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Assessing the Observation Skills of Biology Students in Selected Senior High Schools in the Eastern Region of Ghana

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Abstract
The purpose of the study was to determine whether Senior High School Form 3 Biology students have the skills of observation. The study adopted "Basic Skills Assessment" approach or method. One public/government science school offering biology was selected randomly and one private science school offering biology was also selected purposively for this study. A task was developed for assessing the observation skills of biology students at SHS 3. The research questions were answered using the Mann-Whitney U-test. The results indicated that students (both males and females) were performing at similar levels in the skill of observation. A look at the mean ranks indicates that even though the males scored higher than the females, the difference was not statistically significant. Students from the private schools performed significantly better than the students from the public school on the skill of observation. It was recommended that students from public school should be made to do more practical activities that involve observation to improve upon their observation skills.

Keywords: Observation skills, Basic Skills Assessment, Dichotomous scoring, Performance task

Introduction

The dependence on summative written examination to assess students' ability in science subjects as undertaken in many countries around the world leads to low assessment of Scientific and Technological Literacy (STL) goals (Holdbrook, 1999). Teachers perceive that examinations place heavy restrictions on the permitted teaching approaches. It is clear that, assessment practices need to change if scientific and technological literacy is to be achieved. These assessment practices run parallel to the practices that exist in Senior High Schools in Ghana. The internal as well as West African Secondary School Certificate Examination (WASSCE) assessment had mainly been paper-and-pencil tests. But the syllabus emphasizes the learning of major conceptual themes more by the activity method than learning factual information. The current trend therefore, is to adopt assessment practices that could fairly measure performances and promote "hands-on" or activity method of learning. These hands-on activities would eventually lead to the developing science process skills. Some of these process skills include observing, reasoning, planning, interpreting and many others. For acquisition and exhibition of adequate proficiency in laboratory skills of observing, the students must be engaged in non-traditional and performance-based tasks. This will involve the students to have hands-on and minds-on activities to enable the students see that science is real and interesting.

Almost every activity of science begins with observation about all things around, using the senses as appropriate and safe; identifying similarities and differences; noticing details and sequence; ordering observations. One of the general aims of the teaching syllabus for Biology at the Senior High School in Ghana states that "The syllabus is designed to help students develop science practical skills required to work with scientific equipment, biological materials and living things" (Ministry of Education, Science and Sports[MOESS], 2008, p1). Among the many skills required to achieve this goal is observation skill, a skill which is developed by making drawings and diagrams. Drawing has an important place in biological teaching because of its role in developing observation skills. Making of drawings of specimens is very fundamental in developing observational skills .Alkaslassy, O'Day (2002) were of the view that observing is

a fundamental science process skill. We observe objects and events using all our five senses and this is how we learn about the world around us. Observing is not simply a question of looking, but it involves the use of all the senses, that is, sight, sound, touch, smell and even taste. One has to look at a specimen very carefully to be able to draw it accurately, and labelling of a drawing forces one to think about the component structures and their positions. This means that making and labelling of drawings in Biology sharpens a student's observation and thinking skills making him able to relate.

Observation alone is not necessarily an accurate and reliable activity for gathering data. Observers often "miss seemingly obvious things" and "invent quite false observations." Nevertheless, the skill is valuable and crucial to both the process of conducting scientific inquiry and to the process of teaching and studying the ways of science. Observational skills expected in science are to read the instrument correctly, notice colour change, notice relevant details in given specimen, locate desired parts in specimen accurately, and take observations carefully in a systematic manner (Amoah, 2011).

Statement of the Problem

One of the general aims of the teaching syllabus for Biology at the Senior High School in Ghana states that "The syllabus is designed to help students develop science practical skills required to work with scientific equipment, biological materials and living things" (Ministry of Education, Science and Sports[MOESS], 2008, p1).Yet report from the Chief Examiner for Biology indicates that most Biology students do not show satisfactory competence in the skills of planning, observing and reasoning when confronted with practical issues in the laboratory [West African Examination Council,(WAEC), 2001-2008]. Some of the weaknesses most biology students exhibit during biology practical as identified by the Chief Examiner include the following:

a) The standard of drawing still remained poor, and there was much room for improvement. (WAEC, 2001, 2002).

b) Answers of candidates should be based on specimens provided only. (WAEC, 2003)

c) The perennial problem of candidates' inability to describe or explain the graph was still prevalent. (WAEC, 2004).

d) Power of observation was very poor. (WAEC, 2005, 2006).

