



Effects of 7E's Learning Strategy on Academic Motivation of Biology Students in Secondary Schools in Bauchi, Nigeria

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ABSTRACT

The study investigated the Effects of 7Es learning approach on motivation of secondary school Biology in Bauchi, Nigeria. The study was guided by three specific objectives, three research questions and two hypotheses. Sequential explanatory mixed-method design was adopted for the study. The researchers sample two schools with population of 137 SS II Biology students for data collection. Nine students were purposively sampled for the Focus Group Discussion Protocol. The instruments for data collections were Biology Academic Motivation Rating Scale Questionnaires (MRSQ) and Focus Group Discussion Protocol (FGDP). The instruments were validated by experts and subjected to pilot study. The instrument yield Cronbach's Alpha reliability coefficient of .818. The participants agreed with the transcriptions for the Qualitative data. The data collected from the study were subjected to descriptive statistics of mean, standard deviation and mean difference to answer the research questions. Inferential statistics of independent sample t-test was used to test the null hypotheses at $P \leq 0.05$ levels of significance. The result shows that 7Es learning cycles had positive effects on academic motivation of biology students. It was concluded that 7Es learning cycle was effective in improving academic motivation of secondary school students in biology. The study recommended school principals should encourage Biology teachers to incorporate 7Es Learning Cycle Instruction into their teaching the students in Bauchi metropolis.

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INTRODUCTION

Biology is one of the science subjects at secondary school level in Nigeria. The objectives of biology according to Federal Government of Nigeria (2013) is to provide students with: (1) biology skills on the usage of laboratory equipment/facilities; (2) knowledge of biological science; (3) understanding of application of scientific knowledge to daily life in matters related to health and agriculture; and (4) reasonable and functional scientific attitude. Abdullahi and Zanyum (2018) reported that the subject of biology piques intellectual curiosity of students, increases their awareness of the fragile ecosystem, and stimulates critical thinking. The author added that, the importance and application of biology cut across many disciplines. Abdullahi, Jibrin, Dauda and Danjuma (2021) opined that knowledge and

understanding of biology at secondary school level would help students to better understand related subjects such as health science, horticulture, agricultural science, animal husbandry at among others. The authors maintained that, it is one of the core requirements of students that would further their educational career in Medicine, Botany, Nursing, Agriculture and other related courses at tertiary institutions in Nigeria. This explained why biology is the most popular science subjects at secondary school level.

Despite the importance of biology on feature academic endeavour of secondary school students, and its popularity, studies have shown that academic motivation of students in Bauchi towards the subject was low (Abdullahi & Jibrin, 2017; Abdullahi & Zayum, 2018; Abdullahi, Jibrin, Dauda & Danjuma, 2021). The

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trends of the situation according to the authors had negative effect of the academic performance of students in the subject. The factors affecting academic motivation of student have been documented by many authors, nevertheless, most scholars ascribed the poor motivation to the teaching approach of the teachers. For instance, the studies of Muhammad and Muhammad (2015), Williams and Ochiama (2018), Abdullahi and Zayum (2018), Cheron (2021) all blame the teaching approach of teachers to students' attitude and performance in biology. Erkan and Özlem (2013) reported that motivation and performance of students are achieved depends on the teaching method of teachers. Najme and Majid (2014) also reported that motivation is one of the factors that enhanced the attitude and achievement of students.

To this end, Khaled (2016), Balta and Sarac (2016) opined that 7Es learning cycle instruction fosters student's motivation and performance in chemistry. Bunkure (2012) argued that constructivism improve students' learning motivation and successful accomplishment of a task of students in Physics. Abdullahi, Jibrin, Dauda and Danjuma (2021) opined that 7Es learning cycle has the potentials of promoting academic performance of students in Biology. From the forgone studies, it was established that 7Es learning cycles had positive effect on academic motivation of students in related subjects but none in biology specifically, it is based on these premises that the researchers carried out this study to filled the literature gap.

