BSU Journal of Science, Mathematics and Computer Education (BSU-JSMCE) Volume 5, Issue 1, June 2025

ETHNO-SCIENCE TEACHING APPROACH AND MOTIVATION OF STUDENTS IN BASIC SCIENCE IN KOGI STATE, NIGERIA

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Abstract
This study investigated the effects of ethno-science teaching strategy on motivation of students in Basic Science in Kogi-East Education Zone using quasi-experimental design. The specific design is the pre-test, post-test non-equivalent, non-randomised control group. The population of this study comprised 8,308 students (5, 200 males and 3,100 females). The sample of the study comprised 75 Upper Basic Science students (male and females). The researcher employed multi-stage sampling procedure. Basic Science Motivation Scale (BSMS) was used for data collection. BSMS has 30 items and the instrument was validated by three experts in science education and an expert in test and measurement all from Benue State University, Makurdi. A trial test of the instrument was carried out on 20 students in a school that was not sampled but within the study area to enable the researchers determine the internal consistency of the test items. Scores obtained from the test were used to analyze the reliability coefficient of the instrument using Cronbach alpha and the reliability yielded 0.87. Two teachers who teach Basic Science in the sampled schools served as research assistants during data collection. The data collected were collated and for analysis. The research questions were answered using bar graphs, mean and standard deviation. Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. This was to correct the initial differences that may exist in the means. Findings revealed that there is significant difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method; there was no significant difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach. Based on the findings it was recommended among others that teachers should teach Basic Science using ethno-science strategy to improve students' motivation in the subject.

Key words: Ethno-science, Motivation, Basic Science and Gender

Introduction

Science has been conceived variously by different people. It is a discipline that discovers new knowledge through observation, measurement, experimentation and drawing of inferences based on empirical data (Ode, Akpoghol, & Aondover, 2020). Science therefore is the scientific process of

discovering knowledge through a systematic process that is experimental, verifiable and confirmable. That suggests science has a logical step-wise process to be followed and it is experimental in nature. Developed nations today based their strength on scientific and technological advancement as seen in the demonstration of computer skills, security, innovations in manufacturing, use of nuclear weapons and advance agricultural practices as the list is endless. It is also noteworthy that advancement in knowledge of science has led to improved health, housing, agriculture, energy, environment, urbanization and global climate change.

Improvement in science has led to the discovery of many chemicals (Chemistry), brought solutions to the problems of effective utilisation of energy to power our world (Physics) and an apt understanding of how the human body works (Biology). This has established the fact that the major difference between a developed country in a continent and the under-developed or developing ones is the advancement in science and technology. Nigeria, like any nation of the world, aspires to be among the most scientifically and technologically advanced nations of the world. The reason for this aspiration is not far-fetched from the numerous contributions of science and technology in human development. For any developing nation, like Nigeria, to achieve scientific and technological advancements, it becomes imperative to start planning for a firm scientific education for her citizen at the basic level of education as specified in the National Policy on Education (Federal Republic of Nigeria, 2014). In Nigeria, Basic Science introduces students to scientific education.

Basic Science is taught at the primary and upper basic levels of education. It combines aspects of Biology, Chemistry and Physics. Therefore, Basic Science expresses the fundamental unity of scientific thought (Maduabum, 2014). It is expected that by teaching Basic Science to children at basic education level, every Nigerian student would be given the basic knowledge and understanding of what science is all about and some of the basic innovations that are taking place around them. This assertion blends with the objectives of science teaching at the Upper Basic level of education which is to produce individuals who will be able to live effectively in modern age of science and technology and contribute to the development of the nation (FRN, 2014). In Basic Science class, students develop reflective thinking and good habits which are needed for scientific method and successful future life (Agogo & Ode, 2017). Basic Science is therefore aimed at enabling students who is exposed to it to acquire the specific science process skills such as observing, organizing information acquired, generalizing on the basis of acquired information, predicting as a result of generalization and designing experiment to check predictions.

