



Effect of 7e's Learning Cycle Model on Secondary School Students' Interest in Physics in Akwa North Local Government Area.

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Abstract

Effect of learning cycle model on secondary school students' interest in physics was determined. Two research questions and two hypotheses guided the study. The research design adopted was quasi-experimental specifically pretest, post-test non-equivalent control group design. Two groups made up of 52 SS2 students offering physics were drawn from the population of 378. Physics interest rating scale was used to collect data for the study and three experts validated the instrument. The reliability coefficient of 0.89 was obtained using Cronbach Alpha method. Mean and standard deviation were used to answer the research questions while analysis of covariance was used to test the null hypothesis at 0.05 level of significance. The findings indicated that 7Es learning cycle had a significant positive effect on the interest of the students in physics. Also, gender did not influence the interest of the students when taught with 7Es learning cycle model. It was recommended that physics teachers should use the 7Es learning cycle model for physics instruction to motivate and sustain students' interest in the subject.

Keywords: Learning Cycle Model, Interest, Physics, Secondary School.

Introduction

Physics deals with the study of laws that determine the structure of the universe with reference to the matter and energy in the universe (Ike, 2014). Physics is the most utilized basic science subjects in most technology and technology-related profession. This merely indicates that the enormous role Physics plays in the technological growth of any nation must not be undermined. Physics is the most basic of science and its concepts and techniques underpin the understanding of all other branches of science. The knowledge of physics facilitates our understanding of other disciplines; thorough understanding of quantum mechanics is necessary to chemists and material scientists since the structure of every atom in the universe is determined by quantum mechanics. Physics is also a cross-cutting discipline that has applications in many sectors of economic development, including health, agriculture, water, energy and information technology.

Particularly, in our world developing with technological changes, the place of physics and its applications is quite important. Notwithstanding, the numerous benefits of physics especially in the development of science and technology of any Nation. Physics is a boring Subject for many students especially those in the secondary schools. Also, abstract concepts such as electricity, electric field, magnetism, electromagnetic induction and electromagnetic waves lead to misconceptions in

cognitive processes and logical thinking development of students and consequently cause many problems experienced by students (Yigit, Akdeniz & Kurt, 2012). If students understand that physics concepts are not abstract and they are directly related to their lives, they may learn physics by feeling since their interest in the subject may improve.

Interest is the direct bearing to the quality of work and educational attainment. Interest is an important variable in learning because when one becomes interested in an activity, one is likely to be more deeply involved in that Activity (Akin & Karplus, 2016). Interest is the motive that serves as important influence in producing both activities and attitudes that are favourable to learning. According to Nworgu (2015), interest can be seen as the cause of certain actions. To Nworgu, interest acts as a drive or motivation that propels people to act in certain ways and make room for better Performance. This is because according to Okigbo and Okeke (2011), one becomes interested in an activity one is likely to be more deeply involved in that activity. The use of 7e's learning cycle model in teaching involved such activities hence the Researchers investigated the effect of the model on interest of secondary school students in physics in Awka North LGA of Anambra state.

7e's learning cycle model is an inquiry-based teaching approach which is grounded on the theory of constructivism. Constructivism is a theory that explains how knowledge is constructed in human



being when information comes in contact with existing knowledge that had been developed by experiences. Proulx (2006) defined constructivism as a view of learning based on the belief that learners are not empty vessels that are waiting to be filled by the teachers with objective knowledge from an external world. Hence, the use and development of the 7e's learning cycle model which involved eliciting the knowledge of the Learner. Constructivist perspective views learning as an active knowledge construction process in the mind of the learner instead of the acquisition from outsiders in an already organized form.

