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An Investigative Study on Student's Preconception and Level of Assimilation of Science Related Subjects

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ABSTRACT
This paper, being a descriptive survey is an investigative study on student's preconception and level of assimilation of science related subjects using all Primary and Secondary Schools Teachers in Abraka, Ethiope East Local Government Area of Delta State as its population. A sample of 120 teachers randomly selected from Twenty Two (22) Schools in Abraka community. The data collected via questionnaire revealed that preconception improves student's assimilation of science related subjects by providing preemptive knowledge about core science subjects, and that Preconception improves their assimilation of science related subjects by providing a guideline on how to conduct themselves during science classes and science laboratory workshops. And that significant relationship exists between Student's Preconception and their level of assimilation of science subjects. These were tested using Frequency, and percentages, while correlation analyses and t-test statistics were used for the research hypotheses, with an instrument validity of 0.78 and a reliability coefficient of 0.86 tested at 0.05 level of significance. Based on the findings, the researcher recommends that teacher training institution, government policy maker and curriculum developers to recognize these areas of preconception in children and explore them in order to fully maximize teaching and learning experience in science education.
Keywords:Science education, student's preconception, science curriculum

INTRODUCTION

A child at birth according to researchers comes into this world as a blank slate often referred to as "tabula rasa" and over the process time, accumulates some level of knowledge. Lucariello & Naff (2015) asserts that Students do not come to school as blank slates to be filled with instruction. Rather, they come to school with considerable knowledge, some correct and some not. The science education community generally accepts the idea that students enter the classroom with their own understanding of the world (Henriques, 2002). Either way, that knowledge is based on intuition, everyday experience, as well as what they have been taught in other settings (Lucariello & Naff, 2015). The knowledge processes therefore begins at childbirth and develops continually and gathered over time to form an extensive knowledge base which guides intuition, presumption, and insight called preconception. It is another form of pre-instructional knowledge that Teachers and researchers generally refer to, and since a considerable amount of our knowledge is organized by subject matter (mathematics, science, etc.), so too are our preconceptions (Lucariello & Naff, 2015).

Firstly, given that preconception is another form of gathered knowledge, Nonaka & Toyama (2003) posited that it is created through such interactions between human agency and social structures. Bradley, (1996) in agreement stated that much of young children's scientific learning comes from various environments in and around their homes, the information that is shared around them and the skills' demonstrated by close adults such as their parents. De'Kock (2005) agrees and adds that children's science views are a result of personal experiences, which can include watching television, reading books and oral language interactions in addition to interaction with adults (Kambouri, M. 2010). Diamond (2009) posits that there can be substantial discontinuities between what young people experience in their school science lessons and in the rest of their lives. Aikenhead, (1996) has argued that school science

expects young people to cross this border, which is more forbidding for some students than for others. Students of school age spend about two-thirds of their waking lives outside formal schooling. Yet science educators tend to ignore the crucial influences that experiences outside school have on students' beliefs, attitudes and motivation to learn. They often see these influences only as a source of misconceptions (Diamond, 2009).

However, the term misconception has an obvious connotation of 'a wrong idea' and also research reported on common misconceptions in various areas of science indicates that this term is usually used in studies where children have been exposed to 'formal models or theories and have assimilated them incorrectly' (Driver & Easley, 1978). In a similar study, Schreiner, (2000) explored the way in which student attitudes towards science can be seen as expressions of their identity, whilst Reiss, (2000) concluded that school science education can only succeed when students believe that the science they are being taught is of personal worth to themselves. It is in this regard that preconception in science education is regarded as knowledge developed from unorthodox methods gathered outside formal education and aligning with students life style and personal interest. In agreement Kambouri, (2010) adds that it is an early year's children's ideas in science which have most likely been developed autonomously in relation with children's experiences, without much exposition to formal models or theories through education and which differ from conventional scientific explanations or classifications.

Secondly, assimilation refers to how knowledge is structured and retained. Duruji et al. (2014) added that when we talk about assimilation, we refer to such building blocks that centre on how learning is organized. Explaining further, that the process of assimilation occurs when new information is added to an existing schema so as to understand the world. This process can lead to modification of existing knowledge so as to absorb the new information. This helps the individual to understand the world and provides basic guidance for future events.