Reports from chief examiners of Basic Examination Certificate Examination (BECE) have consistently reflected the poor performance of students in Basic Science (NECO Chief Examiner's Report, 2018). Consequently, there is a public outcry to the poor performance of students in Basic Science which could be due to poor students' motivation to learn the subject. Similarly, reports from the Chief Examiners of WAEC in 2018 and 2019 stress that few candidates attained credit pass in Biology, Chemistry and Physics which are constituent subjects of Basic Science and important requirements to study science-related disciplines in tertiary institutions. Most of the failures recorded in students' performance in Basic Science have been attributed to poor motivation of students due to inadequate exposure of students to activities, inadequate preparation, inability to comprehend questions, ineffective methods of teaching science subjects, gender insensitivity and unqualified science teachers (Balarabe,

2016). In a similar vein, Adewale (2016) observes that students' poor motivation in Biology in Senior School Certificate Examination is attributed to students' poor knowledge of Basic Science at the basic level of education.

Motivation is one of the most important factors in students' academic performance and in ensuring than an action is repeated. Motivation is therefore crucial in the education system as it helps both students and teachers to achieve the all important roles of teaching and learning. Due to motivation, students perform any task and achieve any goal they seek to achieve (Haider, Qureshi, Pirzada and Shahzadi (2015). It is is a possible performance arouser. Mondal (2022) attributes the poor motivation of students in Basic Science to the inability of the science teachers to adopt or evolve teaching methods or strategies that would motivate students to understand concepts in Basic Science and steps in carrying out basic experiments in the subject. Hence, teacher's ability to motivate students to develop the needed interest in learning this subject is vital. Motivation is therefore primal in the teaching and learning of Basic Science. Motivation is considered as a crucial factor that affects and determines human activities.

Motivation is a crucial index in education and other fields of human endeavour and for students to understand concepts in Basic Science effectively, there is need for the Basic Science teacher to use teaching approaches that would motivate them to learn, a method that overturns the gloomy performance of students in this seemingly important subject. In an attempt to evolve an effective teaching strategy, scholars (Ibe & Nwosu, 2017; Hikimati, Wayan and Pujani, 2020) recommend that ethno-science could help to motivate students in Basic Science.

Ethno-science teaching approach has been defined by Fasasi (2017) as an instructional approach that systematically accesses the prior cultural beliefs and ideas of learners that are related to the science concepts being taught to ensure a better understanding of the content. In establishing the relationship between the cultural realities of the learner and the content, the teacher may also be required to use natural teaching aids gotten from the immediate environment of the learners.

Ethno-science encompasses identifiable cultural groups such as national, tribal societies, labour groups, ideologies, daily practices and specific way of reasoning and inferring (Ajayi, Achor & Agogo, 2017). This means that ethno-science refers to members of a group within a cultural environment identified by their cultural traditions, codes symbols myth and specific ways used to reason and infer. By implication, ethno-science teaching strategy means a strategy that is adopted by science teacher in the process of teaching science such as Basic Science, Biology, Chemistry and Physics, as the case may be. It is through the use of the learner's culture and background in understanding and explaining activities that arise in their cultural environment. It is good to use familiar things/activities in ones' environment to teach for more lasting effects on the learners

Ethno-science learning approach refers to a context-based learning. According to Yuliana, Cahyono, Widodo and Irwanto (2021), conceptualised context-based learning is a student-based learning approach that connects scientific contents and real world contexts to promote students' motivation and performance in science. The reason for using ethno-science teaching approach is to help students understand the importance of studying science and become more motivated in science class. Ethno-science teaching

approach as a context-based approach to teaching science enables students to develop connection with science as they relate scientific concepts to their natural environment regardless of gender (Nwagbara, 2016).

Gender is a factor that may influence students' motivation and performance. It is an analytic subject that describes sociological roles, cultural responsibilities and expectations of male and female in a given society or cultural setting. Ezeh (2013) supports this view by understanding gender as the personality trait, attitudes, behaviour, values relative power, influence, roles and expectations that the society ascribes to the sexes on a differential basis. Gender is therefore a social concept that goes beyond the biological realities of being a male or female. Nwagbara (2016) states that school subjects and professions are often stereotyped on gender; it has been observed that science subjects and science based professions are often perceived as masculine while art subjects and art based professions are seen as feminine which could affect students' motivation in Basic Science.

