



Effect of 7E Learning Cycle on Cell Concept Performance Among Senior Secondary School Slow Learners in Katsina Metropolis, Nigeria

Ibrahim, Ahmed¹., Lakpini, M. A²., Abdulkarim, B.³, & Falalu, M. K.³

¹Department of Science Education Federal University of Kashere, Gombe State, Nigeria

²Institute of Education Ahmadu Bello University Zaria, Kaduna State, Nigeria

³Department of Science Education, Ahmadu Bello University Zaria, Kaduna State, Nigeria

Correspondence: ahmadkt21@fukashere.edu.ng, ahmadkt21@gmail.com

Abstract

The study investigated effect of 7E Learning Cycle on Cell Concept Performance among Senior Secondary School Slow Learners in Katsina Metropolis, Nigeria. Solomon four group design was used. One of the experimental and control groups were pre-tested and post-tested while the second groups were post-tested only. Four schools were selected using simple random technique and assigned to experimental and control groups. The total population was 5,459 SSII Biology students in Katsina Metropolis, out of which 352 students were purposively sampled using Student Intelligence Quotient Ability Test (SIQAT) and retrospective performance. Cell Performance Test (CPT) was used for data collection. The data was analysed using mean, standard deviation, and independent t-test, the post test result revealed significant difference between slow learners exposed to 7E learning cycle in the experimental group and those exposed to conventional method, 7E group performed significantly better than those in the control group. It was concluded that 7E learning cycle enhance better understanding of cell concepts. Some of the recommendations include; teaching of biology should be conducted using the 7E learning cycle as it makes students learn meaningfully and enhances better performance.

Keyword: 7E Learning Cycle, Cell Concept, Performance and Slow Learners

Citation: Ibrahim, A., Lakpini, M. A., Abdulkarim, B. & Falalu, M. K. (2022). Effect of 7E Learning Cycle on Cell Concept Performance Among Senior Secondary School Slow Learners in Katsina Metropolis, Nigeria. *Kashere Journal of Education*, 3(1): 138-145.

Submitted: 15/2/2022

Accepted: 17/4/2022

Published: 1/6/2022

Introduction

Biology plays a vital role in the economic development of a nation, which include solutions to the problem of food scarcity, pollution, population explosion, radiation, disease, health, hygiene, family life, poverty eradication, management and conservation of natural resources as well as biotechnology and ethics. Despite the importance of biology, there is still problem of poor performance in the subject, especially in the cell concepts. Adewale, Nzewuihe, and Ogunshola, (2016) reported that students have problem in answering question on the cell concepts. Especially on classify organisms based on their cellular forms. Students sometimes confused osmosis with diffusion when questions are set on such topics. The methodology used by some teachers in teaching the concept led to the poor performance. One of the factors responsible for

the poor performance includes conventional method of teaching. Also explained that poor performance among science students was because science teachers employ the Conventional method with little or no attention to the procedures that make students have good learning and understanding of basic concepts and principles (Jean, Etienne & Florian, 2021). This is because students fail to learn and understand science concepts not because they have no ability or interest, but because they find themselves presented with bits of knowledge or information out of their world of experiences. 7E learning cycle is one of the strategies which take into account of students' prior knowledge and allow the student to explore new knowledge based on their previous experience (Khaled, 2016).

7E learning cycle originated from Piaget's mental development model. 7E learning model



Ibrahim, A., Lakpini, M. A., Abdulkarim, B. & Falalu, M. K. ©2022 Federal University of Kashere

of instruction is a broad one encompassing seven phases each starting with the same letter; Elicitation, Engagement, Exploration, Explanation, Elaboration, Evaluation, and Extension. Elicitation Stage in learning cycle begins with the activation of prior knowledge in students about the subject matter. Shalini and Anurag (2018) suggest that the learner must possess concepts relevant to the new learning to be able to learn meaningfully. In this phase, the teacher has an opportunity to assess students existing concepts, while the students have the opportunity to recall their ideas. In general, the teacher directs students probing questions with respect to the subject to reveal students already acquired knowledge. The Engagement Stage requires active commitment of students. Hakan and Devrim, (2017) believes that motivation strategies that create interest in the topic, captivate students' attention and curiosity promotion are implement in this step. This step provides short activities seek to connect and organize to students' prior knowledge to prepare students for new learning and subsequently improves students' performance. In the exploration stage the general goal of this phase is to make student familiar with the concept and establish a desire to learn in the students. Hakan and Devrim, (2017) revealed in this stage the learners make observations, work collaboratively, raise questions, form relationships and conduct experiments with the assistance of prior knowledge. The teacher, on the other hand, guide students by asking probing questions and provides enough time to students for their exploration about the concept. These questions are generally the source of conflict between students' personal ideas. The explanation step is developed from the first three phases and includes additional opportunities for students to demonstrate their understanding. Istuningsih, Baedhowi and Sangka, (2018) said the involvement of students in this phase is necessary in order to avoid an expository format instruction. Students explain and share their thoughts, their observations, experiences, discoveries, and claim evidence in their own words with other students. The teacher organizes a discussion period and connects students' explanations with scientific clarification by highlighting the

