TEACHERS' AWARENESS AND ATTITUDE TOWARDS THE ASSESSMENT OF SCIENCE PROCESS SKILLS IN RIVERS STATE, NIGERIA

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ABSTRACT

No scientist can be effective without the science process skills which are needful for the doing of science. The study investigated science teachers awareness and attitude towards the assessment of science process skills. It adopted a survey design and 200 science teachers were drawn as sample for the study. The teachers were given a self-structured questionnaire for data collection. The research questions were answered using mean scores while the hypotheses were analyzed using independent t-test and analysis of variance. Results revealed that science teachers have average awareness of the science process skills and negative attitude towards the assessment of the science process skills. Gender and years of experience were found not to make significant differences in both awareness and attitude of teachers. Recommendations were made based on the findings.

Keywords: Science, Process Skills, Assessment, Awareness, Attitude

INTRODUCTION

Science education in Nigeria like in most developing nations has seen many policies formulated to boost technological know-how with the intent to become more productive and be able to solve paralyzing life problems of the people, it is disheartening to still endure extreme poverty and basic amenities not being available for the masses with all the money spent on science education. Nigeria today cannot boast of regular four hours of electricity supply in most cities which makes one ponder if our educational system especially science education cannot address such menial issues.

Science is an organized body of knowledge that has three aspects, the products, process and the ethics, each of these is important to the scientist and national development but the process which teaches how science is done forms the basis for application of scientific knowledge for national development. A scientist needs to know the process skills which form the doing of science to be able to apply the knowledge he has acquired. Kamba et al(2018) compiled the basic process skills from the works of Padilla and Martin as predicting, observing, classifying, measuring, communicating, inferring and the integrated process skills as formulating hypotheses, interpreting, formulating models, experimenting, operationally defining, identifying and controlling variables. The emphasis of this work will be on the basic skills which includes:-

Observing: this process requires the ability to perceive and pick up information about and object through the senses. e.g. describing an insect as a creature with jointed appendage.

Classification: being able to notice differences and similarities in objects and using the

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observed characterizes to put things into groups e.g. insects, spiders, centipedes are all arthropods because they have joint appendage, insects are classified into group that has three body parts while spiders are in another group with only two body parts.

Measuring: this is the ability to use standard measurement tools to obtain accurate dimension of objects e.g., using the rule to get precise length or width of a thing or using a scale to get the precise weight of an object

Communication: a scientist should be able to orally, in writing or pictures give meaning to information gotten and be able to comprehend what others have presented.

Inferring: this requires being able to observe issues carefully and proffer a most probable explanation.

Prediction: a good scientist should be able to make a tentative attempt to explain how things would turn out based on patterns of events. These skills as Opong in Inko-Tariah (2005) noted are sequence of operations used by scientist during scientific investigations. If students are not encouraged and trained to acquire these skills, they end up just absorbing facts and principles they cannot apply. It is in the doing of science that discoveries are made on how to use the knowledge of science for the enhancement of human life; scientific milestones reached globally today are discoveries from the doing of science. A nation with factual scientists that cannot solve real life problems will remain underdeveloped even if all the citizens are graduates while a secondary school student that is knowledgeable in the doing of science can make breakthrough that can move the world forward.

Science education in Nigeria is still unproductive as the "doing" of science is not emphasized. No wonder after all the effort made to set up science schools, at the secondary level, polytechnics and universities of science and technology, Nigerian scientists are still assembling parts manufactured in other countries. It is amusing to see roadside mechanics repairing cars for mechanical engineers because he learnt the theories and laws of motion but not the practical aspects of it. It is time our policy makers look into the science education in Nigeria and do the needful as much progress has not been made till date. It is common knowledge that only the scientist that knows how science is done can demonstrate the knowledge he has acquired. It therefore becomes necessary that emphasis is laid on students acquisition of the science process skills.

Studies on students' acquisition of science process skills both in distant and recent times continue to show students' low proficiency in these skills. Inko-Tariah in 2005 and 2006 evaluated students' proficiency in science process skills in agricultural science and biology respectively and found students to have low acquisition of these skills. Recently Ekon and Eni (2015) and Jack (2018) studied student's acquisition of these skills and still found students very low in proficiency in these skills. This probably implies a fundamental problem of teachers having inadequate knowledge to teach the skills and unfavorable disposition to assess students' acquisition of the skills. Assessment of students acquisition of the process skills is very important if not students will not be serious to acquire them, meaning the state of science in Nigeria will not change in the near future. The observation that emphasis is still not being laid on students acquisition of these skills prompted this study. Studies on different aspects of science process skills have been carried out by researchers. Oloyede and Adeoye (2012) studied the relationship between acquisition of science process skills (SPS) and achievements in science. A sample of 320 senior secondary two students from selected schools in Bauchi state was used for the study. Test of logical thinking and science process skills were given and results from third term senior secondary one examination was collected.

