ASSESSING THE ACQUISITION OF SCIENCE PROCESS SKILLS IN CHEMISTRY: THE CASE OF SECONDARY SCHOOLS IN PATANI LOCAL GOVERNMENT AREA

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Abstract

This study examined the acquisition of science process skills in chemistry among public and private secondary school students in Patani local government area of Delta State. To guide the study, two research questions were raised while two hypotheses were formulated and tested. The study employed the ex-post facto research designed. A sample of one hundred students studying chemistry was selected from ten schools located in urban and rural setting in the local government area. Students who are in both schools are aware of predicting and inferring as science process skills to a low comparatively. Private school students are more aware of science process skills than public school students. Findings also showed that both male and female students have low level of acquisition of measuring, inferring and predicting science process skills with female students having a higher level of acquisition of communicating skills than male students. On the basis of school location, findings indicated that students in urban schools have better acquisition of science process skills in chemistry than students in rural schools. The study concluded by recommending that schools should ensure that they create awareness of students in science process skills in chemistry by regular exposure of students to practicals in chemistry. And that practical classes should start at the senior secondary JSS II level that students can have enough knowledge of science process skills in chemistry.

In all countries of the world, science and technology have been recognized for the important roles they play in attaining national development. As a result in most countries of the world, emphasis is titled towards the teaching and learning of science in schools. Hence in Nigeria, as a way of making Nigeria citizens show interest in science education, the government established a policy of admitting 60% of the candidates seeking admission into science and science related courses while 40% of the candidates are admitted into art and social science related courses. Emphasis have also shifted from the traditional method of teaching science which is teacher-centered, wherein students are passive listeners to the modern student-centered method of teaching science. The modern method of teaching science is activity-based, which encourages active participation of students in the science classroom with the aim of enhancing the development of the spirit of inquiry as future scientists.

For science teaching to be meaningful and relevant, it must adequately reflect the nature and product of science as well as promote affective reaction to science and stress attitudes such as honesty, open and critical mindedness, curiosity, suspended judgement and humility which characterized scientists and science enterprise (Akinyemi et al., 2010; Akinbobola and Ado, 2006). One of the important dimensions to the teaching of science is the process of doing science. The process of doing science is referred to as the scientific process. The scientific process skills form the foundation for the scientific methods. According to Nwosu and Okeke (1995), science process skills have been described as mental and physical abilities and competencies which serve as a tools needed for the effective study of science and technology as well as problem solving for individual and societal development. Hence science process skills are very important for students to effectively study science both in present and future. Students are more motivated when they can test their ideas in the laboratory by inquiry style experiments (Arena, 1996). Students need science process skills because they need to know how to question and how to determine the relationship between two variables or to discover and explain a phenomenon (Yager, 1994).

Additionally, students need science process skills to test ideas and facts otherwise science becomes a memory test and memorizing facts appears to reduce students motivation to learning science. Wynne (1999) noted that science process skills allows students to tie new information to old information and they gradually build small facts together to produce a larger understanding of the concept. Science process skills help students to build meaningful relationship between facts and critically about an idea or subject or solve problem. According to Akinbobola and Ado (2006), to prepare and equip students for possible careers in science related courses led to the development of science process skills.

Science process skills are grouped into two, namely basic science process skills and integrated science process skills. Most researchers agree that basic science process skills are observing, predicting, inferring, classifying, measuring and communicating (Rezba, 1995; Arena, 1996; Rillero, 1998 and Wynne, 1999). This study examined the acquisition of science process skills in chemistry in Patani Local Government Area of Delta State, Nigeria.

Statement of the Problem

Over the years, the performance of students in science subjects has been poor. Majority of students who sat for the West African Examination Council (WAEC) and National Examination Council (NECO) cannot pass at credit level all the science subjects at one sitting. Research has been conducted on the poor performance of students in science subjects. Majority of such researches tend to point to the students lack of science process skills as being a significant factor. This study examined the level of acquisition of science process skills in chemistry among secondary school students in Patani Local Government Area of Delta State.

Purpose of the Study

This study focused on the assessment of acquisition of science process skills in chemistry in Patani Local Government Area of Delta State. Specifically, the study intend to;

1. Ascertain the awareness level of chemistry students of science process skills.

2. Find out if there is significant difference between the science process skills acquisition in chemistry among male and female students.