Statement of the Problem

The attitude and performance of secondary school students in biology at West Africa Examination Council (WAEC) in Bauchi has been documented to be worrisome (Abdullahi & Zayum, 2018). A baseline survey by the researcher on performance of students in Biology from 2015 to 2020 in eight schools in the area of the study shows that less than 40% of the students that sat for the paper had credit pass and above. The summary of the results shows that out of 32940 students that registered biology at SSCE level only (10070) 30.57% students passed at credit level. This is a threat to career aspiration of students intending to read medicine, nursing, biology and other

related courses at tertiary institutions. There is no much difference in the trend of the performance as reported by NECO Chief Examiner's Reports of 2015, 2016 and 2017 where only 45.81%, 43.15% and 48.61% of the candidates had minimum of credit pass.

The poor performance of biology students Bauchi metropolis, Bauchi state, Nigeria was found to be worrisome as the WAEC yearly ranking in 2014, 2015 and 2016 persistently placed Bauchi State in 31st position (see Appendix A). Eze (2014) stated that the failure is more worrisome in science related subjects which shows Kebbi, Gombe and Bauchi state recording 6.30%, 5.68% and 5.28% pass respectively. The poor performance of students in biology at SSCE level is a threat those aspiring to study medicine, nursing, biology and other related courses at tertiary institutions. The low performance of biology students that is generally attributed to their academic motivation prompted the researchers to specifically: (1) determine the difference between the pre-treatment mean motivation scores of biology students in control and experimental groups; (2) assess the difference between the post-treatment mean motivation scores of biology students in control and experimental; and (3) explore the views of students on the effects of 7Es learning cycle instruction on their performance, retention and motivation in biology in Bauchi metropolis, Bauchi state, Nigeria.

Research Questions

In line with the research objectives, the following research questions guided the study:

1. What is the difference between pre-treatment mean academic motivations of biology students in control and experimental groups in Bauchi metropolis, Bauchi state, Nigeria?
2. What is the difference between the post-treatment mean motivation scores of students taught biology using 7Es learning cycle and those taught using the conventional method in Bauchi metropolis, Bauchi state, Nigeria?
3. What are the views of students on the effects of 7Es learning cycle

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instruction on their motivation, performance and retention in biology in Bauchi metropolis, Bauchi state, Nigeria?

Research Null Hypotheses

The study tested the following null hypotheses using t-test analysis at $P \leq 0.05$ level of significance.

1. There is no significant difference between the pre-treatment mean motivation score of biology students in control and experimental groups in Bauchi metropolis, Bauchi state, Nigeria.
2. There is no significant difference between post-treatment mean motivation scores of secondary school students taught biology using 7Es learning cycle and those taught using the conventional method Bauchi metropolis, Bauchi state, Nigeria.

METHODOLOGY

The study employed sequential explanatory mixed-method design. The design consists of two different phases (Creswell, 2014). The first phase was quantitative in nature and the second phase was qualitative. Creswell

(2014) opined that sequential explanatory mixed-method enables researcher to collect quantitative data from the subject and exploring their opinions using qualitative approach for in-depth explanation.

The first phase of the study was quasi-experimental research design. The design was used to determine the effects of 7Es learning cycle instruction on motivation, academic performance and retention ability of biology students in secondary school in the study area. Quasi experimental design was considered suitable because it would not disrupt or affects the normal class lessons of students that may be disallowed by the school authority. Based on these arguments, the design was considered suitable for the study.

In the second phase, the qualitative data were collected using Focus Group Discussion to find out the in-depth views of students on 7Es as suggested by Creswell (2014) who opined that, qualitative research design provides the researcher the opportunity of exploring more detail opinions of the target group. This approach was used to explore in-depth views of the students on the effects of 7Es learning cycle on their motivation, performance and retention. The design is as presented in Figure 1:

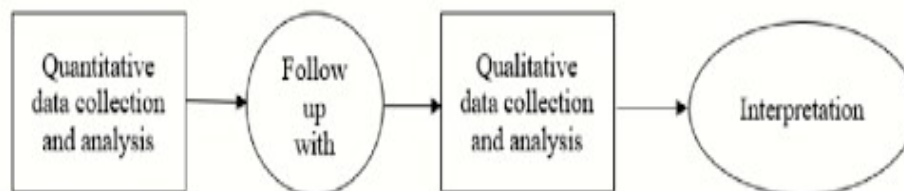


Figure 1: Sequential-explanatory research design flow (Creswell & Plano-Clark, 2011)

In Figure 1, the use of Sequential-explanatory research was applicable in the present study because quantitative data collection and analysis preceded the qualitative phase. Besides, the emphasis of the study was maintained since a more in-depth investigation was carried out to build on the quantitative data results (Creswell & Plano-Clark, 2011).

