen as professional inadequacies to be accounted for. To do this, the science teachers should be concerned to know when their students are making progress or not. and a source of due for self-improvement. This requires a thorough knowledge of assessment and evaluation technique procedure the teacher should possess with certain required competencies. The pertinent questions, there are;

• To what extent do the practicing teachers possess and apply these competencies?
• What competences do the BST teachers must have for effective evaluation of students’ cognitive and psychomotor achievement in BST?

RESULTS
Q 1. What is the general Demographic data and level of teachers’ competencies in the various evaluation variables under consideration?

HYPOTHESES
Ho1. There is no significant difference in the teachers qualifications and their level of competencies in evaluating student cognitive achieving in BST.
Ho2. There is no significant difference in the teachers years of experience and their level of competencies.
Ho3 There is no significant difference between the teachers gender and their competencies in evaluating student cognitive achievement in BST.
Thus the question which seek to know if there is any difference between teachers’ in their competency in the 4 Evaluation areas. The means showed that there were differences in the teachers’ competencies with mean score of ability to determining objectives 33.91 as the least, followed by determining of content 41.81, drawing table of specification 53.89 and finally evaluating generally 65.57. 

Hypothesis 1 The hypothesis states that there is no significant difference between teachers’ qualification, and their competency in constructing the table of specification.

In ascertaining whether a difference was observable in teachers’ qualification and competency in constructing the table of specification, the total scores obtained from different groups of qualification on teachers competency scale were subjected to analysis of variance (ANOVA) and presented in Table 2 below.

The result of the analysis of variance (ANOVA) on table 2 revealed that the observed f-ratio was 0.8200 while the table value was 2.13. Thus the result was not significant at 0.05 level. This meant that the qualification of the teacher has no influence on construction of the table of specification. Hence the null hypothesis which states that there is no significant difference between teachers’ qualification and construction of the table of specification is no rejected.

Hypothesis 2 There is no significant difference in teachers’ teaching experience and their competency in evaluating students cognitive achievement. The hypothesis was set out to determine whether teaching experience could influence the evaluation of students cognitive achievement.

![Fig. 1: Histogram of teachers’ mean score competencies in evaluation](image)

Table 1: Teachers’ Demographics Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>57</td>
<td>63.30</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>33</td>
<td>36.70</td>
</tr>
<tr>
<td>Qualification</td>
<td>B.Sc.Ed</td>
<td>22</td>
<td>24.4</td>
</tr>
<tr>
<td></td>
<td>B.Sc. (PGDE)</td>
<td>20</td>
<td>22.20</td>
</tr>
<tr>
<td></td>
<td>HND (PGDE)</td>
<td>16</td>
<td>17.80</td>
</tr>
<tr>
<td></td>
<td>NCE</td>
<td>32</td>
<td>35.60</td>
</tr>
<tr>
<td>Years of Experience</td>
<td>1-3 years</td>
<td>09</td>
<td>10.00</td>
</tr>
<tr>
<td></td>
<td>4-6 years</td>
<td>18</td>
<td>20.00</td>
</tr>
<tr>
<td></td>
<td>7-9 years</td>
<td>24</td>
<td>26.70</td>
</tr>
<tr>
<td></td>
<td>≥ 10 years</td>
<td>39</td>
<td>43.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teachers’ competency</th>
<th>Evaluation Area</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Draw table of specification</td>
<td>53.87</td>
<td>16.42</td>
<td></td>
</tr>
<tr>
<td>2. Determine of objective</td>
<td>33.91</td>
<td>9.46</td>
<td></td>
</tr>
<tr>
<td>3. Determine Content items</td>
<td>41.81</td>
<td>11.57</td>
<td></td>
</tr>
<tr>
<td>4. Evaluate Cogn. &amp; Psych Achievement</td>
<td>65.57</td>
<td>19.30</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Analysis of variance (ANOVA) on teachers’ qualification and their competency in constructing table of specification

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>N</th>
<th>Sum of Square</th>
<th>Mean</th>
<th>f-calculated</th>
<th>f-critical</th>
<th>Level of sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>7</td>
<td>1570.256</td>
<td>224.322</td>
<td>0.8200</td>
<td>2.13</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Within Groups</td>
<td>82</td>
<td>22432.144</td>
<td>273.563</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>24002.400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Analysis of variance (ANOVA) on Evaluation of students cognitive achievement with teaching experience

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>d.f</th>
<th>Sum of square</th>
<th>Mean</th>
<th>f-ratio</th>
<th>f-table</th>
<th>Level of sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>3</td>
<td>2380.150</td>
<td>793.382</td>
<td>2.9162</td>
<td>2.72</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Within groups</td>
<td>85</td>
<td>30706.080</td>
<td>361.248</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>33086.230</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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The analysis of variance (ANOVA) shown on table 11 revealed that the observed F-ratio value was 2.9162 while the table value was 2.72. This result was significant at 0.05 level. Thus, there was a significant difference between teachers' teaching experience and their competency in each evaluating students' cognitive achievement. ($F = 2.9162, df = 3/85$). Therefore, the hypothesis was not accepted. Thus teaching experience significantly made no difference in evaluation.

**Hypothesis 3**
There is no significant difference between teachers' gender and their competency in evaluating the students' cognitive achievement (CA) in BST.