The 7e's learning cycle model as created by Karplus in the Late 1950's and fully developed by Atkin and Karplus in 1962, is an expansion of the 5e's learning cycle. It places a greater emphasis on prior experience and eliciting tacit knowledge that can be used as a foundation for the learning to come. The "transfer of learning" and the importance of "eliciting prior knowledge" is greatly emphasized. The 7e's Learning cycle model is used in teaching senior secondary school's students some physics concepts. The model has seven (7) phases; therefore, it requires instruction to include the following discrete elements: engage, elicit, explore, explain, elaborate, evaluate and extend (Eisenkraft, 2003). Each learning cycle begins with the active engagement of students in inquiring the concepts. In engage phase, the teacher may use a relevant scenario or a simple experiment activity just to capture students' attention, raise questions in their minds and assess their prior knowledge about the subject matter. After the initial engagement, eliciting of prior knowledge about the subject matter takes place. This elicits phase lets the teacher assess any misconceptions the students have. During the explore phase, children are encouraged to play with the materials, discover how things work, talk among themselves and with the teacher/leader; they generally work in groups. The explore phase is student-centered with the teacher acting as facilitator by providing materials, giving directions, asking questions and encouraging students' discovery.

The students are introduced to models, laws, and theories during the explain phase of the learning cycle (Eisenkraft, 2003). The teacher guides the discussion as he/she works with the children to organize data, look for patterns, make comparisons, and identify problems. After all students have constructed and expressed understanding of the concept, the teacher may introduce related scientific

terminology. Then, students are asked to look for many solutions and ideas, not just one "correct" answer. They might repeat the activity or they might wonder about some component or application of the activity, thus beginning the cycle again as they explore a new idea. This elaborate phase of the learning cycle provides an opportunity for students to apply their knowledge to new domains, which may include asking new questions and making new hypothesis (Eisenkraft, 2003). These applications help extend and expand students' understandings and apply the concept to everyday life experiences. The extend phase gives students opportunity to see the relationship between what they have just learned and how it applies to their own life. To make sure the students have understood the subject matter, the students and the teacher employ the evaluate phase. The researcher intends to find out how the Students Interest would be enhanced when taught the Propagation of Sound Waves using 7e's learning cycle and conventional method.

Statement of the Problem

The problem of low interest in science subjects especially Physics has for long ceased to be news. Researchers and physics teachers have ever since been seeking ways to bring the interest of students to an appreciable extent. This stands to be a great challenge facing the education system in Nigeria. Although many other challenges such as quality of science teachers, lack of science equipment, poor incentives among others have over time been queried, further investigations still have to be carried out especially using students since they are the primary factors here.

These factors have over time resulted to gross lack of interest in physics which often lead to low enrollment in the subject especially the females. This situation is causing a lot of concern to science educators. There is considerable evidence in literature to show that traditional physics instruction, predominantly based on lectures and manipulation of formulae to teach a concept is ineffective. It is against this backdrop and quest for better ways of providing effective teaching and learning of physics concepts that the researchers are motivated to embark on the present study. The problem of the study therefore, is "what is the effect of 7e's learning cycle model on senior secondary schools' students' interest in physics in Awka North LGA of Anambra state"?



Purpose of the Study

The purpose of this study was to determine the effects of 7Es learning cycle model on interest of secondary school students in physics in Akwa North LGA of Anambra state. Specifically, the study determined the:

1. mean interest rating scores of students taught physics using 7Es learning cycle model and those taught using the conventional method.
2. mean interest rating scores of male and female students taught physics using 7Es learning cycle model.

Research Questions

The research questions guiding the study were:

1. What are the mean interest rating scores of students taught physics using 7Es learning cycle model and those taught using the conventional method?
2. What are the mean interest rating scores of male and female students taught physics using 7e's learning cycle model?

Hypotheses

The following null hypotheses were tested at .05 level of significance.

1. There is no significant difference between the mean interest rating scores of students taught physics using 7Es learning model and those taught using the conventional method.
2. There is no significant difference between the mean interest rating scores of male and female students taught physics using 7Es learning model.

