Integrated Science Teaching Effectiveness in Junior Secondary Schools: Matters Arising

By

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Abstract

This study was designed to evaluate integrated science teaching effectiveness in junior secondary schools in Delta Central Senatorial District in Delta State, Nigeria. A descriptive survey design was adopted. A stratified random sampling technique was employed in the study. Four research questions were raised to guide the study. The instrument used was Integrated Science Teachers Performance Assessment Checklist (ISTPAC) to collect data from 94 integrated science teachers sampled for the study. The findings revealed that some of the teachers teaching integrated science in junior secondary schools are not professionally qualified and experienced. The instructional materials are inadequate in teaching the subject. It was therefore recommended that only qualified and experienced teachers be employed to handle the subject at the Junior Secondary School level. And also, that instructional material which has remained an age old problem in teaching and learning in the educational system should adequately be addressed as matters arising in teaching and learning science in Nigeria.

There is no doubt the need for constant evaluation for improvement of educational performance across countries all over the world. This no doubt has ushered changes globally in educational reforms that have brought changes in educational standards and an improved economic emancipation of many nations.

Some research studies have laid emphasis on the relationship between evaluation and teaching effectiveness. According to Cook, Shadish and Williams (1987),
educational evaluation is meant to produce knowledge about the value of educational management and its component parts. That is, knowledge that can be used to make teaching and learning more responsive to the problems in education. In other words, they are intended to improve teaching. Therefore, the main objective of educational evaluation is for improvement in teaching and learning. Evaluation is often used as a strategy for school improvement in teaching and learning. School improvement can be regarded as action for promoting teaching effectiveness (Xiaorong, 2001). Also, Tijani (2005) explained that evaluation involves the designing of strategies and instruments for assessing students, teachers and programme performance.

Available literatures have shown that performance of students in integrated science as a subject is low (Adetayo, 2008). Also, the Delta State Ministry of Education Chief Examiners Report (2008) revealed students abysmal performance in Integrated Science at the Junior Secondary Certificate Examination. Problems such as poor school infrastructure, lack of qualified Integrated Science teachers, poorly equipped science workshops and laboratories just to mention a few affects the teaching of Integrated Science. Despite these problems, the subject is still being taught in schools. Over the years, Educational researchers have investigated factors affecting students learning of Integrated Science in schools. At the heart of the inquiry, is the teacher’s factor. Studies have established relationship between teachers’ factors and students’ achievement in school (Olatoye, 2006 and Adekola, 2006).

Effective teaching of Integrated Science is an activity which will bring about the most productive and beneficial learning experience for students and promote their development as learners. Effective teaching of Integrated Science goes beyond just imparting knowledge but it is a purposeful activity carried out by somebody with a specialized knowledge in Integrated Science in a skillful way to enhance cognitive, affective and psychomotor development of a person or group of persons.

For the teaching of Integrated Science to be effective, the Integrated Science teacher must have an extensive knowledge of the subject, knowledge of the curriculum, knowledge and understanding of how children develop and how they learn. This includes knowledge of the context in which learning occurs (home, community, school factor) and knowledge of assessment techniques. An Integrated Science teacher should possess some teaching skills and be able to plan lessons, manage a classroom, engage students in active learning, present challenging situations to encourage problem solving, collect and monitor information on achievement, maintain good students record, provide motivation for students and support cooperative group work.
The teaching of Integrated Science requires various teaching approaches and meaningful learning (Ayodele and Adegbite, 2003). The use of inappropriate methods could make students dread science education in later life.

In another development, Ololube, Egbezor and Kpolovie (2008) argued that the falling educational standards can be attributed to the use of teachers who are unqualified for instructional purposes, including those with general education (academic) qualifications such as Bachelors of Science (B.Sc.), Bachelors of Arts (B.A), Master of Science (M.Sc.) and Masters of Arts (M.A) degrees without teaching qualifications. It must be noted that without a professional teaching qualification, no meaningful progress can be achieved in the teaching profession. Lawal (2003) indicated that skilled and effective teaching and learning are expected from professionally trained teachers.

Integrated Science teachers are expected to employ the use of teaching aids to supplement other methods and manage and control their classes for effective learning of Integrated Science. The use of inappropriate methods could affect students’ performance in Integrated Science. Many of the Integrated Science teachers do not have a clear insight about the appropriate pedagogies to enhance Integrated Science teaching and learning. Most of the teachers resort to teaching with only one major teaching method which is the lecture or “chalk and talk” method in our Integrated Science classroom. Sometimes, classes are too large for teachers to manage for effective teaching and learning. This has greatly affected Integrated Science teaching ranging from methodology and techniques of teaching (Okoye, 2004).