important concepts. Students acquire new knowledge by connecting with prior experiences and the new experiences in this phase causes the re-evaluation of previous experiences. Students verbalize their understandings by using previously experienced knowledge during former phase which will help the students in understanding the cell concepts (Balta & Sarac, 2016). Evaluation stage aims to assess students to determine whether they gain the necessary knowledge and skills and whether they change their thinking or behaviour. Although the assessment of the learning occurs over all phases of learning cycle, achieving to educational objectives and obtaining scientifically correct understanding of the concept are evaluated at this phase (Khaled, 2016). The Extension phase aim to transfer of knowledge to encounter new phenomena and perform the learned knowledge in additional situations. The phase stress that the teachers need to be sure that students are able to apply their learning to new situations especially in daily life context. Shalini and Anurag (2018) were in the view that teachers motivate students to use recently gained knowledge in new contexts to deepen the understanding and to build new experiences over them at this phase. Lucidi (2014) was of the opinion that full benefits of education can be derived only when there is no bias in the gender concept a society holds. The need for gender complementarity goes beyond mere lending of helping hands for effective contribution to national development. For effective change to take place, females must be encouraged to develop interest in all disciplines, especially in science and technology, which has known for long as the realm of men alone. For effective social transformation, therefore there is need for both formal and informal education to address the gender imbalance in society that prevents females from being at their optimum best in the development race especially in science subject such as biology. The 7E learning cycle was a gender friendly as reported by studies such as Shalini & Anurag, (2018) and Khaled, (2016).



Statement of the Problem

Persistent poor performance leaves one in doubt of the effectiveness of the Conventional method. The use of Conventional methods of teaching was one of the reason of poor performance among senior secondary school biology students. With little or no attention to the procedures that make students have good learning and understanding of basic concepts and principles (Jean, Etienne & Florian, 2021). The Conventional method is said to have such shortcomings because it only appeals to the learners' auditory sense. Thus, there is the need for better instructional strategies to be used to ensure effective and meaningful learning by the students. This is because students fail to learn and understand biology concepts not because they have no ability or interest, but because they find themselves presented with bits of knowledge or information out of their world of experiences which directly correlate of negative transfer of learning. This means that low retention may lead to low performance. 7E learning cycle is one of the strategies which take into account of students' prior knowledge and allow the student to explore new knowledge based on their previous experience. Therefore, this study investigated the effect of 7E learning cycle on performance in cell concepts among senior secondary school slow learners in Katsina metropolis.

Objectives of the Study

Specifically, the study was set to achieve the following objectives:

1. Determine the effect of 7E learning cycle on performance in Cell concepts among slow learners.
2. Determine the effect 7E learning cycle on performance between male and female slow learners.

Research Questions

1. What is the difference between mean performance scores of Slow Learners taught Cell concept with 7E learning cycle and those taught with conventional method?
2. What is the difference between mean performance scores of male and female Slow Learners taught with 7E learning cycle?

Null Hypotheses

- H₀₁ There is no significant difference between mean performance scores of Slow Learners taught Cell concept using 7E Learning cycle and those taught using conventional methods
- H₀₂ There is no significant difference between mean performance scores of male and female Slow Learners taught with 7E Learning cycle.

Methodology

The study was quasi-experimental with Solomon four-group design. Two group of participants (Control 1 and Treatment 1) were given treatment and post-test while the other two group of participants (Control 2 and Treatment 2) were given pre-test before the treatment and post-test after the treatment.