The population of the study was all 3328 biology students in Senior Secondary II

Bauchi, Bauchi state, Nigeria. The sample for the study comprises two intact classes which were drawn from two secondary schools. Both the two schools and the classes used for the study were selected randomly. The two schools had 66 (experimental) students and 71 (Control) students. The selection of the schools, class and assigning the students into control and experimental group were done randomly. For the purpose of qualitative phase,

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the researcher used purposive sampling to select nine students that participated in the Focus Group Discussion.

The instrument for quantitative data collection was Motivation Rating Scale Questionnaire (MRSQ) adopted from Andressa, Mvrikaki and Dermitzaki (2015). The instrument was used to elicit data on motivation from the experimental and control groups before and after the treatment. The instrument comprises 34 items divided into 6 motivation sub construct (Biology learning value, active learning strategy, self-efficacy, performance goal, achievement goal and learning environment stimulation). The instrument is structured in 4-points scale (as adopted) of Strongly Agree (SA), 4 points; Agree (A), 3 points; Disagree (D), 2 points and Strongly Disagree (SD), 1 point.

The instrument for Focus Group Discussion was Interview. The instrument sought for in depth views of the students to explain the results of the qualitative analysis obtained in the study. The instrument was developed by the researcher based on the result of quantitative study (Creswell, 2014) and it comprises of five question to ascertain students' motivation in biology. This was based on the suggestion of Amena (2017) who recommended 5-12 questions for FGDP.

The researcher consulted four experts who were requested to check for their appropriateness of the motivation rating questionnaire. The experts were drawn from psychology and science education respectively. Items of the instruments were considered with few corrections in area of spellings. The corrected instruments were used for the pilot study immediately. The instrument yields a Cronbach Alpha reliability coefficient of 0.84

In order to ensure validity and reliability of the qualitative data, the transcribed interview was sent to each participant politely asking them to confirm or otherwise their statement and each of the participants stood with his/her opinion. Moreover, the findings and the raw data were also given to the colleagues for peer review to check agreement of the emerging findings with the raw data (Merriam, 2009). The outcome of the peer review confirmed the congruency of the emerging findings with the raw data.

In the stage one of data collection; the researcher selected the research assistants to

be involved in the study. The research assistants were drawn from the schools that were involved in the study. The research assistants were given five days training of two hours daily. To ensure that the research assistants mastered the strategies as expected, the researcher organized microteaching session at the end of the training. Copy of the instructional package comprising three (3) weeks instructional units and a comprehensive lesson plan were given to the research assistants. To enable the researchers established the equivalence of the participants in the study prior to the treatment, the pre-treatment motivation questionnaire was administered to the two groups of the students.

After stage one, the two groups of students were taught separately guided by their respective lesson plan. The students in the experimental group were taught using 7E-LCI. The students in this group were taught biology using 7Es-LCI (eliciting, engaging, exploring, explaining, elaborating, evaluating and extending) that involved recalling prior knowledge, curiosity, participation and extension of knowledge by the trained research assistants. On the other had the students in control group were taught using conventional teaching method. During the experiment, Genetics concepts were covered during the period of the research using the biology lessons periods of 80 double periods of 80 minutes and single period of 40 minutes for period of four weeks. At the exercise the post-test post-treatment motivation questionnaire was administered to the two groups of the students.

The qualitative expect of data was conducted using Focus Group Discussion Protocol (FGDP). The choice of FGDP was based on the suggestion of Brandom (2020) who opined that focus group provides adverse set of responses based on the interview profile, cost-effective, time savings, anonymity for many of the participants and yield a richer amount of data. Prior to commencement of the FGDP the teacher ensures the environment was quiet and conducive for the interview. The interview protocol was developed based on the results of hypotheses testing (Creswell, 2003). The FGDP was conducted in three sessions with time range of 65-76 minutes. The participants were asked to explain why the variables under investigation were significant or

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not significant. The results of the quantitative and qualitative data were integrated during the discussion of the study's outcomes (Ivankova, Creswell, & Stick, 2006).

