



EFFECT OF CONVERGENT THINKING STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN PHYSICS IN ENUGU EDUCATION ZONE OF ENUGU STATE

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ABSTRACT

The study determined the effect of Convergent Thinking Strategy on Senior Secondary School Students' Achievement in Physics in Enugu Education Zone, Enugu State. The study was guided by two (2) research questions and three (3) research hypotheses. The design of this study was pretest-posttest non-equivalent control group quasi-experimental design. The population for the study was 5,442 Senior Secondary School Two (SSS1) students in the 31 secondary schools in Enugu Education Zone for 2025/2026 academic session. The sample size of the study was 294 SSS1 students in the three (3) out of 21 coeducational secondary schools in the zone. Purposive and simple random sampling techniques were used to sample the three (3) coeducational secondary schools and the two (2) intact classes used in each school. The instrument used for data collection was Wave Achievement Test (WAT). WAT was both content and face validated by two experts in Science Education and one expert in Measurement and Evaluation, all from the faculty of education, ESUT. The reliability estimate for WAT was determined using Kuder-Richardson formula 20 (K-R 20) method. A K-R 20 reliability coefficient of 0.89 was obtained for WAT, which indicated that WAT was reliable. WAT was administered as pretest before the treatment by the research assistants. Scores of the students were recorded and kept for use after the experiment. Mean and standard deviation were used in answering the research questions while Analysis of Covariance (ANCOVA) was used to test the research hypotheses at 0.05 alpha levels. The study discovered among others that Convergent Thinking Strategy was more effective in improving achievement in the topic of waves in Physics than expository method, divergent Thinking Strategy is equally effective for both male and female students, promoting equitable learning opportunities regardless of gender and there is no significant interaction effect between methods (CTS and expository method) and gender on the achievement scores of students in wave. The study concluded that use of Convergent Thinking Strategy is effective in enhancing students' achievement in waves. The study recommends that Physics teachers should be encouraged to adopt Convergent Thinking Strategy as an effective method of teaching complex concept like waves, workshop and professional development programs should be organized to train teachers in the effective use of innovative instructional methods such as CTS and educational authorities should revise the Physics curriculum to incorporate teaching strategies that foster creativity, problem-solving and critical thinking.

Keywords: Convergent Thinking Strategy, Achievement and Physics.



Introduction

Science Education includes all learning processes designed to give students endless opportunities to understand and apply the knowledge, skills, and attitudes needed to thrive in a scientific and technological society. Science education is a vital field of study that takes into account both the science discipline's subject matter, such as Physics, Biology, Chemistry, Agriculture, and so on, as well as the process involved in teaching and learning in science (Onah & Nnadi, 2022). It is in the achievement of this objective that we hope to produce the requisite scientific and technological expertise which will aid in bringing about the much-needed socio-economic development. This expertise, however, can only be developed through a well-organized and effective science and technology education system.

The only way to effectively advance science and technology is via high-quality scientific education. Science education provides a strong foundation for future scientific careers and helps individuals become informed citizens capable of making rational and evidenced-based decisions. (Jolaoluwa, Mustapha, Salami, Ogundeji and Oluwagbemi, 2024). Effective science education includes both content knowledge and development of scientific inquiry skills. It involves hands-on experimentation, observation, data analysis and communication of scientific findings. By engaging in scientific practices, students learn to think like scientists and develop problem-solving skills. In order to achieve this purpose of scientific education, we intend to generate the necessary huge pool of scientists and technologists who will aid the country's much-needed socio-economic growth. The only way to create these professionals is through a systematic and effective science and technology education. One component of science education is Physics education.

It is important to note that among all the science subjects, Physics is one of the core science subjects that are taught at the Senior Secondary School and it is made optional for senior Secondary School students (NPE, 2024). Physics is also taught at the Junior Secondary School level, though combined with other science subject, which is known as Basic Science. The presence of physics concepts at both junior and senior classes shows its importance to other subjects. According to Obasi (2021) Physics enables students to acquire basic concepts and principles of the various branches of science and also enable the students to acquire essential scientific skills and attitudes as a preparation for the technological application of the various science subjects. These objectives of studying Physics have been applauded in the sense that it can make a student to fit into the modern age at the completion of his/her secondary education. The benefit derived from the study of Physics are enormous as the subject perpetually serve as the springboard for the technological advancement of different nations. In consideration of these benefits, it becomes imperative to adopt innovative teaching strategies that would enhance better understanding of the subject if nations must stay afloat in this era of global competitiveness. These strategies encourage the teaching of Physics such that it stimulates interest and enhances deeper understanding to enable learners develop the necessary skills required to confront the emerging challenges of the 21st century. Achieving these objectives is possible if only the teaching strategy adopted by the teacher are learner-centered, learners' friendly and hands-on (Bassey and Ekpo, 2020).