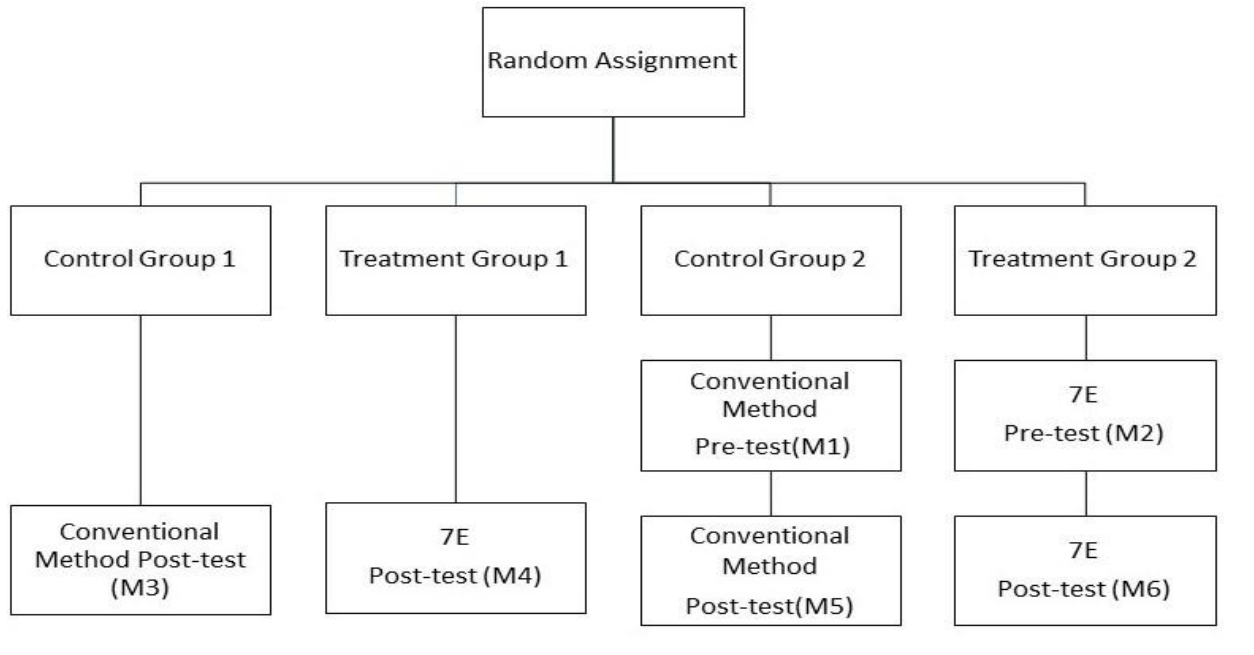


Figure I: Solomon four-group experimental design

The experimental group were taught using the 7E learning cycle, lesson note which was prepared using the 7E phases for the period of six weeks and 80 minutes per lesson while conventional method of teaching was used for the control group for a period of six weeks and 80 minutes per lesson.

The population comprised of all the SSII biology Students in Public Secondary Schools in Katsina metropolis. The total population was 5,459 which consisted of 2920 males and 2539 females' students. Out of which three hundred and fifty-two (352) slow learners, were purposively selected based on their performance on Student Intelligence Quotient Ability Test (SIQAT) and Retrospective result of each student.

Four schools were randomly selected by simple random sampling technique and assigned to treatment group I and II and control group I and II. Two Intact Classes were randomly selected from each of the sampled schools while three hundred and fifty-two (352) senior secondary school biology slow learners, were purposively selected based on their performance on Student Intelligence Quotient Ability Test (SIQAT). The students were given Student Intelligence Quotient Ability Test (SIQAT) which was marked and recorded. Retrospective result of

three consecutive term of each student was collected, average was computed and compared with their performance on the Student Intelligence Quotient Ability Test (SIQAT). Students that score less than 32.4% of the IQ test were classified as slow learners based on the Stanford Binet IQ scale (Morvarid, 2016 and Philip, 2007).

Two (2) instruments were used in this study. These are:

1. Cell Performance Test (CPT);
2. Student Intelligence Quotient Ability Test (SIQAT).

The Cell Performance Test (CPT) consisted of two sections. Section A; contained name, school name, sex, and Section B consisted of twenty-five multiple choice test items. A panel of experts carried out the content validity of the Cell Performance Test (CPT) from Department of Science Education Ahmadu Bello University Zaria. Test re-test method was used to determine reliability of the Cell Performance Test (CPT) and its correlation coefficient was found to be 0.81. The treatment last for a period of six weeks' after which the post-test was administered to the groups and the researcher marked the scripts based on the marking scheme and recorded the scores which were used for data analysis.



Results

Research Question I:

What is the difference between mean performance scores of senior secondary school slow learners taught Cell concept with 7E

Learning cycle and those taught using conventional method?