In view of all the problems mentioned already, this study is being undertaken with a view of finding out the extent to which teachers qualification, years of teaching experience and the availability of instructional materials in Integrated Science classrooms affecting their teaching.

The problem this study sought to find is the extent to which some of the known characteristics of teaching effectiveness are employed in Integrated Science classroom to promote learning. In order to do this, the following research questions were raised to guide the study.

**Research Questions**

1. What are the academic qualifications of teachers teaching Integrated Science in the Junior Secondary Schools?
2. What are the teaching experiences of the teachers teaching Integrated Science?
3. Are instructional materials available for effective teaching of Integrated Science?
4. What are the teaching method(s) employed by teachers for effective teaching of Integrated Science?

Methodology

The research design of this study is the descriptive survey. This is important because it involves a systematic collection of facts and accurate information or data about a given population or areas of interest, object or class of events in order to analyze, describe, compare and contrast and to interpret the facts without manipulating any variable.

The population of the study is made up of Integrated Science teachers in public Junior Secondary Schools in Delta Central Senatorial District of Delta State, during the 2009/2010 academic year. The target population is 167 schools drawn from public Junior Secondary Schools, 187 Integrated Science teachers drawn from eight Local Government Areas.

Table 1 Shows the Population for the Study

<table>
<thead>
<tr>
<th>Local Government Areas</th>
<th>Number of Schools</th>
<th>Number of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiope East</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Ethiope West</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Okpe</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Sapele</td>
<td>24</td>
<td>38</td>
</tr>
<tr>
<td>Udu</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Ughelli North</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>Ughelli South</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Uvwie</td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>167</strong></td>
<td><strong>187</strong></td>
</tr>
</tbody>
</table>

Source: Department of Planning and Statistics, Post Primary Education Board (PPEB) Asaba, 2009/2010

Sample and Sampling Techniques

The schools were stratified into urban and rural schools. These were made up of 74 public urban Junior Secondary Schools and 20 from rural schools. This is made up of a total of 94 schools with a representation of 56% from 167 Junior Secondary Schools.
Also, 74 teachers were drawn from urban schools and 20 from rural schools representing 50% of the population of 187 teachers from the target population.

**Research Instrument**

The research instrument was Integrated Science Teachers Performance Assessment Checklist (ISTPAC) which consists of 4 sections with 30 items. Section A contained items to collect information on the qualification of teachers and teaching experience. Section B on instructional materials available for Integrated Science teaching effectiveness and Section C on instructional methods.

The instrument was validated by experts in the field of Curriculum Studies, Measurement and Evaluation and Science Education to ascertain the content and face validity of the instrument.

The reliability of the instrument was done using Test-Retest method. The teachers’ performance assessment checklist has a reliability coefficient of 0.73 using Pearson Product Moment Correlation.

**Data Analysis**

The analysis was based on the scoring for teachers qualification and teaching experiences by use of frequency counts while the items in section C and D on instructional materials available for teachers use and the teaching methods employed by teachers was by scoring the items as Agree – 2 or Disagree – 1. The analysis was done with use of frequency counts and percentages.

**Results and Discussion**

**Results**

**Research Question 1**

What are the academic qualifications of teachers teaching Integrated Science in Junior Secondary Schools in Delta Central Senatorial District?

| Table 2: Teachers’ Academic Qualification |
|-------------------------------|------------|----------|----------------|-----------------|
| **S/N** | **Qualification** | **Frequency** | **Percentage (%)** | **Valid percentage** | **Cumulative** |
| 1 | N.C.E | 20 | 21.28 | 21.28 | 21.28 |
| 2. | B.Sc. (Ed) Int. Science | 11 | 11.70 | 11.70 | 32.98 |
| 3. | B.Sc./Ed. | 53 | 56.38 | 56.38 | 89.36 |
| 4. | B.Sc. | 4 | 4.26 | 4.26 | 93.62 |
The result indicated that a total of 20 respondents had NCE representing 21.28%, 11 respondents had B.Sc./Ed. Integrated Science representing 11.70%, 53 respondents had B.Sc./Ed. Representing 56.38%, 4 respondents had B.Sc. representing 4.26%, 3 had M.Ed. representing 3.19%, 2 had M.Sc. representing 2.13% and 1 had PGDE representing 1.06% of the total respondents.