The biology students in the Birim Central municipality of the eastern region of Ghana are no exception to this problem. It is of concern therefore to assess the observation skills of students in the SHS biology to determine whether they have observation skills.

Purpose of the Study

The purpose of the study was to determine whether Senior High School Form 3 Biology students have the skills of observation.

Research Questions

1. Is there a significant difference between the male and female elective biology students in their proficiencies in the laboratory skills of observing?
2. Is there a significant difference between private and public school elective biology students in their proficiencies in laboratory skills of observation?
3.

Methodology

The study adopted "Basic Skills Assessment" approach or method. Basic skill assessment is a psychological assessment which is basically a judgmental process whereby a broad range of information, often including the results of psychological tests, is integrated into a meaningful understanding of a particular person. Psychological testing is thus a narrower concept referring to the psychometric aspects of a test, the actual administration and scoring of the test, and the interpretation made of the scores (Domino & Domino, 2006). Psychometric tests are standardized test designed to evaluate psychological functions; intelligence, ability, interests and values. They are pen and paper or computer based and are taken under standardized conditions. The results are quantified by reference to a scale derived from research and the

answers are objectively marked and analyse to produce a score or profile. The rationale for this approach was that it would test the minimum competency in basic skills. Students were engaged in hands-on activities that were scored dichotomously as right or wrong. The weakness of basic skill assessment or psychological testing is that it is usually not possible to control all the extraneous variables.

Population

All SHS year 3 elective biology students in the Birim Central Municipality of the Eastern Region of Ghana were used. Each class was made up of an average of 45 students. There were four schools offering biology with an estimated population of 180 students offering elective biology. This constituted the target population. Three of the schools are government/public schools and the other one a private school. SHS year 3 biology students were selected for the study because it was expected that they had been exposed to at least two years of teaching and learning in biology so they would have acquired some process skills in biology.

Sample and Sampling Procedure

Students from two schools were used for the study. The two schools consisted of one public and one private school. The private school was purposively sampled. This was because it was the only private school offering biology in the district. One public school was selected from among three schools using the computer generated random numbers. There was only one science class in the private school that was used for the study. In the public school, there were three science classes but students from one class who were available during the day of the study were used. In all, 86 students were used consisting of 30 students from the private school and 56 students from the public school.

Instruments

Performance task instruments were developed and were non-traditional. The task was for observation skill. Three different types of leaves were provided for the students and they were expected to observe certain features of the leaf to compare and contrast. The task was given background information relevant to the problem posed. Students were given three minutes to read the task and 25 minutes to complete that task. The task was scored dichotomously.

Results/Discussion

Research Question 1 was answered using Mann-Whitney U test and it is presented on Table 1.

Table 1: Results of the Mann-Whitney U Test of the Sex Differences in the Observing Skills

Sex	N	Mean Rank	Z	P- value
Male	25	51.02	-1.86	0.06
Female	61	40.02		
Total	**86**			

Significance: $P < 0.05$

A Mann-Whitney U test was conducted to find out which of the sexes is more proficient in the skill of observing. The result of the test for the observing skill was not statistically significant, $z = -1.864$, $p = 0.06$ (two-tailed), Mann-Whitney $U = 528.500$. The males had a mean rank of 51.02, while the females had a mean rank of 40.02. This therefore indicates that the students (both males and females) were performing at similar levels in the skill of observing. A look at the mean ranks indicates that even though the males scored higher than the females, the difference was not statistically significant.

The outcome implies that even though females can observe well, males can do it better and more critically. One reason that could be assigned to the low observing skills of the females is that during the observing stage, most of them were observing trivial issues like spots on the leaf and insects on the leaf. Some of them even wrote on internal features which could not be observed externally. This implies that they answered the practical questions from the theory they have learnt (WAEC, 2000). This situation can be attributed to the insufficient practical work in most of our schools. This study is not consistent with other study conducted by Tachie (2001) which shows that the performance of female students in each of the two part of Task A and the overall performance were slightly higher than that of the male students even though the difference in performance of female students to male students was not significant. His work supports the assertion of Awortwi (1999) that there is a gradual improvement in the performance of girls in recent years. However, one cannot dismiss her assertion, as the female students were not rated as poor observers either. Generally, in this study the males performed quite better than the females, but it could be seen that the performance of both sexes was not quite encouraging and that they were not precise (WAEC, 2004). Greenfield (1997) asserted that girls engaged in "hands-on" laboratory work combined carefully with structured collaborative learning would perform equally as boys. Female students therefore deserve more support at the basic level through sustainable interventions such as the Science, Technology and Mathematics Education programs to enhance their performance. Teachers must also engage their students in practical activities at least two times every one month. This can only be done when educators and educational administrators provides the necessary materials for the activities. Female students must also be motivated by teachers and parents to perform more hands-on activities and observe critically.