Data collected were analyzed in three stages. In stage one and two, the Statistical Packages for Social Sciences (SPSS) version 25 was used to answer research questions. In this stage, mean score, standard deviation and mean difference were employed to answer the research questions. In the next second stage, the SPSS was employed run *Independent Sample t-test* for the test of null hypotheses. The hypotheses were tested at 0.05 level of significance.

In stage three, thematically analyzed was employed using Microsoft Excel Package (MEP) for qualitative data. Meyer and Avery (2009) opined that Excel can be used for qualitative analysis using conditional formatting and other functions. Similarly, Solveig (2016) reported that Microsoft Excel is used by millions around the world and the program packages are used for qualitative study.

Results

RESULT

Research question one: What is the difference between the pre-test mean academic achievements of biology students in experimental and control groups Bauchi metropolis, Bauchi state, Nigeria?

What is the difference between pre-treatment mean academic motivations of biology students in experimental and control groups Bauchi metropolis, Bauchi state, Nigeria?

To answer research question two, the pre-treatment mean academic motivations scores of students in experimental and control groups were subjected to descriptive statistics of means and standard deviations were computer and used to draw the Table 1. From the Table, the means motivation of 1.63 and 1.64 for experimental and control were obtained with standard deviations of .591 and .591 respectively. The mean difference between the two groups of students was 0.01. The result therefore indicated that, there was slight difference between pre-treatment academic motivations of the two groups of students used for the study.

Table 1: Descriptive Statistics of Pre-treatment Motivation Scores of Biology Students in the Experimental and Control Groups

Group	N	Mean	Std. Dev.	Mean Diff.	Remark
Experimental	71	1.63	.591	0.01	Slight Difference (SD)
Control	66	1.64	.545		

Source: *Fieldwork, 2021*

Research question two: What is the difference between the post-treatment mean motivation scores of students taught biology using 7Es learning cycle and those taught using the conventional method Bauchi metropolis, Bauchi state, Nigeria?

To answer research question four, the retention academic achievement of students in experimental and control groups were subjected to descriptive statistics of means and standard deviations were computer and used to draw the Table 2. The result in the Table

disclosed the mean score of 3.03 with the standard deviation of .755 for students in the experimental group in the 4-point scale. The students in control group had the motivational mean of 1.86 with the standard deviation of .742. The mean difference of 1.22 obtained suggested that there was difference between the post-test mean motivations scores of the two groups of students used for the study. The result favored students in the experimental group.

Table 2: Descriptive Statistics of post-treatment mean motivation scores of Biology Students in Control and Experimental groups

GROUP	N	Mean	Std. Dev.	Mean Dif.	Remark
Experimental	71	3.03	.755	1.22	Large Difference (LD)
Control	66	1.86	.742		

Source: *Fieldwork, 2021*

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Testing the Null Hypotheses

The results were as presented in Tables 3 and 4

Null hypothesis one: There is no significant difference between the pre-treatment mean academic motivation scores of biology students in control and experimental groups in Bauchi metropolis, Bauchi state, Nigeria.

To test null hypothesis two, the pre-treatment mean academic motivation of biology students in the experimental and control groups were subjected to *independent Sample t-test* of statistics. Summary of the analysis are as show in Table 3. The documented Independent

Sample t-test result of null hypothesis disclosed the pre-treatment mean motivation scores of 1.6338 with the standard deviations of .59135 were obtained for students in the experimental group. Students in the control group had the mean of 1.6364 with standard deviation of .54454. The t-value stood at .026 at degree of freedom of 135 with $p=.979$. The p-value obtained was greater than the 0.05 level of significance. The outcome therefore shows that there was no significant difference between the pre-treatment motivations scores of the two groups of students used for the study. The null hypothesis was therefore retained.