The application of ethno-science teaching approach based on literature evidence has been proven to be effective in science. For instance, students achieve science process skills more easily if teachers use ethno-science approach (Ibe & Nwosu, 2017). Fasasi (2017) identifies the importance of ethno-science teaching approach as: using appropriate just-in-time learning stimuli; engaging students' preconceptions prior to teaching them new concepts; providing deep foundational knowledge; helping students make appropriate connections within the context of a conceptual framework; organizing knowledge in ways that facilitate information retrieval and application; and allowing students more opportunities to define learning goals and monitor their progress in achieving them. Similarly, Yuliana, Cahyono, Widodo and Irwanto (2021) opine that teachers may combine science with students' personal contexts in their daily lives to encourage better assimilation of contents. Seraphine (2014) found that the inclusion of contextual materials such as local wisdom in science learning facilitates the learning of science contents that are far from the experiences of students. To the best of researchers' knowledge, research on effect of ethno-science teaching approach on motivation of students in Basic Science are scarce in the study area. To this end this study ascertained the effect of ethno-science teaching approach on motivation of students in Basic Science are scarce in Kogi-East Education Zone.

Statement of the Problem

The 21st century has been plagued with many issues. While the solutions to some of these issues still elude man's effort, man has provided lasting solutions to many of these problems. Interestingly, most of the solutions to man's problems are found in nature, hence, the need to utilise the scientific process. Consequently, no nation can boast that it has solved or is solving its multifaceted and ever increasing problems without science. With science, cures to diseases have been discovered and applied, the moon has been explored, vaccines have been produced to keep illnesses at bay, and phenomena that were once attributed to witchcraft have been demystified. For any nation to benefit from the many advantages of science, its rudiments should be imbibed in the populace at early age.

Students' weak background in science and technology is a source of great concern to the Nation. This situation is not acceptable in a country that is striving towards achieving the objectives of becoming self-reliant. Motivation of students in Basic Science has been poor over the years. The Universal Basic Education Commission (UBEC, 2018) survey attributes this problem to the poor instructional method adopted by Basic

Science teachers. The use of ethno-science approach may improve the motivation of students in to learn Basic Science. In the ethno-science classroom, the teacher uses the material found in the local environment to teach students. The teacher could use this approach to help students establish the connection between the natural environment and what is taught in the classroom which could improve students' motivation in the subject. Thus, the problem of this study put in a question form is: What is the effects of ethno-science teaching approach on students' motivation in Basic Science?

Purpose of the Study

The purpose of this study was to investigate effects of ethno-science teaching approach on motivation of students in Basic Science in Kogi-East Education Zone. The study sought to:

1. Ascertain the difference in the motivation of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method.
2. Find out the difference in the motivation of male and female students taught Basic science using ethno-science approach.

Research Questions

The following research questions guided the study:

1. What is the difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method?
2. What is the difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method.
2. There is no significant difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach

Methodology

The researchers employed quasi-experimental design. The specific design is the pre-test, post-test non-equivalent group design. The non-equivalent groups design entails that the researcher chooses existing groups that appear and give treatment to only one or two of the groups (Emaikwu, 2015). The population of this study comprised 8,308 students (5, 200 males and 3,100 females). The sample of the study comprised 75 Upper Basic Science students (male and females). The researcher employed multi-stage sampling procedure. The first stage was to select two local government areas by using simple random sampling of hat and draw with replacement. For stage two, one town each was selected from the two earlier selected local government areas using purposive sampling technique to ensure that such a town has coeducational school. Two schools were selected: one for experimental group A, one for experimental group B and one for control group. Purposive sampling was used to select one intact class from each of these schools if there was more than one stream.