The scores from the three measures were correlated and the results showed positive

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relationship between formal reasoning ability, acquisition of process skills and achievement in chemistry. Abungu et al (2014) investigated the effect of science process skill teaching approach on secondary school achievement in chemistry in Nyando district of Kenya. The study adopted a quasi-experimental design and purposive sampling was used to obtain a sample of 90 students. The students were taught two topics, volumetric and quantitative analysis and chemistry achievement test was given to them. The results revealed that science process skills teaching approach made a significant difference in achievement of chemistry. It was found that the boys in the experimental group outperformed the girls. Studies have shown students perform better in all science subjects when the science process skills are taught. Melandro and Adonis (2017) also did a study on science process skills with a study titled "Self and Teacher-assessment of Science Process Skills,they assessed both basic and integrated science process skills level of competence of selected grade ten technical-vocational students. Data was collected using, students activity output, worksheets, self and teacher score sheets. Findings revealed average competence in science process skills. Studies on teachers have also been done.

On teachers' acquisition of these skills, Aydoydu (2015) investigated basic process skills, integrated process skills and overall science process skills of science teachers in terms of some variable. The survey study involved 170 science teachers from a province location in the central Anatolia Region of Turkey. Data was collected with a test on science process skills and result among others showed the science teachers not to have a satisfactory level of integrated science process skills. In another study, Abanikannda and Kolawole (2017) did an assessment of science process skills teaching approach competence level of Osun State secondary school mathematic teachers. The study investigate the teacher awareness and extent of use of science process skills in six local government areas and result showed the teachers to be aware of the skills and students exposed to the skills participated more in the doing of science instead of just absorbing scientific facts and principles.

Susanti et al (2018) also in a study portrayed images of science process skills among pre-service biology teachers in Sriwijaya Indonesia. The study involved 41 participants who were given a multi-choice test comprising 41 items to measure the mastery of science process skills. Results revealed that the teachers performed much better in communication skills at 81% while performances on identifying variables and prediction were the lowest at 59% each. A related study by Hikmah et al (2018) investigated high school chemistry teachers understanding of science process skills and how it pertains to their assessment of science process skills in chemistry learning. The study assessed concepts and operational aspects of science process skills of chemistry teachers, semi-structured interview was used for data collection. Results showed that teachers' knowledge of concepts and understanding of operations of science process skills is weak, this as expected impacted on teachers accurately and affectively selecting assessment items for science process skills in chemistry.

The teachers must have adequate knowledge of these skills to be able to incorporate them into the lessons delivered. Continuous assessment of students' proficiency in these skills will get the attention of the student so as to make conscious efforts to acquire these skills. A creative and industrious teachers will always see ways to incorporate the skills into every topic of discussion while to lazy teachers may see it as added responsibility to teach and assess students proficiency in these skills. Realization that scientific and technological breakthrough are far-fetched without these skill prompted this study.

RESEARCH QUESTIONS

The following research questions are asked to guide the study:

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1. To what extent are teachers aware of the science process skills?
2. What is the attitude of teachers toward the assessments of science process skills?

HYPOTHESES

The following hypotheses are used to guide the study:

Ho_1: Science teachers' awareness of science process skills does not differ significantly based on gender

Ho_2: Science teachers' awareness of science process skills does not differ significantl y based on educational qualification

Ho_3: Science teachers' attitude towards the assessment of science process skills does not differ significantly based on gender

Ho_4: Science teachers' attitude towards the assessment of science process skills does not differ significantly based on educational qualification.