Method

The design of the study was quasi-experimental. Specifically, the pre-test post-test non-equivalent control group design was used. The population of the study comprised 378 Senior Secondary two (SS2) students offering physics in the 2019/2020 academic session from the eight public secondary schools in Awka North Local Government of Anambra state. The sample size of 52 SS2 physics students from two

out of the eight public secondary schools in the Area. Purposive and simple random sampling techniques were adopted to draw the sample. First, only the co-educational schools were selected by purposive sampling. Secondly, two out of eight were selected by simple random sampling technique. All the SS2 Physics Students in the selected two schools formed the sample size. Finally, the two classes were randomly assigned to experimental and control groups. The experimental group (school) has a total of 30 students while the control group (school) has a total of 22 students.

The instrument used for data collection was Physics Interest Rating Scale (PIRS) with about 23 items. The PIRS is a formally standard interest scale part of which was gotten from Bakare (1977) adopted and modified by the researcher to suit the purpose of the study. The instrument was presented to three research experts in science education and measurement and Evaluation from Nnamdi Azikiwe University, Awka. To establish the validity of the instrument the PIRS was trial-tested on one intact class of SS2 students offering physics in a school in Awka south LGA of Anambra state. The responses obtained were collated and scores subjected to Cronbach Alpha statistical analysis and a score of .89 was gotten. The researchers accept the internal consistency value of .89 to be reliable and good for the study.

The experimental group was taught physics concepts using 7e's learning cycle model for four weeks while the control group was taught the same concepts within the same period using the conventional lecture method. Mean scores and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at .05 level of significance.

Results

Table 1: Difference between mean interest rating scores of SS2 students taught physics using 7Es learning cycle model and those taught using the conventional method

Group	N	Pre-interest		Post-interest		Mean gain
		X̄	SD	X̄	SD	
Experimental	30	38.12	6.11	61.66	4.88	23.54
Control	22	31.82	7.44	49.34	3.91	17.52
Mean difference		6.30		12.32		6.02



Data in Table 1 show that the experimental group (7e’s learning cycle) gained a mean interest score of 23.54 while the control group (conventional method) had a gain mean of 17.52. The difference in their mean gain is 6.02 in favour of the experimental

group. This indicate that 7Es learning cycle model prove to be more effective in improving their interest.

Table 2: Difference between mean interest rating score of male and female students taught physics using 7e’s learning cycle model

Experimental Group	N	Pre-interest		Post-interest		Mean gain
		\bar{X}	SD	\bar{X}	SD	
Male	18	36.23	7.09	76.10	5.13	39.87
Female	12	35.22	8.25	69.02	4.45	33.8
Mean difference		1.01		7.08		6.07

Data in Table 2 reveals the difference between mean interest rating score of male and female students taught physics using 7e’s learning cycle model. The analysis shows that male has 39.87 while the female had 33.8. The difference in their mean gain is 6.07 in favour of the males.

Hypothesis testing

Table 3: ANCOVA test of the difference in the mean interest rating scores of SS2 students taught physics using 7Es learning model and those taught using the conventional method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1268.389 ^a	2	634.194	40.306	.000
Intercept	1528.879	1	1528.879	97.167	.000
Interest	107.460	1	107.460	6.830	.011
Treatment	618.797	1	618.797	39.327	.000
Error	1038.481	50	15.735		
Total	45582.000	52			
Corrected Total	2306.870	51			

a. R Squared = .664 (Adjusted R Squared = .682)

Table 3 shows that there is significant effect on the interest of students taught with 7Es learning cycle model, $F(1,50)=6.83$, $P=0.011<0.05$. This means that the null hypothesis is rejected, thus, there is a significant difference between mean interest rating scores of SS2 students taught physics using 7e’s

learning model and those taught using the conventional method.

Table 4: ANVOCA test of the difference in the mean interest rating scores of male and female students taught physics using 7Es learning model

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	6356.390 ^a	1	6356.390	276.005	.000
Intercept	644403.000	1	644403.000	27981.086	.000
Gender	6.614	1	6.614	1.245	.008
Treatment	6356.390	1	6356.390	276.005	.000
Error	2671.474	28	23.030		
Total	655788.000	30			
Corrected Total	9027.864	29			

a. R Squared = .704 (Adjusted R Squared = .702)

Table 4 shows that $F(1,28)=1.245$, $P=0.008<0.05$. This implies that the difference between the mean interest rating score of male and female students taught physics using 7e’s learning model is significant.