Table 3: Summary of t-test analysis of pre-treatment mean academic motivation scores of biology students in Experimental and control groups

GROUP	N	Mean	Std. Dev.	Std. Error Mean	d	t	P-value	Dec.
Experimental	71	1.6338	.59135	.07018	135	0.026	0.979	Retained
Control	66	1.6364	.54452	.06703				

Source: Fieldwork, 2021

Null hypothesis two: There is no significant differences between post-treatment mean motivation scores of secondary school students taught biology using 7Es learning cycle and those taught using the conventional method Bauchi metropolis, Bauchi state, Nigeria.

The result post-treatment mean motivation scores of students in the control group in To test null hypothesis two, the mean retention performance scores of biology students in the experimental and control groups were subjected to *independent Sample t-test* of statistics. Summary of the analysis are as show in Table 4. The Table revealed the post-

treatment mean motivation score of 3.03 with standard deviation of .755 for students in experimental group. Students in control group had mean score of 1.86 with standard deviation of .742. The degree of freedom was 135 with the t-value of -6.790 and p -value of .000. The obtained p -value (0.00) was less than the alpha value of 0.05. The result suggested that the difference between the post-treatment motivation of students in control and experimental groups was significant. The mean difference favored students in the experimental group. The hypothesis was not accepted.

Table 4: Summary of t-test analysis of mean retention performance scores of biology students in Experimental and control groups

GROUP	N	Mean	Std. Dev.	Std. Error Mean	d	t	P-value	Dec.
Experimental	71	3.03	.755	.020	135	6.790	.000	Rejected
Control	66	1.86	.742	.091				

Source: Fieldwork, 2021

Result of Qualitative Analysis

The in-depth views of FGDP conducted were as presented in Table 5 (Figure 1) to The purpose of the quality approach in this study is to have in-depth views of the two

groups of the students used for the study regarding the instructional approaches used for the study.

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Theme One: Effect of 7Es LCI on Students' Motivation.

The theme focus on Students views on the effects of 7Es learning cycle instruction on their motivation in biology Bauchi metropolis, Bauchi state, Nigeria. To address the views of students under theme two, the following questions were asked;

Q1) what are your general view about your recent biology lessons on the Genetics topic?

Q2) How will you assess the method used by the teacher towards encouraging you understand biology?

Q3) how does your teacher encourage you to perform better?

Q4) what are some achievements you are proud of?

The views of students' regarding the above questions led to the development of four sub-themes; Interest, encouragement, confidence and motivation. Table 19 and Figure 5 is the analysis of participant's views on effects of 7Es learning cycle on their motivation in biology. The discussion of sub-themes that emerged under theme two are as follows;

Interest

According to Judith, Jessi and Stacy (2018), The term *interest* can describe two distinct (though often co-occurring) experiences: an individual's momentary experience of being captivated by an object as well as more lasting feelings that the object is enjoyable and worth further exploration. Interest is, therefore, both a psychological *state* characterized by increased attention, effort, and affect, experienced in a particular moment (*situational interest*), as well as an enduring *predisposition* to reengage with a particular object or topic over time. So also, Susan (2014) stated that, the necessity of interest in learning does not only mean that someone has an interest in learning about something. It also means that when someone has an interest in something it becomes easy and even enjoyable to learn about that topic. The views of students regarding interest sub-theme shows participant 2, 4, 6 and 9 mentioned that the teaching approach is interesting. For instance, participant 4 reported that "it was interesting, the teacher change the way he teach by making us do class exercises on our own". Likewise participant 2 said "yes,

the method was interesting because the teacher make the subject more interesting and simple unlike before that the lesson is boring". So also, participant 4 stated that 4 "true the teaching make me to start loving the subject because I did well in class activities and test". Similarly, participant 6 added that "is true the lessons are interesting and if the teacher will continue with the method, we will not be failing exams because it encourages us to learn". Furthermore, participant 7 said "Just like my friends said the lesson was interesting because of the way the teachers teach in a friendly way". So also, participant 9 mentioned that, he found the lesson interesting because he realized the teacher is just guiding them while they do everything that will make them learn. He added that if it was the teacher doing everything, he is sure the teacher will be teaching and some of them might be making noise. Allowing them to do exercises in class really help them to learn and make them like the subject and see it as one of the simple subjects.

