

ENVIRONMENTAL PEDAGOGIES THAT PROMOTE STUDENTS UNDERSTANDING OF INTEGRATED SCIENCE (BIOLOGY ASPECT)

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Abstract- The environmental pedagogies that enhance students understanding of integrated science (biology aspect) was carried out with second year students at the Zion Girls' Senior High School in the Winneba Metropolis of the Central Region, Ghana. A total of sixty students comprising twenty randomly selected from each of the three 2nd year classes were sampled for the study. Likert scale attached to the questionnaires was used to collect the data for analysis using graphical percentages. The results indicated that majority of the students prefer learning in a quiet environment for better understanding and absorption of the topics they have been taught or treated during classes. Another suitable environment for a student to properly understand what he/she has taught in class was just sitting behind a table/chair to learn. Time an important environmental pedagogy was determined, and it came to light that most of the students preferred learning during the evening when there is less noise. The library always being quiet was a suitable pedagogical environment for learning. The students learnt better when a pedagogical environment such as practical lessons made up of hands-on-activities was created during teaching. The results further showed that majority of the students took notes of essential points when the classroom environment is well organized or arranged. Again, many students showed great enjoy when a pedagogical tool like collaborative studies was applied because it helped them to share ideas or clarify views with their colleagues. From the analysis, it came to light that there was a significant relationship between students' pedagogical environments and teaching styles because most of the students preferred variations in their teachers' pedagogies. Students are able to perform better in science, if teachers teaching pedagogies conform to students environmental pedagogies.

Keywords: Environment, Pedagogy, Collaborative, Integrated Science

Introduction

Biology an aspect of pure science is very important because it serves as a foundation for students pursuing biology and other biology related courses at the Senior High School level. However, a lot of students regard it as difficult, abstract and irrelevant to their needs in the society. The major reasons are the approaches to its teaching and learning, while some blame is placed on curriculum developers and teachers, and the pedagogical environment students opt for during learning.

Ausubel (1978), an educational psychologist emphasized that before any information can be organized in the mind during storage, the learner must make a conscious effort to relate what materials, including the environment in which learning is taking place to an already existing material which he or she is familiar with.

According to Cottrell (2003), the typical methods for learning consciously are repeating something learnt, writing out, and checking it out that what is learnt is remembered and can be told someone else. She also emphasized that attention depends on the mental or environmental pedagogy of the learner, and whether the material is completely new to the learner or not.

According to Feldman (2000), learning styles reflect one's preferred environmental pedagogy that will help

him/her to acquire, use and think about knowledge. These styles or strategies are not abilities, but types of learning through suitable environmental pedagogy. They represent the ways we approach these tasks by using good pedagogies. We do not all learn in the same way. Each of us has preferred environmental pedagogy that works best for him/her. And our success in the academia is not only how we learn but also the type of environmental pedagogy we apply during learning.

Booth and Brooks (1995) defined learning style as a complication of patterns of behavior that appears constantly in the learning processes of an individual from the initial stimulation to the final recognizable product of learning. Learning style is how information is processed out and also, how to work with the outcome.

As stated by Dunn and Dunn (1978), when students are taught using models that complement their learning styles, they learn better and achieve higher test scores. In order to have a meaningful education, teachers should identify the individual learning styles and link their teaching methods to those styles for maximum output.

According to Gordon (1996), studying is not just reading and memorizing although it encompasses both. Studying is the active learning of academic ideas and information in a suitable environmental pedagogy. When ideas are

put together in a summarized form, they are easily understood and remembered.

Academic performance in Ghanaian schools today depends on several factors. The most important is the student's own strategies or environmental pedagogy adopted for learning. Chall (2000) refers to academic performance as a student's ability to exhibit a high level of studying, thinking and analyzing issues as well as making sound judgment after going through an educational programme. The measurement of performance is done mainly through written tests.

People have different learning abilities that are linked to different environmental pedagogy. These different preferences, called learning styles, evolve through formal learning in and outside the school environment.

Cottrell (2000) stated that learning is not just studying but a faceted process involving each individual learner, his/her learning history, current pedagogical environment and their interactions. We say that learning has taken place when we understand something and can explain, teach or demonstrate to others.