Basic Science Motivation Scale (BSMS) was adapted from Glynn, Taasoobshirazi and

Brickman (2009) as instrument for data collection. The instrument contains 30 items which cover aspects of students' motivation to learn Basic Science. Addition 10 items were constructed by the researcher to give a total of 30 items. The instrument was validated by three experts in science education and an expert in test and measurement all from Benue State University, Makurdi. The experts carried out face and content validity of the instrument. Suggestions arising from this process were mostly directed at improving the relevance of the lesson plans to the study and correcting some grammatical errors in the items. The researcher effected all the suggestions in order to improve on the validity of the instrument. A trial test of the instrument was carried out on 20 students in a school that was not sampled but within the study area to enable the researchers determine the internal consistency of the test items. Scores obtained from the test were used to analyze the reliability coefficient of the instrument using Cronbach Alpha because the items in the instrument were scored polytomously. The reliability of the BSMS was 0.87.

Two teachers who teach Basic Science in the sampled schools served as research assistants. The research assistants were trained on how to teach students using the ethno-science teaching strategy. The research assistants also administered the tests to the students at the beginning (pre-test) and at the at end (post-test) of the intervention**.** The treatment commenced in the second week and continued till the fifth week. The sixth week was used for the administration of posttest for both control and experimental groups. The treatment took place once a week for 80 minutes per lesson. The data collected were collated and for analysis. The research questions were answered using bar graphs, mean and standard deviation. This was because the research questions are descriptive in nature. Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. This was to correct the initial differences that may exist in the means. ANCOVA may also control the effects of the variables that the researcher did not seek to investigate.

Results

Research Question One

What is the difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method?

Table 1: *Mean Motivation Ratings of Students Taught Basic Science using Ethno-Science Teaching Approach and Conventional Method*

Approach		Pre-tes	Post-test	Mean gain
Ethnos-Science Teaching Approach	Mean	24.51	48.97	24.46
	N	35	35	
	SD	4.48	13.29	
Conventional Method	Mean	22.52	24.61	2.09
	N	33	33	
	SD	2.96	3.91	
Mean difference				22.37

Table 1 shows that 35 students were taught Basic Science using ethnos-science teaching approach and 33 students were taught Basic Science using conventional method. The mean motivation rating of students taught Basic Science using ethnos-science teaching approach is 24.51 with a standard deviation of 4.48 in pre-test and 48.97 with a standard

deviation of 13.29 in post-test. The mean motivation rating of students taught Basic Science using conventional method is 22.52 with a standard deviation of 2.96 in pre-test and 24.61 with a standard deviation of 3.91 in post-test. The mean gain in motivation of students taught Basic Science using ethnos-science teaching approach is 24.46; while that of students taught Basic Science using conventional method is 2.09. The difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught using conventional method is 22.37 in favour of students in ethnos-science teaching approach class. The summary of the pre-test, post-test and mean gain in motivation ratings of students taught Basic Science using ethnos-science teaching approach and conventional method is shown in Figure 10.