Research Question 2 was answered using Mann-Whitney U test and it is presented on Table 2.

Table 2: Results of Mann-Whitney U Test of the Difference between Private and Public School Students in the Observation Skills

School type	N	Mean Rank	Z	P- value
Private	30	54.33	-3.38	0.01
Public	56	35.93		
Total	**86**			

Significance: $P < 0.05$

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A Mann-Whitney U test was conducted to find out students from which of the school type (public/private) is more proficient in the skill of observing. The result of the test for the observing skill was statistically significant, $z = -3.38$, $p = 0.01$ (two-tailed), Mann-Whitney $U = 455.000$. The private school students had a mean rank of 54.33, while the public school students had a mean rank of 35.93. This therefore indicates that the students from the private schools performed significantly better than the students from the public school on the skill of observing. This implies that when students from private schools and public schools are taken through the same set of task in observing, the performance of the private school would be better and higher than the public schools and the difference in their achievement will be significant. This result could be attributed to the size of the school as this has been found to be contributory factor to science performance. In general, private schools tend to be smaller than public schools (Anderson & Resnick, 1997). This implies that the number of students that would be assigned to a particular specimen would be less hence students from the private schools would be closer to specimens than those from the public schools. This means that students can have time to observe well and critically. Generally, smaller schools are often found

to be associated with higher school performance (Darling-Hammond, 2000). In a study of almost 6,500 at-risk eighth-grade students nationwide, Finn and Voelkl (1993) found that smaller school size was positively associated with a more nurturing environment and greater minority student engagement. Other scholars, however, argue that the relationship between school size and achievement is complex; it may be nonlinear and might vary by rural/urban context (Howley & Howley, 2004; Lee 2004). Class size has also been found to influence achievement. The best evidence available indicates that smaller class sizes boost achievement (Krueger & Whitmore, 2001). This implies that teachers would have enough time for their students hence observation could be done with more teacher guidance since the ratio of students to teachers is manageable. Of course, smaller classes are expensive, and the issue is therefore highly politicized and public schools cannot afford that. Data from the National Center for Education Statistics (NCES) Schools and Staffing Survey indicate that, on average, private school teachers have fewer students (19.6) than do public school teachers (23.2) (Anderson & Resnick, 1997). Indeed, smaller class size is probably one reason parents choose private schools. Apart from the class size, the school climate can also contribute to the achievement of students in science in a particular school. However, other researches in Latin-America countries, found no differences between the two types of schools (Somers, McEwan, & Williams, 2004). Several explanations have been provided in the literature. In the first place, differences in effectiveness between schools could be explained by the differences in the characteristics of pupils. Because private schools are likely to demand pupil fees, they are most likely to attract pupil from higher socio-economic strata resulting in better scholastic achievement on average. This implies that parents here pay high fees and that most of the science kits and specimen are provided in the school so students are always in contact with these materials so they are able to observe very well. Moreover, the composition of the school regarding the background characteristics of the pupils plays an important role. Schools that have a relatively higher number of "good" pupils will build up a good academic reputation that will attract better teachers and even more good pupils, and there will be fewer factors that disturb the educational process. The result obtained is also in sharp contrast to that of Hoxby (2000) who found out that public schools are more effective that private schools.

Conclusions

The study sought to determine whether Senior High School Form 3 Biology students show satisfactory competence on the skills of observation. It can be concluded that students (both males and females) were performing at similar levels in the skill of observing. A look at the mean ranks indicates that even though the males scored higher than the females, the difference was not statistically significant. Students from the private schools performed significantly better than the students from the public school on the skill of observation.

Recommendations

1. Students from public school should be made to do more practical activities that involve observation to improve upon their observation skills.
2. Female biology students should be made to do more practical activities that involve observation to improve upon their observation skills.

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