Discussion

The finding revealed that the mean interest ratings of students taught using 7e’s learning cycle is higher than those taught using the conventional method. Students developing more interest in 7e’s learning cycle model than their counterpart taught using the conventional method could be as a result of the



learning activities and creativity involved in teaching which involves the researcher providing structures, materials and guided the participants' progress through problem-solving to discover answers to instructional topics at hand. This finding was in tandem with the finding of Aquinas, Ossei and Ghartey (2014) that students' interest scores taught using 7e's learning cycle is higher than those taught using the conventional methods in physics. This finding also agreed with the finding of Mecit (2006) that the experimental group achieved significantly better than the control group in using 7e learning model on interest. The findings of Balta (2016) supported that 7E learning model cycle have a positive effect on interest of students.

The finding revealed that mean interest rating score of male students taught 7e's learning cycle is higher than their female counterpart. This means that the use of 7e's learning cycle was effective and has the potential of improving male students' interest rating in physics. This implies that the male participants had better interest scores than their female counterparts when taught physics using 7e's learning cycle. This finding agreed with the finding of Aquinas, Ossei and Ghartey (2014) mean interest scores of male students taught physics using 7e's learning cycle is higher than their female counterpart.

Conclusion

From the Findings of this study, it was concluded that 7Es learning cycle model is effective in enhancing the interest of students in physics. Also, the interest of males was observed to be higher than females however the interest of both male and female witnessed a significant improvement.

Recommendations

The following recommendations were made based on the Findings,

1. Physics Teachers should use the 7Es learning cycle model for physics instruction so as to check, motivate and sustain students' interest in the subject.
2. Seminars, Workshops and Conferences should be organized and sponsored by the Government and Science Teachers Association of Nigeria (STAN) to educate and encourage teachers on the use of efficient interest sustaining methods such as 7e's learning cycle model.

3. Curriculum Planners Should include 7Es learning cycle model in the curriculum of teacher's education programme and training to enable easy Adaption and transfer to Students during Teaching and learning of physics.

References

- Akin, J. M., & Karplus, R. (2016). Discovery on invention. *Journal of Science Teachers Association of Nigeria*, 29(5), 45-49
- Aquinas, Ossei & Ghartey (2014). An investigation into Physics teaching in senior high school. *World Journal of Education*, 4(5), 40-50
- Balta, N. (2016). The effect of 7e learning cycle on learning in science teaching: A meta-Analysis Study. *European Educational Research Journal*, 5(2), 61-72
- Eisenkraft, A. (2003). A 7E model emphasizes transfer of learning and the importance of eliciting prior understanding (Blog post). *The Science Teacher*, 70(7), 12-24.
- Eisenkraft, A. (2003). Expanding the 5e Model. *The Science Teacher*, 70(6), 56-59.
- Ike, E.E. (2014). Essential principles of Physics, Jos. *Enic publishers*
- Mecit, Ö. (2006). The effect of 7e learning cycle model on the improvement of fifth grade students' critical thinking skills. A Thesis submitted to the graduate school of natural and applied sciences of middle-east technical University.
- Nworgu, B.G. (2015). Educational research: *Basic issues and methodology* Nsukka, Enugu state. University Trust Publishers
- Okigbo, E.C. & Okeke, S.O.C. (2011). Effects of games and Analogies on students' interest in Mathematics. *Journal of the Science Teachers Association of Nigeria (JSTAN)*, 46(1), 101-112
- Proulx, J. (2006). Constructivism: A re-equilibration and clarification of the concepts and some



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potential implications for teaching and pedagogy. *Radical pedagogy*, 8(1)

Yigit, N., Akdeniz, A.R. & Kurt, S. (2012).
Development of worksheets in physics

teaching”, New Millennium at the beginning
of the Year of Science and Education
Symposium Proceedings, Maltepe
University, İstanbul, (151-157).