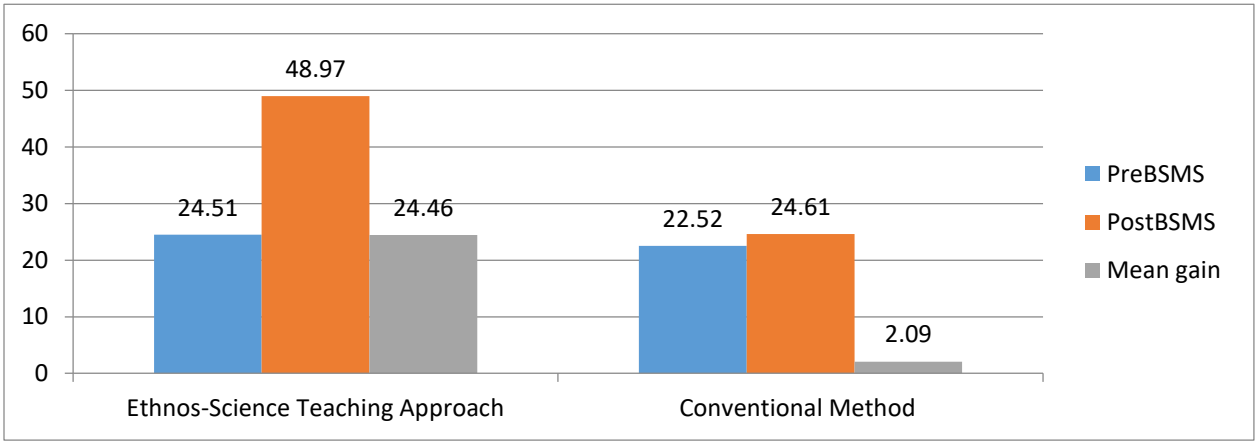

Figure 1: Pre-test, Post-test and Mean Gain in Motivation Ratings of Students Taught Basic Science using Ethno-Science Teaching Approach and Conventional Method

Research Question Two: What is the difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach?

Table 2: *Mean Motivation Ratings of Male and Female Students Taught Basic Science using Ethno-Science Teaching Approach*

Gender		Pre-test	Post-test	Mean gain
Male	Mean	23.79	46.84	23.05
	N	19	19	
	SD	3.92	13.46	
Female	Mean	25.38	51.50	26.12
	N	16	16	
	SD	5.05	13.06	
Mean difference				3.07

Table 2 shows that 19 male and 16 female students were taught Basic Science using ethno-science teaching approach. The mean motivation rating of male students taught Basic Science using ethno-science teaching approach is 23.79 with a standard deviation of 3.92 in pre-test and 46.84 with a standard deviation of 13.46 in post-test. The mean motivation rating of female students taught Basic Science using ethno-science teaching approach is 25.38 with a standard deviation of 5.05 in pre-test and 51.50 with a standard deviation of 13.06 in post-test. The mean gain in motivation of male students taught Basic Science using ethno-science teaching approach is 23.05 while that of female students taught Basic Science using ethno-science teaching approach is 26.12. The difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach is 3.07 in favour of female students in ethno-science teaching approach class. The summary of the pretest, posttest and mean gain in motivation ratings of male and female students taught Basic Science using ethno-science teaching approach is shown in Figure 12.

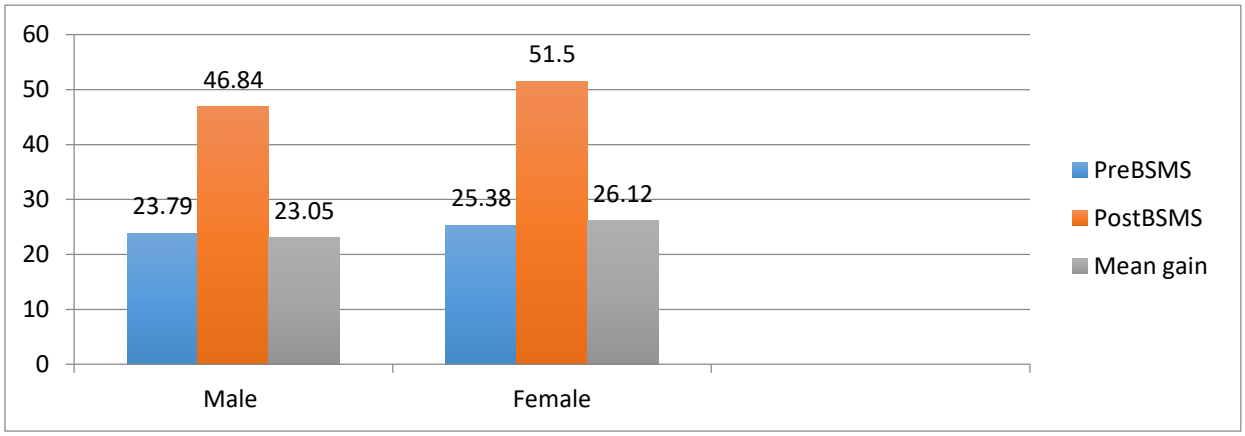

Figure 2: Pre-test, Post-test and Mean Gain in Motivation Ratings of Male and Female Students Taught Basic Science using Ethno-science Teaching Approach

Hypothesis One

There is no significant difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method.