3. Find out if there is significant difference between the science process skills acquisition in chemistry among urban and rural school students.

4. Find out if there is significant difference between the science process skills acquisition in chemistry among public and private school students.

Research Questions

Four research questions were answered in this study as follows;

1. What is the extent of awareness of science process skills in chemistry among secondary school students?

2. Is there any significant difference between the science process skills acquisition in chemistry among male and female students?

3. Is there any significant difference between the science process skills acquisition in chemistry among urban and rural school students?

4. Is there any significant difference between the science process skills acquisition in chemistry among public and private school students?

Hypothesis

Three null hypotheses were formulated and tested in this study as follows:

1. There is no significant difference between the science process skills acquisition in chemistry among male and female students.

2. There is no significant difference between the science process skills acquisition in chemistry among urban and rural school students.

3. There is no significant difference between the science process skills acquisition in chemistry among public and private school students.

Methodology

The study adopted the survey research design, ex-post facto in nature to assess the level of acquisition of science process skills among public and private secondary school students in Patani Local Government Area of Delta State. A sample of the study were drawn from ten secondary schools. In each school, ten Senior Secondary Three (SS3) students offering chemistry were randomly selected. The total sample of the study comprised of 100 SS3 students. Male students were (n=60) while female students were (n=40). The schools were located in urban and rural settings. Senior school mock examination questions in chemistry practical's tailored after WAEC standards was the instrument used to assess students acquisition. In all the schools, SS3 students participated in chemistry practical involving the basic science process skills. Besides, the students have all gone through the senior school certificate examination syllabus for chemistry for both WAEC and NECO. The administration of the examination was carried out by the research assistants who were chemistry teachers in each of the school in the presence of the researcher. The practical exercise was conducted twice in each school.

Results

The results of the study are presented in tables below:

Table 1: Level of Awareness Acquisition of Science Process Skills in Chemistry

S/N	Science process skills	Public schools			Private schools		
		Mean	SD	Level	Mean	SD	Level
1.	observing	2.50	0.60	HL	2.78	0.86	HL
2.	Measuring	2.64	0.51	ML	2.92	0.73	HL
3.	Classifying	2.60	0.57	ML	2.70	0.54	HL
4.	Communicating	3.00	1.00	HL	2.76	0.90	HL
5.	Inferring	2.36	0.86	LL	2.40	1.23	LL
6.	Predicting	2.12	0.48	LL	2.39	1.02	LL

Table 1 shows the level of awareness of science process skills among chemistry students in public and private schools. From the data in the table, chemistry students in both public and private schools are aware of observing, measuring, communicating, and classifying as science process. This is because the mean of these variables exceeded 2.50, the cut-off score for taking decision. The mean score for the other two variables predicting and inferring fall below 2.50 the cut-off point. Hence, the students in both schools are aware of predicting and inferring as science process skills to a low level. Comparatively, private school students are more aware of science process skills than public school students.

Table 2: Mean Scores Showing Level of Acquisition of Science Process Skills by Male and Female Chemistry Students

S/N	Science process skills	Public schools			Private schools		
		Mean	SD	Level	Mean	SD	Level
1.	observing	2.80	0.47	HL	2.70	0.63	HL
2.	Measuring	2.42	0.52	LL	2.37	0.82	LL
3.	Classifying	2.83	0.80	HL	2.72	0.88	HL
4.	Communicating	2.64	0.66	ML	2.73	0.46	HL
5.	Inferring	2.40	0.96	LL	2.22	1.00	LL
6.	Predicting	2.32	1.00	LL	2.33	1.11	LL

From table 2, it is clear that male and female students, their level of acquisition of observing and classifying science process skills is high. Both male and female students have low level of acquisition

of measuring, inferring and predicting science process skills. Female students have a higher level of acquisition of communicating skills than male students.

Table 3: Mean Scores Showing Science Process Skills Acquisition in Chemistry in Urban and Rural Schools

S/N	Science process skills	Public schools			Private schools		
		Mean	SD	Level	Mean	SD	Level
1.	Observing	3.30	0.34	HL	2.65	1.00	ML
2.	Measuring	3.00	0.74	HL	2.25	1.16	LL
3.	Classifying	2.94	0.40	HL	2.46	0.94	LL
4.	Communicating	2.60	0.81	ML	2.54	0.88	ML
5.	Inferring	2.68	0.90	HL	1.94	1.12	LL
6.	Predicting	2.55	0.64	ML	2.08	1.04	LL

From table it is clear that students in urban schools have better acquisition of science process skills in chemistry than students in rural schools.