Research Question 2
What are the teaching experiences of teachers teaching Integrated Science?

Table 3: Responses of Teachers on their Teaching Experiences

<table>
<thead>
<tr>
<th>S/N</th>
<th>Teaching Experiences</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Valid percentage</th>
<th>cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-5 years</td>
<td>26</td>
<td>27.66</td>
<td>27.66</td>
<td>27.66</td>
</tr>
<tr>
<td>2.</td>
<td>6-10 years</td>
<td>21</td>
<td>22.34</td>
<td>22.34</td>
<td>50.00</td>
</tr>
<tr>
<td>3.</td>
<td>11-15 years</td>
<td>23</td>
<td>24.47</td>
<td>24.47</td>
<td>74.47</td>
</tr>
<tr>
<td>4.</td>
<td>16-20 years</td>
<td>9</td>
<td>9.57</td>
<td>9.57</td>
<td>84.04</td>
</tr>
<tr>
<td>5.</td>
<td>21 and above</td>
<td>15</td>
<td>15.96</td>
<td>15.96</td>
<td>100.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>94</td>
<td>100.00</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

The results indicate that out of 94 of the respondents, 26 had 0-5 years teaching experience representing 27.66%, 21 had 6-10 years teaching experience representing 22.34%, 23 had 11-15 years teaching experience representing 24.47%, 9 respondents had 16-20 years teaching experience representing 9.57% and 15 respondents had above 12 years teaching experience representing 15.96% of the total sample.

Research Question 3
Are instructional materials available for effective teaching of Integrated Science?
The result arising from the benchmark on instructional materials for teaching Integrated Science reveals that 40 respondents which represents 42.55% responded that Integrated Science students have textbooks while 54 respondents representing 57.45% responded non availability, 77 respondents which represents 81.91% have Integrated Science teachers textbooks while 18.09 disagreed, 63 respondents which represents 67.02% agreed having Integrated Science Teachers guide while 32.98% disagreed. 37 respondents which represent 39.36 agreed while 57% disagreed to statement on availability of measuring instruments like blackboard ruler, measuring cylinder, test tube etc in school. On the statement on chemicals for practical work, 21 respondents representing 22.34% agreed while 73 respondents representing 77.66% disagreed. On availability of posters, 35 respondents representing 37.24% agreed of having posters while 59 respondents representing 62.76% disagreed. 43 respondents representing 45.74% respondents agreed that wall charts are available while 51 respondents representing 54.26% disagreed, 1 respondent representing 1.06% responded that projected and electronic instructional materials are available while 93 respondents representing 98.94% disagreed. 94 respondents representing 100% agreed that
Chalkboards are available. While 26 respondents representing 27.66% agreed that reference books are available 68 respondents representing 72.34% disagreed.

**Research Question 4**

What are the teaching methods employed by teachers for effective teaching of Integrated Science?

<table>
<thead>
<tr>
<th>s/n</th>
<th>Statement</th>
<th>Agreed No.</th>
<th>Agreed %</th>
<th>Disagree No.</th>
<th>Disagree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I use lecture (Chalk and talk teaching)</td>
<td>81</td>
<td>86.17</td>
<td>13</td>
<td>13.83</td>
</tr>
<tr>
<td>2.</td>
<td>I use demonstration</td>
<td>38</td>
<td>40.43</td>
<td>56</td>
<td>59.57</td>
</tr>
<tr>
<td>3.</td>
<td>I use project</td>
<td>19</td>
<td>20.21</td>
<td>75</td>
<td>79.79</td>
</tr>
<tr>
<td>4.</td>
<td>I use fieldtrip</td>
<td>8</td>
<td>8.51</td>
<td>86</td>
<td>91.79</td>
</tr>
<tr>
<td>5.</td>
<td>I use discussion</td>
<td>56</td>
<td>57.57</td>
<td>38</td>
<td>40.43</td>
</tr>
<tr>
<td>6.</td>
<td>I use inquiry</td>
<td>12</td>
<td>12.77</td>
<td>82</td>
<td>87.23</td>
</tr>
<tr>
<td>7.</td>
<td>I use discovery/activity</td>
<td>13</td>
<td>13.83</td>
<td>81</td>
<td>76.17</td>
</tr>
</tbody>
</table>