Table 3: *ANCOVA of Motivation Ratings of Students Taught Basic Science using Ethno-Science Teaching Approach and Conventional Method*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10682.570[a]	2	5341.285	58.805	.000	.644
Intercept	567.565	1	567.565	6.249	.015	.088
PreBSMS	598.891	1	598.891	6.594	.013	.092
Strategy	8242.429	1	8242.429	90.746	.000	.583
Error	5903.959	65	90.830			
Total	110420.000	68				
Corrected Total	16586.529	67				

a. R Squared = .644 (Adjusted R Squared = .633)

Table 3 shows that F (1, 65) = 90.746; p = 0.000 < 0.05. Thus, the null hypothesis is rejected. This implies that there is significant difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method. The partial eta square of 0.583 obtain for strategies means that 58.3 percent of mean motivation ratings of students in Basic Science is accounted for by the strategies employed.

Hypothesis Two

There is no significant difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach

Table 4: *ANCOVA of Motivation Ratings of Male and Female Students Taught Basic Science Using Ethno-Science Teaching Approach*

Source	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Sq
Corrected Model	524.631[a]	2	262.316	1.529	.232	.087
Intercept	1061.387	1	1061.387	6.188	.018	.162
PreBSMS	336.186	1	336.186	1.960	.171	.058
Gender	104.597	1	104.597	.610	.441	.019
Error	5488.340	32	171.511			
Total	89950.000	35				
Corrected Total	6012.971	34				

a. R Squared = .087 (Adjusted R Squared = .030)

Table 4 shows that F (1, 32) = 0.610; p = 0.441 > 0.05. Thus, the null hypothesis is not rejected. This implies that there is no significant difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching

approach. The partial eta square of 0.019 obtain for gender means that only 1.9 percent of mean motivation ratings of students in Basic Science is accounted for by their gender.

Discussion of Findings

The finding revealed a significant difference in the mean motivation ratings of students taught Basic Science using ethno-science teaching approach and those taught with the conventional method. This signifies that the use of ethno-science teaching approach augmented students' motivation in Basic Science more than conventional method. The finding is in line with the finding of Chongo and Baliga (2019) and Ibe & Nwosu (2017) who found that that ethno-physics-based instruction which was used to teach the experimental group enhanced the attitude and motivation to learn better than the conventional method which was used to teach the control group. The agreement of these foundings could be due to the fact that ethno-science encompasses identifiable cultural groups such as national, tribal societies, labour groups, ideologies, daily practices and specific way of reasoning and inferring (Ajayi, Achor & Agogo, 2017). This means that ethno-science refers to members of a group within a cultural environment identified by their cultural traditions, codes symbols myth and specific ways used to reason and infer. By implication. It is through the use of the learner's culture and background in understanding and explaining activities that arise in their cultural environment. It is good to use familiar things/activities in ones environment to teach for more lasting effects on the learners.

The finding revealed that there was no significant difference in the mean motivation ratings of male and female students taught Basic Science using ethno-science teaching approach. This indicates that the use of ethno-science teaching approach is not gender sensitive with respect to students' motivation in Basic Science. The finding disagrees with the finding of Ure (2021) and Fasasi (2017) who found that the influence of gender on the achievement of the students was significant. The consistency of the findings could be because Ethno-science learning approach refers to a context-based learning. According to Yuliana, Cahyono, Widodo and Irwanto (2021) conceptualised context-based learning is a student-based learning approach that connects scientific contents and real world contexts to promote students' motivation and performance in science. the reason for using ethno-science teaching approach is to help students understand the importance of studying science and to develop a positive attitude towards science. Ethno-science teaching approach as a context-based approach to teaching science enables students to develop connection with science as they relate scientific concepts to their natural environment.

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