Table 4: t-test Analysis of Science Process Skills in Chemistry of Public ond Private School Students

Groups	N	Mean	SD	Df	t-cal	t-crit	Decision
Public school	50	15.66	4.79	98	1.47	1.96	NS at 0.05 level
Private school	50	15.88	3.99				

From table 4, the calculated t-value is less than the critical t-value at degree of freedom 98 and 0.05 significant level. Since the calculated t-value is less than the critical t-value, hypothesis one is retained. This implies that there is no significant difference between the science process skills acquisition of public and private secondary school students.

Table 5: t-test Analysis of Science Process Skills in Chemistry of Male and Female Students

Groups	N	Mean	SD	Df	t-cal	t-crit	Decision
Male	60	16.48	4.15	98	2.34	1.96	S at 0.05 level
Female	40	15.52	4.95				

From table 5, the calculated t-value is greater than the critical t-value at degree of freedom 98 and 0.05 significant level. Since the calculated t-value is greater than the critical t-value, hypothesis two is not accepted. This implies that there is a significant difference between the science process skills acquisition of male and female secondary school students.

Table 6: t-test Analysis of Science Process Skills in Chemistry of Urban and Rural Students

Groups	N	Mean	SD	Df	t-cal	t-crit	Decision
Urban	50	17.24	3.84	98	3.47	1.96	S at 0.05 level
Rural	50	13.89	6.35				

From table 6, the calculated t-value is greater than the critical t-value at degree of freedom 98 and 0.05 significant level. Since the calculated t-value is greater than the critical t-value hypothesis two is not accepted. This implies that there is a significant difference between the science process skills acquisition of urban and rural secondary school students. The findings for hypothesis three showed that.

Discussion of Results

The results of this study indicated that students are not aware of inferring and predicting in science process skills. This is very disheartening and does not go down well for effective learning of science. The results also show that students (male and female) have low level of acquisition of science process skills in basic skills like measuring, inferring and predicting. The result is supported by the findings of Nwosu (1994) who found a low level of acquisition of science process skills among students. Student's poor acquisition of science process skills in chemistry could be explained by the lack of exposure of students of practical exercise in chemistry. Most of the time, practicals commence at the approach of external examination and students visit the science laboratory just about a week or two weeks before the external examinations begin.

The results on school location indicated that students in urban schools have better acquisition of science process skills in chemistry than students in rural schools. This could be as a result of lack of science teachers in schools located in rural area. Most schools in rural areas of Patani Local Government lack teachers because of poor terrain, teachers do not agree to take up appointment in such area.

The results for hypothesis one showed that there is no significant difference between the science process skills acquisition of public and private secondary school students. The result for hypothesis two indicated that there is a significant difference between the science process skills acquisition of male and female secondary school students. The results for hypothesis three showed that there is a significant difference between the science process skills acquisition of urban and rural secondary school students.

Conclusion

The study focused on assessing the science process skills acquisition of secondary school students in Patani Local Government Area of Delta State. The findings of the study showed that although students are aware of the science process, the level of awareness of measuring, predicting and inferring is at low ebb. The findings in terms of gender showed that both male and female students have low level of acquisition of science process skills in some basic skills like measuring, inferring and predicting. While the findings in terms of school location indicated that students in urban schools have better acquisition of science process skills in chemistry than students in the rural schools.

Recommendations

Based on the findings, the study preferred the following recommendations;

1. Schools should ensure that they create awareness of students of science process skills by regular exposure of students to practicals in chemistry.

2. Practical classes should start at senior secondary class two so that students can have enough knowledge of science process skills in chemistry.

3. There is need for chemistry teachers to emphasize such skills as measuring, predicting and inferring during any practical chemistry lesson.

4. The government should ensure that science teachers are posted to rural schools and create an enabling and sustaining environment to encourage them to stay in such schools so that they can be committed to teaching science process skills in chemistry to students.

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