Statement of the problem

According to Demirci, Çirkinoğlu, (2004), many studies (Thornton ve Sokoloff, 1990; Van Heuvelen, 1991; Hestenes ve ark., 1992; Poon, 1993; Palmer ve Flanagan, 1997; McDermott, 1997; Mazur, 1997; Redish ve ark., 1997; Duit ve ark., 1997; Mutimucio 1998; Hake, 1998; Tatlı ve Eryılmaz, 2001) in physics education showed that students have many preconceived ideas due to their experiences in their surrounding environments before entering the classroom, and those ideas negatively affect their further physics learning. Lucariello & Naff (2015) in agreement, added that student preconceptions, when consistent with concepts in the assigned curriculum, are called anchoring conceptions. Learning, in such cases, is much easier. It becomes a matter of conceptual growth, enrichment, or adding to student knowledge. More often, teachers find themselves teaching concepts that are difficult for their students to learn because students' preconceptions are inconsistent with the concepts being taught.

METHODOLOGY

The methodology adopted in this research was carefully considered as it will define the process of collecting and analyzing data and information to answer the research questions (Hitchcock & Hughes, 1989). The selection of the methodology was based on the methods' appropriateness in relation to the research questions (Kambouri, 2010). The study adopted the use of a descriptive design of the survey type. The population of the study consisted of all Primary and Secondary Schools Teachers in Abraka, Ethiope East Local Government Area of Delta State, Nigeria. The sample of 120 teachers randomly selected from Four (4) government owned primary schools, Seven (7) government owned secondary schools, Six (6) Privately owned Primary schools, five (5) Privately owned secondary schools bringing the total to Twenty Two (22) Schools in Abraka community. According to Field (2009) the use of random selection increases external validity and refers to the degree to which the conclusions of this specific study would hold for other persons in other places and at other times. The instrument used to collect information from respondents for the study was a questionnaire constructed by researcher, having two sections A (For respondents Bio Data) and B (to investigate student's preconception and their level of assimilation). The validity of the instrument was 0.78 whilst the reliability was 0.86, mutually coefficient

at a 0.05 level of significance, making the instrument suitable for the study. Frequency and percentages were used to answer the research questions raised, while correlation analyses and t-test statistics were used for the Research hypotheses tested at 0.05 level of significance.

Research Questions:

1. Does student's Preconception improve their assimilation of science related subjects?
2. Are students Preconception consistent with concepts in the assigned science curriculum?

Research Hypotheses:

1. There is no significant relationship between student's Preconception and their level of assimilation of science subjects
2. There is no significant difference between male and female students Preconception

RESULTS AND DISCUSSION

The responses to research questions are presented in the tables below;

Table 1: Respondents Frequency and Percentages on whether or not their Preconception improves their assimilation of science related subjects

Items on students Preconception	Agree		Disagree	
	Freq	%	Freq	%
Providing preemptive knowledge about core science subjects	78	65.0	42	35.0
Providing a guideline on how to conduct themselves during science classes and science laboratory workshops	91	75.8	29	24.2
Understanding the ethics and of interdependency science related courses	101	84.2	19	15.8
Psychologically preparing students minds towards tackling science subjects	86	71.7	34	28.3
Disorienting their minds from previous misconception	69	57.5	51	42.5

The Table 1 revels that 78 (65.0%) of the respondents agreed that preconception improves student's assimilation of science related subjects by providing preemptive knowledge about core science subjects while 42 (35.0%) of them disagreed. 91 (75.8%) respondents agreed that Preconception improves their assimilation of science related subjects by Providing a guideline on how to conduct themselves during science classes and science laboratory workshops, while 29 (24.2%) disagreed. With regards to Understanding the ethics and of interdependency science related courses, 101 (84.2%) agreed, while 19 (15.8%) disagreed, while on Psychologically preparing students minds towards tackling science subjects 86 (71.7%) agreed and 34 (28.3%) disagreed, while in respect of Disorienting their minds from previous misconception 69 (57.5%) respondents agreed and 51 (42.5%) disagreed. In summary, the results show that student's Preconception improve their assimilation of science related subjects.

Table 2: Respondents Frequency and Percentages on whether or not students Preconception are consistent with concepts in the assigned science curriculum

Items on students Preconception	Agree		Disagree	
	Freq	%	Freq	%
Providing student with relevant talents for science projects	109	90.8	11	9.2
Providing students with the necessary flair required to handle science courses	113	94.2	7	5.8
Identifying the distinctions (boundary and limitation) of individuals science subjects	68	56.7	52	43.3
Identifying the relevance of science in the larger society	71	59.2	49	40.8
Understanding the purpose of science in decision making	65	54.2	55	45.8