There are various ways or methods of learning. Examples are conscious learning, learning at different levels of attention and the SQ3R.

According to Cottrell (2003), "conscious learning" is when one is aware that he or she is to memorize a concept or recognize that a new concept is understood. Science requires this method of learning because it is not all concepts in science that can be memorized. Some concepts such as anaerobic respiration and path of glycolysis need to be understood in the right sequence. Conscious learning has three main steps:

- Repeating what has been learned
- Writing it out
- Checking that it can be remembered.

The level of attention is very important in learning science. This is because it is not easy to read about some of the concepts and understand them without the teacher's explanation. Our level of attention, according to Cottrell (2003), depends on the following levels:

- The mental or environmental pedagogy of learning,
- The way the information is presented, and
- Whether or not the material is completely new.

The SQ3R technique helps an individual to understand any given text even if initially it appeared difficult and dull, fix the essentials of the text in memory, and revise efficiently. The method comprises five steps or stages. These are survey, question, read, recall and review which represents the abbreviation SQ3R. Survey is similar to skimming. Look at the title, author, date of first publication and date of the edition; check whether the book is suitable for your needs and up to date. Look at the contents and chapter headings to see which part are relevant to you, and the introduction to see the author's purpose of writing the book. Finally, check the index and bibliography to get a wider view of the book's context. Question: Ask yourself what you hope to gain from the book, why you are reading it, and whether parts of it are of particular interest to you.

Read a book or sections of it more than once to gain full understand of it. Firstly, gain an impression of what the chapter or section is about. Next, look more closely at the details of the text, by asking yourself questions about it all the time. Lastly, decide what you think of the chapter or section you have read.

Recall: At the end of every chapter or section, try to recall the main ideas in what you have read. You may write down notes in points to help you to remember.

Review is checking one's understanding, by going over the chapter or section again to see if you have grasped the correct ideas or concepts. Make a note of any point that you did not remember or understood properly. According to Johnson (2006), most students perform below their academic potential due to lack of review; hence, this must be taken seriously.

From the foregone, it is clear that learning depends greatly on the environmental pedagogy the learner employs, including the way the information is presented. It is therefore, important to investigate students' environmental pedagogy of learning the biology aspect of Integrated Science in order to give them a better understanding.

The study therefore looks at student's general environmental pedagogy to the study of biology at the Senior High School level.

Research questions

The study addressed the following questions:

1. Is there any relationship between students' environmental pedagogy and their academic achievement in biology aspect of Integrated Science at the Senior High School?
2. Is there any significant relationship between students' environmental pedagogies and the pedagogies teachers use to teach the subject?

Materials and Methods

The study was carried out in the Zion Girls' Senior High School in the Winneba Metropolis of the Central Region, Ghana. Winneba, traditionally known as Simpa, is an historic fishing town in Ghana, lying on the south coast, 56 Km west of Accra, the capital of Ghana. The population is about 40,017.

Sixty students comprising twenty each randomly selected from the three classes were sampled for the study. The Likert scale type of questionnaires was used for the study.

The responses to the items were scored using the Likert scale. The statements were scored as follows:

- i. Strongly agree
- ii. Agree
- iii. Disagree
- iv. Strongly disagree

Data analysis

The collected data were analyzed using graphical percentages.

Results

The data collected using the research questions have been designed into various pie charts according to the research questions raised. The response to the questions were ranked as strongly agree (4), agree (3), disagree (2) strongly disagree (1), for positive statements and strongly agree (1), agree (2), disagree (3), strongly disagree (4) for negative statements.

Analysis of research findings

Research question one (R1)

Is there any relationship between students' environmental pedagogy and their academic achievement in the biology aspect of Integrated Science at the Senior High School?