To answer research question one, descriptive statistic using mean and mean difference were used. The detail of the result is presented in Table 4.1

Table 1: Performance of Senior Secondary School Slow Learners Taught Cell Concept with 7E Learning Cycle and Conventional Method

Groups	Pre-test Mean	Post-test Mean	N	Mean Diff.
7E (M2 &M4)	22.64	55.09	88	
Conventional Method (M1 &M3)	21.50	49.36	88	5.73
7E (M6)		55.68	88	
Conventional Method (M5)		48.75	88	6.93

Table:1 reveals that the experimental groups, 7E (M4) with mean of 55.09 and (M6) with mean of 55.68 While for the control groups Conventional Method (M3) with mean of 49.36 and (M5) with mean of 48.75. The mean difference between 7E (M4) and Conventional method (M3) is 5.73 while the mean difference between 7E (M6) and Conventional method (M5) is 6.93. This implied that differences exist between the means of experimental and control group.

Research Question II:

What is the difference between mean performance scores of male and female senior secondary school slow learners taught with 7E Learning cycle?

To answer question two, descriptive statistic using mean and mean difference was used. The detail of the result is presented in Table 2.

Table 2: Mean and Mean Difference of Performance scores of Male and Female Slow Learner taught with 7E learning Cycle.

Groups	Test Type	N	Sex	Mean	Mean Diff.
7E (M4)	Post-test	44	Male	56.162	0.21
		44	Female	55.953	
7E (M6)	Post-test	44	Male	55.681	1.09
		44	Female	54.582	

From Table 2 mean performance scores of male slow learners taught with 7E Learning cycle are 56.162 and 55.681 while for female are 55.953 and 54.582 while the mean differences are 0.21 and 1.09 for Post-test (M4) and Post-test (M6) groups respectively.

To find out the significance difference between the means of experimental and control group hypothesis one was tested using independent t-Test.

H_{01} There is no significant difference between mean performance scores of senior secondary school slow learners taught Cell concept using 7E Learning cycle and those taught using Conventional methods.

Hypotheses testing

Hypothesis One

Table 3: t-test Analysis of Mean Performance Scores of Senior Secondary School Slow Learners Taught Cell Concept with 7E Learning Cycle and Conventional Method

Variable	N	df.	Mean	SD	P	Remark
7E (M4 & M6)	176	350	55.39	17.13	0.016	Rejected
Conventional Method (M3 &M5)	176		49.06	18.74		



Table 3 Shows P-value of 0.016 which is less than 0.05 α -value, which revealed that there is significant difference between the groups in favour of 7E which had the highest mean score. The experimental group performed significantly better than those in the control group taught with Conventional method. Therefore, the hypothesis which stated there is no significant difference in the mean performance scores of senior secondary school slow learners taught cell concept with 7E

learning cycle and Conventional method was rejected.

Hypothesis Two

To find out the Significance difference in the mean performance scores of male and female hypothesis two was tested using independent t-Test.

H₀₂ There is no significant difference between mean performance scores of male and female Slow Learners taught with 7E Learning cycle.

Table 4: t-test: for Mean Performance of Male and Female Senior Secondary School Slow Learner taught with 7E learning cycle.

Variable	N	Mean	df.	SD	P	Remark
Male	88	55.829	174	20.23	0.901	Accepted
Female	88	55.500		20.99		

From Table 4 the t-test result reveals that there is no significant difference in the mean scores of male and female senior secondary school slow learners taught with 7E learning cycle. The p- value for the two groups is 0.901 which was found to be higher than 0.05 α -value of significance. The result revealed there is no significant differences between mean performance scores of male and female Slow learners. Therefore, the hypothesis which stated that there is no significant difference in the mean scores of male and female slow learners taught with 7E learning cycle is accepted.

The result revealed that:

- i. There is significant difference between mean performance scores of senior secondary school slow learners taught Cell concept using 7E Learning cycle and those taught using lecture methods, with 7E Learning cycle having the highest mean performance score.
- ii. There is no significant difference in the mean scores of male and female senior secondary school slow learners taught with 7E learning cycle.

Discussion of Findings

The result of research question one revealed there is significance difference between the 7E learning cycle and conventional method groups. The mean values indicated that 7E

group had the highest mean score which means, the 7E learning cycle group performed significantly better than those in the control group taught with conventional method. The reason behind the better performance of the experimental group may be due to Eliciting stage that was done at the beginning of the lesson to attract students' attention and stimulate their initial thinking so that the students can develop their competence. The difference in results between experimental and control groups have proven that the use of 7E learning cycle is very effective in improving slow learner's learning outcomes. This reinforces the previous research conducted by Morvarid (2016), Khaled (2016) and Mulyono & Noor (2017), who individually found out that there is difference in the performance of students when exposed to 7E learning Cycle and Lecture methods. The usage of 7E learning cycle in science courses increases students' academic and conceptual achievement more efficiently since the model give students the chance to explore.