The result reveals that majority of Integrated Science teachers use lecture method. A total of 81 respondents (86.17%) agreed that they often use lecture method while only 13 respondents (13.83%) disagreed. While 38 respondents (40.43%) agreed to the use of demonstration method, 56 respondents (59.57%) disagreed. 19 respondents (20.21%) agreed that they often use project method while (79.79%) disagreed. 8 respondents (8.51%) agreed that they often use field trip method, 86 respondents (91.49%) disagreed. 56 respondents (57.57%) agreed that they often use discussion method, 38 respondents (40.43%) disagreed. 12 respondents (12.77%) agreed that they often use inquiry method, 82 respondents (87.23%) disagreed. And finally 13 respondents (13.83%) agreed that they often use discovery/activity method, 81 respondents (76.17%) disagreed.

**Discussion of Results**

Research question 1 sought to find out the qualifications of teachers teaching Integrated Science in junior Secondary Schools. The result showed that though there are teachers with B.Ed., B.Sc. and M.Sc. teaching the subject, there are not enough majoring
in Integrated Science. This can be seen with only 11 respondents with B.Sc. (Ed.) in Integrated Science representing 11.70% of the total respondents. The result shows that majority of the teachers teaching the subjects are graduates in other science disciplines but not qualified Integrated Science teachers.

This study corroborates with the works by Onyeachi (2008), Ololube, Egbezor and Kpolovie (2007), Gwany (2006) and Lawal (2003). This may probably be the cause of poor performance in Integrated Science at the JSS level in the Delta Central Senatorial District.

The second research question sought to find out the teaching experiences of teachers teaching Integrated Science. The result showed that a majority of the teachers are inexperienced. Those with experience of 0-5 years were 26 in number representing 27.66% which was more than every other teaching experience possessed by the teachers. This again affirms the study by Ogunbowale (2003) that teachers preparation in terms of qualification, age and teaching experiences have great influence on teaching effectiveness. Also, the study corroborates with Easton-Brooks and Davis (2009) who assert that teachers of less than five years teaching experience cannot be as effective as teachers with more than ten years teaching experience.

The third research question sought to find out instructional materials available for effective teaching of Integrated Science. The results show that instructional materials used for teaching Integrated Science were not adequate. Teachers have enough texts and guide but other facilities such as measuring cylinder, test tubes and chemicals were lacking. The study affirms that lack of these materials can lead to poor performance in the subject by students. This study supports the works of Onyeachi (2008) and Maduabum (2009) who assert that lack of instructional materials can affect teaching effectiveness in school subjects.

The fourth research question sought to find out the teaching methods employed by teachers for effective teaching of Integrated Science. The result shows that teachers used mainly the lecture and discussion methods. The use of other methods was low. This no doubt may affect the effective teaching of Integrated Science. Science Teachers Association of Nigeria (STAN) recommended the use of inquiry/discovery/activity methods in teaching the subject but most schools do not comply with this directive. Instead they resort to the use of mainly lecture/“chalk and talk” methods. This study corroborates with the works of Agboghoroma (2005 and 2009) and Clough and Olsan (2004) who assert that the use of inquiry/activity methods of lecturing Integrated Science produce better results.
Conclusion

The following conclusions were arrived at:

1. Majority of teachers handling the subject are not professionally qualified to teach Integrated Science hence the low teaching effectiveness in the subject.
2. Integrated Science teachers have not acquired enough teaching experience that may enable them have enough mastery of the subject and hence the reduction in teaching effectiveness.
3. The instructional materials meant for teaching Integrated Science are inadequate and thus affects the teaching effectiveness of the subject.
4. Discussion and lecture methods are mainly used in teaching the subject to the detriment of STAN recommendation of either inquiry of activity methods.

Recommendations

1. The Government as a matter of policy must ensure that only professionally qualified Integrated Science teachers should teach the subject for a better teaching effectiveness.
2. Teachers should encourage their students to improvise local instructional materials in teaching and learning of Integrated Science. Also, the government must see to the provision of adequate instructional materials in schools.
3. The need for more workshops and seminars organized for Integrated Science teachers for them to update their knowledge and professional skills.
4. More reference textbooks for teaching Integrated Science should be made available to update their knowledge both in content and skills.
5. Inspectors of school should visit schools more often to monitor and to ensure more seriousness on the part of Integrated Science teachers for greater effectiveness in teaching.

References


Delta State Ministry of Education (2008). *Chief examiners report JSSE May/June, Asaba*