The responses from items one to seven of the questionnaire that answer research question one have been presented in the charts below:

Chart 1: Students view on playing some games before learning

Strongly agree Strongly disagree Disagree Agree

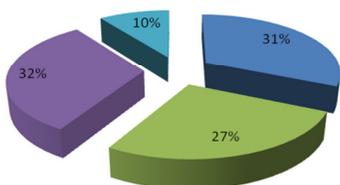


Chart 2: I normally like to learn at quiet place

Strongly agree Strongly disagree Disagree Agree

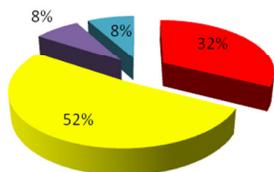


Chart one (1) assesses the views of students who involved themselves in some games before learning. Out of the sixty students sampled, approximately 58% agree with the statement while 42% disagree with the statement. Therefore, an important environmental pedagogy that will enable students learn well was to play some games before learning.

Students' views on the type of environment they normally prefer learning in order to gain better understanding of what they have been taught is presented in Chart 2. Here 84% of the sampled population prefers studying at quiet places while 16% disagree with the statement. It can be deduced from the data that most students find learning in quiet environment very conducive.

Students' posture during learning is an important environmental pedagogy because it enhances better assimilation (Chart 3).

Chart 3: Sitting behind a table or chair makes learning easier.

Strongly agree Strongly disagree Disagree Agree

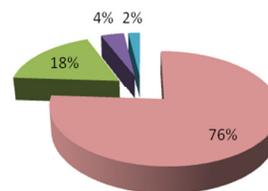
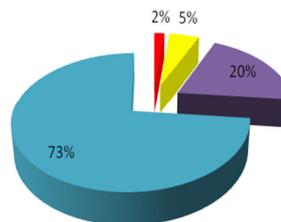


Chart 4: I prefer learning during the day rather than in the evening

Strongly agree Strongly disagree Disagree Agree



As indicated in Chart 3, 94% of the sampled population agreed to the statement while 6% disagreed. This goes to confirm sitting as a valuable environmental pedagogy when students are learning. This is in line with Kumuyi (2001) statement that most students do not understand what they read because they do not adopt a proper learning position when studying; hence they spend most of their learning time struggling with sleep.

Chart 4 shows the time of the day that is convenient for students to learn. Majority of the respondents, 93% disagreed whereas 7% agreed that they prefer learning during the day time rather than in the evening. Learning during the day time is not a good environmental pedagogy for most students because classes are normally organized during the day time. Again, students have their preps in the evening, and are therefore forced to study in the evening.

Based on Chart 4, students were probed further to ascertain why they prefer learning in the evening, and their responses are captured in Chart 5.

Chart 5: Learning in the evening makes concentration and absorption rate higher than in the day

Strongly agree Strongly disagree Disagree Agree

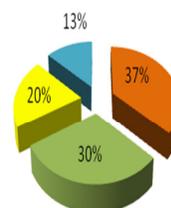
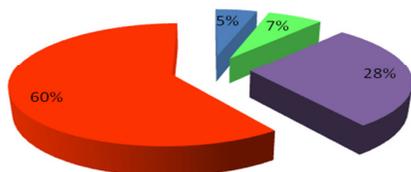


Chart 6: I do not like learning at the library

■ Strongly agree ■ Agree ■ Disagree ■ Strongly disagree



According to Chart 5, majority of the students numbering 67% of the sampled population feel that they are able to concentrate and absorb much better in the evening than in the day. This clarifies learning in the evening as a good environmental pedagogy, and supports Tracy (2002) statement that every person has a time in the day that his alertness or productivity is at the maximum. Students must therefore, plan their learning times to meet with such times so as to enhance their learning. Thirty-three (33%) percent of the respondents did not agree to the statement.

As observed in Chart 6, a large number of students (88%) disagreed while 12% agreed to the statement that they do not like learning at the library. This clearly shows that the library is one of the efficient pedagogical environments for studies. Students learning in the classroom after classes may not have control over the noise others may generate in the class.

Based on Chart 6, students were probed further to ascertain why they prefer learning in the library. As deduced from Chart 7, 91% of the respondents were of the view that the library presents a suitable environment for studying science while 9% of them disagreed. This gives a strong support base to the library as a good pedagogical environment for learning Integrated Science.