The hypothesis was formulated to determine whether sex could determine a difference in competency in evaluating the sciences.

Concerning the influence of sex on evaluation, the results showed that male teachers had a mean score of 47.4211 and a standard deviation of 11.540 while female teachers had a mean score of 40.000 and a standard deviation of 16.355. r-calculated was 2.51 while r-critical or table value was 2.00. The results showed a significant difference in the influence of sex on evaluation at $P<0.05$ and $df=88$. The hypothesis that says that there is no significant difference between teachers’ sex and their competency in evaluating the sciences was rejected.

**DISCUSSION**
On the first hypothesis that there is no significant relationship between the teachers’ qualification and their ability to determine the objective of the test. Analysis of the generated data revealed that there is no significant difference in qualification and the ability to determine the objective of the test. The results indicated that higher qualification does not have any effect on how to determine the objective of the test. It has been noted that teachers with little education (NCE) did well when it comes to the specification of the objectives. Ability to determine the objective of the test was exhibited by the teacher as a result of the knowledge gained during the course of training as a teacher. This could be as a result of the teachers not being well equipped with the skills to handle evaluation of all these abilities of students. This problem might be partly due to the inherent difficulty of the test and measurement course which is fundamental course and ground work for effective evaluation of different cognitive abilities or partly due to the unwillingness on the part of the teachers to apply the knowledge and skills learnt in school. The hypothesis which states that there is no significant relationship between teachers’ teaching experience and their competency in determining the contents to be included. Showed that teaching experience did not influence the mastery of the determining the contents to be included item instruction. According to Biddle and Ellena (1964) in Akem (1995) who found that the important properties in the competency of the content were skills, motives, habits and knowledge are in that order and not qualification. On the question of knowledge Majasan 1970 in the same book of Akem. proposed a three pronged intellectual requirements, “proficiency in the content of his subjects, proficiency in the teaching subjects, and scholarly approach to general problems on which he might be consulted”.

Given the foregoing findings, It could be submitted that teachers’ qualification should not be used as a sole determinant of teachers’ ability in handling a course or subject. Experience has shown that some principals believe that the higher the qualification of a teacher, the higher will be his ability to handle the content of a course of instruction. On the hypothesis that there is no significant difference between teachers’ sex and their competency in evaluating the (CA) in BST, the study revealed that there is a significant difference in teachers’ sex and their competency in evaluating sciences. The result shows that female have been found to be fewer in number compared to their male counterpart in science education. This result agrees with Duyilemi (1998) which says women have always been discouraged from entering certain type of trades or professions which have traditionally been regarded as male domains like sciences. And where few enter they combine this with child rearing and domestic work whereas, men could develop their level of competency in the job. The female are ineffective in the teaching and evaluation of sciences as a result of the combine child rearing and domestic work. The task of cognitive evaluation require time in drawing the table of specification, determine level of objective, determine Content items and evaluate students Cognitive achievement.

The hypothesis which states that there is no significant difference in teachers’ teaching experience and their competency in evaluating students cognitive achievement. Investigations revealed that there was a significant different between the teachers’ teaching experience and their competency in evaluating students cognitive achievement. From the findings, it was discovered that teaching experience has a little to do with the evaluation of the students’ performance. This is because most experienced long serving teachers usually resist change since they have been used to certain styles of teaching and they consider change as a threat.(Adodo 2013). The school administrator should not assume that the abilities of these superior/experience teacher need no further professional growth.

It can be seen from the result of the finding that some beginning teachers did well in evaluating students’ cognitive achievement better than old or experience teachers. One of the most important jobs a teacher has to do is that of evaluating his students’ performance/cognitive achievement at every phase of educational enterprises. His/her failure in this regard will lead him/her in the dark about the extent at which students achieve educational objectives set out for them. This is supported by Adodo (2013) that in evaluating science education, care must be taking by the science teachers not to deal with illusions by accessing nominal treatment which do not exist in science education plans.
and practices. It is important to check frequently on the nature and extent of student learning as the basis for revisions in planning and in teaching methods for better future achievements.

The study revealed that there was no significant difference between teachers’ qualification and their competency in constructing the table of specification. Investigation revealed that there is no significant difference between teachers’ qualification and their competency in constructing the table of specification. This meant that qualification have no influence on the ability of teacher in the construction of the table of specification.

CONCLUSION AND RECOMMENDATIONS
The study showed that years of teachers’ service experience, qualifications have no impact on their level of competencies in evaluating BST student. But the old teachers are the worst affected as they are not ready to change from their parochial methods of assessment and evaluation as the evidence showed that they possess little or nothing on bloom approach. To achieve the National goal of education in Science and Technology, teachers should be well grounded and competent in the areas of items construction, item sampling and test administration. Above all teacher should be able to construct a table of specification before embarking on items construction.

To this effect, the following recommendations are made.

i. Workshop, Seminar for capacity building of teacher on new method of test construct and the use of ICT for lesson plan, lesson implementation and lesson evaluation is highly recommended. They can also be sponsored to attend education conferences.

ii. Training programme curriculum for teachers in the faculty of Education in the universities needs to be reviewed on test, measurement, assessment and evaluation techniques so as to equip the in coming teachers with adequate knowledge in all important area of classroom practices is also necessary.

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