METHODOLOGY

The study adopted an analytical descriptive survey design, and the population of the study comprised all science teachers in Obio/Akpor local government area, a sample of 200 teachers was drawn using stratified random sampling technique. Data was collected using a self-structured questionnaire titled. "Teachers' Awareness and Attitude towards the Assessment of Science Process Skills Scale". The Instrument is divided into three sections, section A is on bio data, section B has 10 items on teachers awareness of science process skills and section C has 10 items on teachers attitude towards the assessment of science process skills. The items are all in Likert format, for section B the responses are VA= Very Aware, A=Aware, SA= Slightly Aware and NA=Not Aware while for section, SA= Strongly Agree, A= Agree, D= Disagree and SD=strongly Disagree. Mean scores were used to answer the research questions while independent t-test and ANOVA were used to analyses the hypotheses at 0.05 level of significance.

RESULTS

Table 1. Mean Score Analysis of Teachers Awareness of Science Process Skills

S/N	ITEMS	SA	A	D	SD	TOTAL	N	X	DECISION
1	Heard of the science process skills	17	16	14	0	756	200	3.78	Accept
2	Heard about them as a student	24	72	56	48	472	200	2.36	Reject
3	I learnt about them as a science teacher	84	70	28	18	620	200	3.1	Accept
4	They were incorporated in topics we learnt in the school	42	98	37	23	559	200	2.79	Accept
5	The teacher mentioned them but I did not know them as science process skills	40	42	40	78	444	200	2.22	Reject
6	In school I heard mainly of the laws and theories of science	90	60	21	29	611	200	3.05	Accept
7	My teachers never mentioned any of them	30	40	84	46	454	200	2.27	Reject
8	I was surprised when I heard they are up to 89	50	20	73	57	463	200	2.31	Reject
9	I did not see these skills in my science tests books	25	91	40	44	497	200	2.50	Accept
10	The science process skills are in the schemes	20	35	77	68	407	200	2.03	Reject

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Result on table 1 shows mean scores of the items on science teachers' awareness of science process skills. The teachers showed fairly average level of awareness with items 1, 3, 4, 6 and 9 which have mean score above the grand mean of 2.5 while the other items with mean score below 2.50 were rejected.

Table 2. Mean Score Analysis of Teachers' Attitude towards the Assessment of Science Process Skills

S/N	ITEMS	SA	A	D	SD	TOTAL	MEAN	DECISION
1	Feel that assessing the process skills will make the students better scientists.	170	16	14	6	756	3.78	Accept
2	It is too much work assessing the process skills	24	72	56	48	472	2.36	Reject
3	Teachers can easily build in the assessment of process skills into their everyday teaching of science.	84	70	28	18	620	3.10	Accept
4	Enough emphasis is not laid on the assessment of science process skills	42	78	37	23	559	2.79	Accept
5	I think the skills can only be assessed in the laboratory	40	42	40	78	444	2.22	Reject
6	Feel assessing the skills will motivate the students to acquire them	90	60	21	29	611	3.05	Accept
7	I was not assessed on the process skills as a student	30	40	84	46	454	2.27	Reject
8	I feel assessing the process skills will increase the bad of the teachers	50	20	73	57	463	2.31	Reject
9	These skills can be assessed with normal examination question	25	91	40	44	497	2.48	Reject
10	The science scheme does not make room for the assessment of the skills	20	35	77	68	407	2.03	Reject

Result on table two shows items 1, 3, 4 and 6 with mean score above the grand mean of 2.5 to be accepted while the remaining six items were rejected. With six items rejected, the teachers' attitude towards assessment of science process skills is below average.

Hypothesis One: Science Teachers' Awareness of Science Process Skills does not differ significantly based on Gender

Table 3. T-Test Analysis on Teachers awareness of science process skills and Gender

Gender	N	X	SD	DF	Calculated t-value	Critical t-value	Level of significance	Remark
Male	80	21.83	5.73	198	0.62	1.66	0.05	Not Significant
Female	120	22.32	5.76					

Table 3: Since the calculated t-value 0.6 is less than the critical t-value 1.66 the null hypothesis is therefore not rejected this implies science teachers' awareness of science process skills does not differ significantly based on gender

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Hypothesis Two: Science teachers' awareness of science process skills does not differ significantly based on educational qualification

Table 4. ANOVA Analysis of Teachers at of Science Process Skills and Educational Qualification

Source of variance	Sum of squares	Degree of freedom	Mean square	Calculated F- value	Critical F-value	Remark
Between	11.37	3	4.46	0.146	2.6506	Not Significant
Within	5963.75	196	30.43			
Total	5977.12	199				

Table 4: Since the calculated F-value 0.146 is less than the critical F-value the null hypothesis is therefore not rejected this implies that science teachers' awareness of science process skills does not differ significantly based on educational qualification.