Chart 7: The library is quiet and suitable place for learning science

■ Strongly agree ■ Agree ■ Disagree ■ Strongly disagree

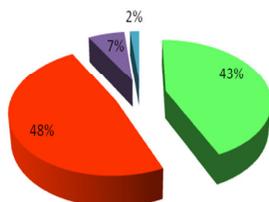
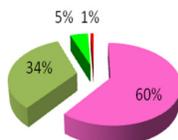


Chart 8: Improvisation of TLMs make me participate actively in practical lessons and makes it interesting.

■ Strongly agree ■ Agree ■ Disagree ■ Strongly disagree



From the various analyses given above, one can clearly indicate that there is a strong relationship between students' pedagogical environment of learning and their academic achievement in studying Integrated Science as a subject.

Research question two (R2)

Is there any significant relationship between students' environmental pedagogies and the pedagogies teachers use to teach the subject?

Responses on items eight (8) to fifteen (15) of the questionnaire were brought together to answer the research question two (2). Chart 8 shows the methods that help students to benefit from the study of science. Improvisation of materials during science lesson makes me participate actively in the practical lesson and makes it more interesting.

Chart 9: Practical lessons help me to relate what I have learnt with real life situations.

■ Strongly agree ■ Agree ■ Disagree ■ Strongly disagree

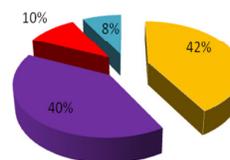
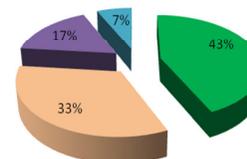


Chart 10: The topics I like most in science are those that emphasize on concrete materials.

■ Strongly agree ■ Agree ■ Disagree ■ Strongly disagree



It is observed Chart 8 that 94% of the students agreed to the statement that teaching-and- learning materials (TLMs) make learning of the subject easier and 6% did not agree. This confirms that when TLMs are introduced as an environmental pedagogy the learning of science becomes very effective as well as give students better understanding.

As stated in Chart 9, 82% of the students studying science stated that, through practical lessons, they are able to relate what they have learnt with the real life situations while 18% of them did not agree to the statement. The introduction of an environmental pedagogy, such as practical lessons provided many of the students a clear understanding of the lesson taught. In Chart 10, 24% of the students indicated that they dislike topics that emphasize concrete materials while 76% were also in agreement with the statement. Many students enjoy topics that are related to their immediate environment or concrete objects. This is a clear evidence

of an environmental pedagogy of teaching where the teacher uses concrete objects to fortify learning.

Chart 11: We learn better from teachers who do not include practical in their lessons.

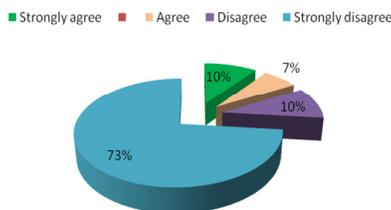


Chart 12: We learn science better when TLMs are used in teaching.

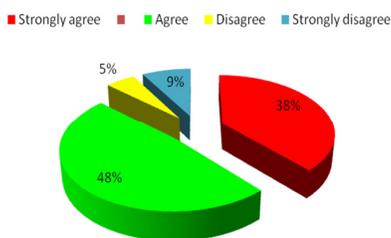


Chart 11 shows the views of students on whether they learn science better from teachers who do not include practical in their lessons. Science lessons delivered by teachers whose lessons are not practically oriented are what I like most. Majority of the students, 83% disagreed with the statement whereas 17% agreed as represented in Chart 11. An environmental pedagogy where a practical lesson is incorporated into the teaching and learning is very healthy in improving students understanding. This kind of response was expected based on students' views on Chart ten (10), which might have influenced their decision in Chart 11.

As stated by Boulind (1958) that students cannot be made to think solely or even mainly, by talking to them, and that any science course needs to be firmly rooted in practical work that uses experiments as a means of solving problems. Students' preference for TLMs in science is, therefore, well grounded because 86% agreed with the statement whereas 14% disagreed as indicated in Chart 12. Therefore, an environmental pedagogy that applies TLMs in the teaching and learning process in order to improve students understanding is very acceptable.

Chart 13: Our understanding of science topics are enhanced depending on teaching methods our teacher apply.