Encouragement

According to Kentwood (2015), encouragement is one of the most powerful tools a teacher can use. It is often the key to unlocking untapped potential in students, especially those who have trouble learning. He further stated that, Encouragement gives students a visual reminder that they have the power to learn and succeed. They are especially effective when used sparingly or in moderation after students achieve learning milestones in the classroom. So also, Nicole (2021) revealed that students receiving encouragement in classrooms reported they felt more empowered to earn their degree and make better decisions regarding their career choices. In addition, the evidence is overwhelming that teachers and parents consistently offering words of encouragement to students contribute profoundly to their academic success. The views of participants 1, 3, 5, and 7 shows that the teaching method encouraged them to learn. For instance, participant 1 said "the way the teacher always encourages us to feel free and share ideas in class made me love the biology subject more, unlike the before that the teaching is more of copying note and teacher explanation". Similarly, participant 3 mentioned "yes, the

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teaching method encourage us to participate in class. The teaching method can make us; the students see the subject as simple and easy to understand". So also, participant 7 reported "the way of teaching is encouraging and it make me always eager to learn and I feel satisfy with that". Likewise participant 5 added "I agree with my friends if the school will make every teacher teach the same way, it will make student pass all the subjects and like studying their subjects".

Self-Confidence

According to Kriti (2020), confidence in students is vital for their success. The amount of self-confidence a student possesses will affect his or her educational goals. If a student loses confidence in school, his or her grades will ultimately be affected. When a student's self-confidence suffers, a child may give up on his or her hopes, dreams and plans. They may feel that they are unworthy of obtaining their goals or it is impossible to achieve them. Building confidence in students can help prevent student dropout rates, ensure that kids maintain their love for learning and help them achieve their dreams and goals. Likewise, UK Essays (2018) revealed that students who feel shy and hesitate to ask the various questions in the class are assumed to have lower level of achievement motivation. Whereas those who do not feel this kind of hesitation is expected to have higher level of achievement motivation. Confidence is "assuredness in oneself and in one's capabilities". Saga (2014), stated that that academic self-confidence in one's academic abilities is a significant predictor of academic performance.

The outcome of sub-theme 3 indicated that the teaching approach has improved student's self-confidence in biology. This was confirmed by participants 2, 4, 7 and 9. For instance participant 2 mentioned that "we learn more in class unlike before that we have to go home and start cramming the note given to us". Participant 4 added that "He make sure we participate in class by allowing us to find out solution to what we feel is difficult, and at the

end we see it very simple". Similarly, participant 9 said "He made us to grab as much as possible by asking us questions and doing class exercise". So also, participant 7 stated that, "The teacher encourages us by allowing us to find answers to class activities on our own. This help in reducing our fear and worry about the subject".

Motivation

According to NRC (2002), Learners' motivation to learn and sense of self affects what is learned, how much is learned, and how much effort will be put into the learning process. So also, Puja (2021) reported that, learning is self-initiated, but it must be aided by motives so that the learner will persist in the learning activity. A definite motive is valuable in all work, as motives make for readiness. The greater the readiness, the greater will be the attention given to the work on hand and the sooner will the desired result be achieved. The author added that, Motivation of learning activities helps the students to concentrate on what they are doing, and thereby to gain satisfaction. Continuous motivation is needed to help learners concentrate on the lessons to be learned. The views of participants under the sub-theme shows that, participant 1,2,3,6,7 and 9 reported the teaching improve their motivation. For instance participant said 2 "I am proud of my improved performance and the way I feel I always want to learn with my classmates". Similarly participant 3 stated "Me the major achievement I am happy with a part from passing the test is that I begin to like learning biology". Likewise participant 6 mentioned "Me I always feel happy to learning and passing my test and exams". Furthermore, participant 1 reported that "We are all proud of our performance and the way we are made to like biology lesson". So also, participant 7 added that "is true we are made to like biology through the way the teacher teaches and made us participate". In addition, participant 9 said "My major achievement I am proud of is the way I feel motivated to learn all the topics in biology".