Hypothesis Three: Science teachers' attitude towards the assessment of science process skills does not differ significantly based on gender

Table 5: T-Test Analysis Teachers Attitude Towards Science Process Skills and Gender

Gender	N	X	SD	DF	Calculated t-value	Critical t-value	Level of significance	Remark
Male	80	22.85	4.88	198	-0.28	1.66	0.05	Not Significant
Female	120	24.71	4.95					

Table 5: Since the calculated t-value -0.28 is less than the critical t-value 1.66 the null hypothesis is therefore not rejected this implies science teachers' attitude of science process skills does not differ significantly based on gender

Hypothesis Four: Science teachers' attitude towards the assessment of science process skills do differ significantly based on educational qualification.

Table 6: ANOVA Analysis of Teachers Attitude of Science Process Skills and Educational Qualification

Source of variance	Sum of squares	Degree of freedom	Mean square	Calculated F-value	Critical F-value
Between	26.07	3	8.69	0.379	2.6506
Within	4497.75	196	22.95		
Total	4523.82	199			

Table 6: since the calculated F-value 0.0379 is less than the critical F-value the null hypothesis is therefore not rejected this implies that science teachers' attitude of science process skills does not differ significantly based on educational qualification

DISCUSSION

Results on table one show means scores of items 1,3,4,6 and 9 to be above grand mean of 2.5 meaning that the teachers are aware in these items but items 2, 4, 5, 7, 8 have mean scores lower than the grand mean of 2.5 meaning that the teachers are not aware in these items. Generally the table shows average awareness of science process skills by the teachers. This result is in line with that of Abanikannda and Kolawole (2017) who found

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science teachers in Osun state to be aware of the science process skills; however the findings disagree with that of Hikmah, et al (2018) who found teachers knowledge of concepts and understanding of science process skills to be weak. This result could be because teachers are beginning to realize the importance of these skills in the doing of science and some creative ones are making efforts to teach them even when they were not taught while in school.

Table two shows the result the result of teachers attitude towards the teaching of science process skills. Results on table two shows items 1, 3, 4 and 6 to have mean scores of 2.5 showing a positive attitude in those items while the mean scores of the remaining items (2, 5, 7, 8, 9, & 10) are less than the mean score of 2.5 meaning teachers have a negative attitude on these items. With six out of ten items rejected, the attitude of teachers towards the assessment of science process skills is negative. The result agrees with the findings of Hikman, et al (2018) who found that science teachers are weak in knowledge and understanding of concepts and operations of science process skills and this impedes their effectiveness in assessment of the process skills. It will be difficult for teachers to have a positive attitude towards the assessment of the process skills if they don't have good knowledge of these skills.

Results on table three and four show gender and years of experience not to make significant differences in teachers awareness of the science process skills. This finding disagrees with Abanikannda and Kolawole (2017) who found gender and teaching experience not to make significant differences in teachers awareness of science process skills. This is expected as both male and female teachers were taught by the same teachers.

The results on table five and six on teachers attitude towards the assessment of science process skills found no significant difference made by gender and years of experience. This is in disagreement with Aydogdu et al (2017) who found gender and seniority (teaching experience) to make significant differences in teachers competencies in science process skills. It is obvious that our science teachers are still not "there" on helping students acquire these skills which are necessary for the doing of science.

CONCLUSION

The paper investigated science teachers awareness and attitude towards the assessment of science process skills. Secondary school teachers were involved in the study which made use of a self-structured questionnaire. Results indicate that teachers have average awareness and negative attitude towards the assessment of these skills. Gender and years of experience were found not to make any significant difference in teachers awareness and attitude towards the assessment of science process skills. The paper concludes that a lot still has to be done to moti vate the science teachers to incorporate these skills into their science schemes and assess the students acquisition of the skills

RECOMMENDATION

The science process skills are the bedrock of doing science and must be taught and assessed properly for national development, to achieve this, it is recommended that:

1. Science teachers should be made to integrate these skills in whatever topic they are teaching.
2. That teachers should be trained and re-trained on these skills to have adequate knowledge to teach it.
3. The teachers should regularly measure students attainment in the skills.
4. Teachers practically demonstrate some of these skills to students.

ISSN: 2307-3721, e ISSN: 2307-3713

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