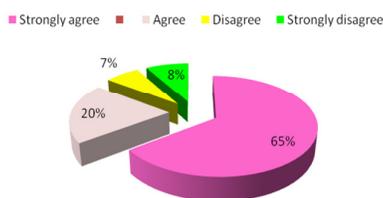
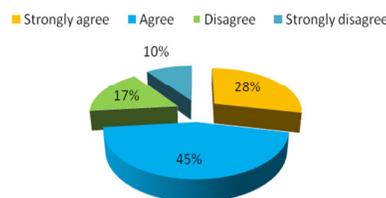


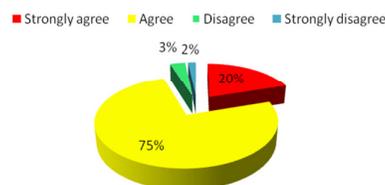
Chart 14: We are able to understand science better with the help of discussion method.



As observed in Chart 13, 85% agreed with the statement whereas 15% were not in favour of the statement. This shows a significant relationship between environmental pedagogy and students learning abilities. From the result, one can clearly judge that the two (environmental pedagogy and students learning abilities) are intertwined or inseparable.

According to Chart 14, the respondents enjoyed the introduction of discussion method in the teaching and learning of science. Majority of the sampled population, 73% agreed to the statement while 27% disagreed. Therefore, discussion method can be considered as a good environmental pedagogy when it comes to the teaching and learning of science.

Chart 15: We like science lesson from teachers who lay out topics to be taught in sequential steps.



As shown in Chart 15, 95% of the sampled population agreed to the statement while 5% disagreed with the statement. Donaldson (1978) is of the view that the way we reason depends upon what we already know. It follows that the way we can process new information would be affected by our background. Therefore, a sequential planning of the topics to merit students understanding is a worthy skill that a teacher must possess. This proves that an environmental pedagogy like the introduction of sequential breakdown of a topic should be encouraged in the teaching and learning process to enhance students understanding.

In summary, for students to have better understanding of the teaching and learning of Integrated Science, the environmental pedagogies introduced under Research Question two (2) should be implemented or embraced.

Discussion

According to the numerated environmental pedagogies captured under the results of this research, students are able to learn better, and develop interest in Integrated Science, only if those pedagogies are implemented or adopted by teachers in the teaching and learning environment as discussed below:

Majority of the students prefer learning in a quiet environment which enables them to absorb things they

read. Students prefer sitting behind a table or chair to learn. The time that most students prefer to learn was during the evening. Again, they prefer learning at the library because it provides a suitable environment for studying. Science students prefer practical lessons because it helps them to learn through experience that is working with hands. Furthermore, students learn better from teachers whose lessons are practically-oriented. Again, many students enjoy group and discussion studies because the two help them to share ideas or clarify issues. This enables them to absorb the things they learn.

Johnson (2006) revealed that it is vital for students to realize that there are various kinds of knowledge available to the serious students, and that the library is a center or a treasure house for all sort of knowledge. The library also helps students to cultivate the attitudes of concentrating which is essential for effective study of the science course. According to Lamphoon (1986), the use of a variety of teaching materials by teachers will lead to a significant increase in knowledge gained by the students.

Conclusion

The study revealed that most of the students like learning when the appropriate environmental pedagogies are applied in the teaching and learning process. Therefore, pedagogical environmental skills such as the use of TLMs/introduction of concrete materials, practical lessons, collaborative lessons, group discussions, efficient use of the library among others should be enforced.

Recommendation

Generally, it was clear that students make use of some pedagogical environments in their studies all the time. There is, therefore, the need to encourage them to get themselves involved in discussions and other pedagogies for a better understanding of science concepts. Teachers should meet individual student's needs by finding time to carry conversation with them. This can be achieved by creating opportunities for small group interaction and discussion among students to help in the restructuring of ideas. Teachers are called upon to abandon dispensing of knowledge by rote learning, and help students to construct knowledge in their own way. Finally, teachers should create avenues for students to develop some study skills when they are admitted by giving them orientation on how to study. Students should be encouraged to use the right kind of environmental pedagogy in order to achieve better academic performances.

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