Table 2 reveals 109 (90.8%) respondents agreeing and 11 (9.2%) disagreeing to the subject matter on whether or not students Preconception are consistent with concepts in the assigned science curriculum by providing student with relevant talents for science projects. The table also showed that 113 (94.2%) agreed and 7 (5.8%) disagreed to whether or not students Preconception are consistent with concepts in the assigned science curriculum by Providing students with the necessary flair required to handle science courses. With regard to Identifying the distinctions (boundary and limitation) of individuals science subjects, 68 (56.7%) agreed and 52 (43.3%) disagreed, while on Identifying the relevance of science in the larger society, 71 (59.2%) and 49 (40.8%) and with regards to Understanding the purpose of science in decision making 65 (54.2) agreed while 55 (45.8%) disagreed. Conclusively, the results obtained reveal that students Preconception are consistent with concepts in the assigned science curriculum.

Hypotheses 1:

Table 3: Showing significant relationship between Student's Preconception and their level of assimilation of science subjects using Pearson Correlation at a 0.05 level of significance

		Students Preconception	Students Level of Assimilation
Students Preconception	Pearson Correlation	1	1.000**
	Sig. (2-tailed)		.000
	N	120	120
Students Level of Assimilation	Pearson Correlation	1.000**	1
	Sig. (2-tailed)	.000	
	N	120	120

**. Correlation is significant at the 0.05 level (2-tailed).

The result of the Person Correlation for the relationship between the two variables for the student's Preconception and their level of assimilation of science subjects using Pearson Correlation 0.05 level of significance as shown in Table 3, reveals an (r) value of 1.000 indicating there is a correlation between student's Preconception and their level of assimilation of science subjects. Thus the hypotheses remains that significant relationship between Student's Preconception and their level of assimilation of science subjects.

Hypotheses 2:

Table 4: Showing significant difference between male and female students Preconception using t-test statistic at a 0.05 level of significance

	N	ẋ ◌ mean	SD	DF	t-Calculated	t Critical Value (.05)	Remark
Male students Preconception	46	2.948	0.093				
Female students Preconception	74	2.930	0.106	118	0.9364	1.980	Accepted

P= ≤ 0.05 level of significance

The result displays two means, 2.948 ± 0.093 for male students preconception and 2.930 ± 0.106 with a 118 degree of freedom using a t-test statistics yielding a t – calculated value of 0.9364 which is less than the t-table value of 1.980 at a 0.05 significance level, accepting the hypotheses which states that there is no significant difference between male and female students Preconception.

DISCUSSION OF FINDINGS

Discovered from the research findings are the fact that preconception improves student's assimilation of science related subjects by providing preemptive knowledge about core science subjects, and that Preconception improves their assimilation of science related subjects by providing a guideline on how to conduct themselves during science classes and science laboratory workshops. In support, (Bradley, 1996) stated that Children's everyday activities enable them to learn some science even before entering preschool education. Thus, children at a young age will have developed concepts about how the world around them works (Kambouri, 2010). Furthermore, the study showed that Preconception improves student's assimilation of science related subjects by helping them understand the ethics and of interdependency science related courses and psychologically preparing their minds towards tackling science subjects, disorienting their minds from previous misconception. As Valanides (2000) states many studies confirm that learners bring ideas into the classroom, which differ from those accepted by the scientific community.

In addition, the findings reveal that students Preconception are consistent with concepts in the assigned science curriculum by providing student with relevant talents for science projects and providing students with the necessary flair required to handle science courses. Pine et al. (2001) in a similar study revealed that children have a lot of preconceptions about science topics and these preconceptions are of considerable importance and cannot be ignored in the learning process, since they are "foundations upon which knowledge is built. The findings went further to show that significant relationship exists between Student's Preconception and their level of assimilation of science subjects. Kambouri, (2010) in support stated that Children's preconceptions can be complicated and should not be ignored; they should be part of the content of teaching. In addition, the study also showed that there is no significant difference between male and female students Preconception. Osakinle et. al. (2010) concurs stating that the sex of the students does not have a significant difference; since lectures are held together and not individualized.

CONCLUSION & RECOMMENDATION

The subject matter of preconception is therefore vital for teachers and curriculum developers as the study has shown that it improves student's assimilation of science related subjects by providing preemptive knowledge about core science courses, and by providing a guideline on how to conduct themselves during science classes and science laboratory workshops. In addition, it provides students with relevant talents for science projects by providing the necessary flair required to handle science courses.

It is therefore recommended that teacher training institution, government policy maker and curriculum developers to recognize these areas of preconception in children and explore them in order to fully maximize teaching and learning experience in science education.

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