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Table 5: Views of Biology Students on Role of 7Es LC on their Motivation

Views	Focus Group Participant									
	1	2	3	4	5	6	7	8	9	
Interesting		√		√	√	√				√
Encouraging	√		√		√		√			
Confidence		√		√				√		√
Motivation	√	√	√	√	√	√	√	√	√	√

Source: Fieldwork, 2021

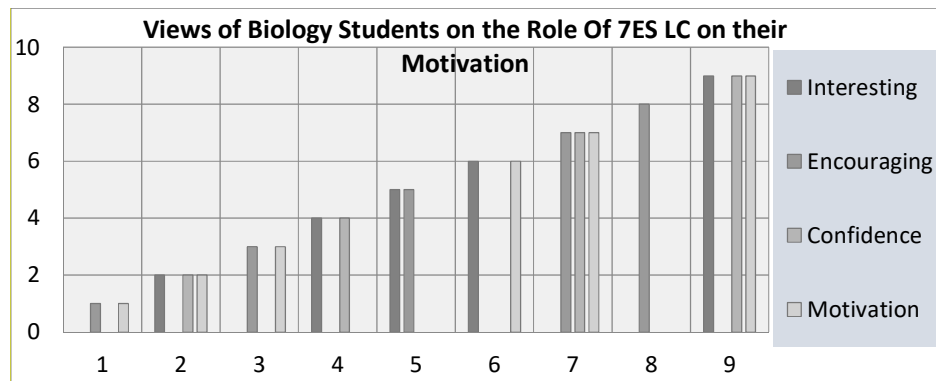


Figure 1: Model for Students' motivation in Biology

The discussion and view of students under theme three indicated that 7Es LCI plays important role in students' motivation in learning Biology. From the interaction, it can be deduced that the 7Es LCI improves students' interaction, sharing of ideas and views which promote their interest in the biology class. The approach improves their communication in class and enables them to ask and answer questions freely. They added that their interaction with the teacher and other colleagues promotes their self-confidence and motivation in learning biology.

DISCUSSION OF FINDINGS

The finding of research question one in Table 1 and test of corresponding null hypothesis two in Table 2 indicated that there was no significant difference in the mean motivation of control and experimental groups prior to the treatment. This was also documented in the report of Adamu and Jibrin (2017) who stated that, prior to the treatment, the attitude, motivation and performance of students in experimental and control groups were the same. Similarly, the study conducted by Adamu and Kusa (2018) reported that, the

behaviors, attitude, interest and performance of students expose to same treatment is almost the same prior the treatment.

The result of research question five and the corresponding null hypothesis suggested that students taught biology using 7Es learning cycle have higher level of motivation compare to their counterparts in the control group. This finding is similar to that of Ayaz and Şekerçi (2015) who found an effect size of .775 for the attitudes of students towards the use of the problem-based learning approach in science lesson. Furthermore, Semerci and Batdı (2015), and Anil and Batdı (2015) separately collected the studies related to constructivist approach and 5E learning cycle on student's achievement, retention and motivation, the results of the study indicated positive effect of the learning cycle. So also, the study conducted by Toraman and Demir (2016) in their meta-analysis on the effect of constructivism on attitudes towards lessons calculated an overall effect size was high.

The finding of FGDP revealed that 7Es LCI plays important role in students' motivation in learning. From the interaction, it can be deduced that the 7Es LCI improves

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students' interaction, sharing of ideas and views which promote their interest in the biology class. The approach improves their communication in class and enables them to ask and answer questions freely. They added that their interaction with the teacher and other colleagues promotes their self-confidence and motivation in learning biology. This is in agreement with the theory of constructivism which states that the teaching approach helps students to assist themselves which enhance their motivation

CONCLUSION AND RECOMMENDATION

The outcome of the study indicated that 7Es learning cycle has positive effects on academic performance, retention and motivation of biology students. This therefore means the implementation of 7Es LCI in biology would help to improve deep understanding and general performance of students in biology and could go a long way to reduce the poor performance of students especially at the SSCE level. Based on this, it was recommended that school principals through the heads of departments should encourage Biology teachers to make use of 7Es LCI in their classrooms since it improves students' motivation, understanding and self-confidence.

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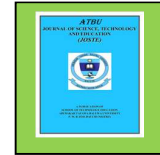
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