The result of research question two revealed there is no difference in the mean scores of male and female senior secondary school slow learners taught with 7E learning cycle. 7E can improve students' learning outcomes irrespective of gender by making the learning process interesting. This finding is in agreement with that of Al Eid (2014),



Ibrahim, A., Lakpini, M. A., Abdulkarim, B. & Falalu, M. K. ©2022 Federal University of Kashere. Avcioglu, (2015) and Balta & Sarac (2016), who found out that there is no gender difference in the academic performance of students when exposed to 7E learning cycle and lecture methods. In addition to creating a safe and open learning environment, the researchers suggest that giving attention to the different learning styles of males and females will provide much opportunity to improving gender equity in the science classroom. Female learning styles are generally more cooperative and interdependent than their male counterpart (NSTA, 2011).

Conclusion

From the findings of this study, it could be concluded that the use of 7E learning cycle improves students' performance and better understanding of cell concepts. This because all senior secondary school slow learners exposed to it, exhibited better performance when compared to those exposed conventional method of teaching.

Recommendations

Based on findings from this study, the following recommendations were made:

- i. The teaching of Biology especially cell concept should be conducted using 7E learning cycle as it makes students learn meaningfully, enhances better performance.
- ii. Biology teacher can employ the use of 7E learning cycle since it is not gender bias.

References

Adewale, A. M., Nzewuihe, G. & Ogunshola, F. (2016). Academic Performance in Biology at Secondary School Certificate Examination (SSCE) and the Influencing Factors among Students in Owerri Municipal of Imo State, Nigeria. *International Journal of Education and Evaluation* ISSN 2489-0073 Vol. 2 No.1 www.iiardpub.org

Al Eid, W. (2014), The effect of teaching a suggested unit based on 7E model in the development of mathematical communication skills in geometry and their retention by the 9th grade students in

Gaza. Unpublished PhD Thesis, Al Azhar University, Gaza, Palestine.

Avcioglu, O. (2015). Investigation of the effects of 7E model on success, in the subject of newton laws of second grade high school students' physics classes (Master Thesis). Gazi University, Ankara, Turkey.

Balta, N. & Sarac, H. (2016). The Effect of 7E Learning Cycle on Learning in Science Teaching: A meta-Analysis Study. *European Journal of Educational Research*, 5(2), 61-72. doi: 10.12973/eujer.5.2.61

Hakan, S. & Devrim T. (2017) Effect of Multimedia Assisted 7E Learning Model Applications on Academic Achievement and Retention in Students. *European Journal of Educational Research*. 6(3), 299 – 311.

Istuningsih, W., Baedhowi, B., & Sangka, K. B. (2018). The effectiveness of scientific approach using e-module based on learning cycle 7E to improve students' learning outcome. *International Journal of Educational Research Review*, 3(3),75-85.

Jean, B. N., Etienne B. and Florian N. (2021). Factors contributing to the students' poor performance in biology subject: A case study of ordinary level in rural secondary schools of Rwamagana district. *GSC Biological and Pharmaceutical Sciences*, 15(03), 249–261.

Khaled K. (2016). The Effectiveness of Using the 7E Learning cycle on the Immediate and Delayed Mathematics Performance and the Longitudinal Impact of Learning among Preparatory Year Students at King Saud University (KSU). *Journal of Education and Practice*, 7(36), 40-52. Retrieved from www.iiste.org. on 12th June 2017.



Mulyono, A. & Noor, N. L. (2017). Self-Regulation and Problem-Solving Ability in 7E-Learning Cycle Based Goal Orientation. *The 3rd International Conference on Mathematics, Science and Education Journal of Physics: Conf. Series* 824 .012035 doi:10.1088/1742-6596/824/1/012035.

Morvarid, B. (2016). The study of effectiveness of seven-step (7E) teaching method in the progress of English learning in student's

Shiraz city. *The Turkish Online Journal of Design, Art and Communication* 2no 341-346.

Philip, C. (2007). *IQ and Aptitude Tests*, Kogan Page Limited Great Britain.

Shalini, S. & Anurag, S. (2018). 7E Learning cycle: A Paradigm Shift in Instructional Approach. *Shanlax International Journal of Education*. 6(2):13-22.