Most often, the expository lecture method is the predominant instructional approach widely used in teaching different school subjects including Physics. The approach which is classified as



teacher-centered is characterized by certain setbacks such as lack of active learners' participation during lesson and low learning outcome. Ugwu and Nzewi (2015) maintained that the lecture method which was successfully used in imparting knowledge in the past seems to be obsolete and has equally failed to produce the desired outcomes in the contemporary students of the 21st century. Studies has also shown that this conventional method of teaching has failed to yield the desired outcome in terms of students' retention and learning processes when compared with innovative teaching methods. (Okeke, 2016; Ogbaga & Osuafor, 2022). The situation calls for advocacy by scholars for a radical shift to innovative teaching strategies (Ntibi, Agube, and Neji, 2020; Adeoye, 2020).

Convergent Thinking Strategy was discovered by an American Psychologist, Joy Paul Guilford in 1950 and modified in 1982 (Guilford, 1982). Yet, according to Nezhad (2013), convergent thinking is a term proposed by Hudson in 1967. Williams (2013) defined convergent or linear thinking as that, which deals with learning facts, following instructions and solving problems with one right answer. According to the researcher, many tests that are used in assessing students such as multiple – choice tests, quizzes and standard tests are measures of convergent thinking. Kelly (2011) revealed that Convergent Thinking Strategy requires the ability to assemble and organize information and direct it towards a particular goal in the achievement of an effective solution to a problem. The process of figuring out a concrete solution to any problem is called Convergent Thinking. In other words, Convergent Thinking Strategy is the process of using one's sense to narrow ideas until a single best solution is solved.

Convergent Thinking Strategy tends to focus on the teacher transmitting the information that they know to the students (Bar-Yam, Rhoades, Sweeney, & Bar-Yam, 2012). Convergent Thinking Strategy helps students to develop creativity and thinking faculty (Anyafulude, 2006). No student can learn effectively if he does not think effectively and no teacher can succeed in teaching assignment successfully if he does not stimulate the student to think in a convergent way (Anyafulude, 2006).

Rintelman (2017) found that middle school technology education students achieved better on the convergent laboratory activity than the divergent laboratory with the topic of mechanisms. Olutola, Ogunjimi, Daramola & Sheu (2017) revealed that the students taught Biology with Convergent thinking strategy achieved better than those taught using the Expository method. These findings give a positive indication that when students are taught Physics using the Convergent Thinking Strategy that there will be meaningful learning of Physics concepts and the students' achievement in Physics could be enhanced. Hence, there is need to employ Convergent Thinking Strategy on the teaching and learning of Physics concepts in order to determine its efficacy on Senior Secondary School Students' Achievement in Physics since that the Expository teaching method mostly used by Physics teachers in Nigerian schools has been described by Physics scholars as an ineffective teaching method which has not given the students enough opportunities to constructs their own learning (Rintelman, 2017).

There are also controversies among scholars on whether Convergent Thinking Strategy is a teacher-centered or student-centered strategy. Olutola, Ogunjimi, Daramola and Sheu (2017)



regarded the Convergent Thinking Strategy as a Teacher centered strategy. This is because according to the authors, the Convergent Thinking Strategy is highly structured and teacher-centered; the students are passive recipients of knowledge transmitted to them and learning achievements are measured by standardized tests and Convergent thinking stands firmly on logic that is not significantly creative while according to Bar-Yam, Rhoades, Sweeney & Bar-Yam (2012), convergent thinking strategy encourages that the students to be typically assessed by a formal written test where the only right answer is the one that is being given to them by the teacher.

According to Anyafulude (2006), the Convergent Thinking Strategy is a student-centered teaching strategy. Anyafulude revealed that Convergent Thinking Strategy makes the students to provide solution to a problem through applying the established rules and logical reasoning. This type of reasoning involves the students solving a problem within the context of known information and narrowing down the solution based on logical inference, which is in line with Bloom's principle that is, solving from known information to unknown (Kelly, 2011). Convergent Thinking Strategy is a logical or realistic thinking. Okpala (2011) revealed that the convergent thinking strategy can be teacher-centered or student-centered strategy depending on the teacher. According to Okpara, the effective use of this instructional strategy depends upon the competency of the teacher in the use of convergent instructional strategy, knowledge of the subject matter, psychology of learning, material selection, skill and above all his willingness to employ the instructional strategy in his instruction. Okpala affirmed that when convergent instructional strategy is effectively used, teaching and learning become more interesting, more challenging, more effective and more rewarding. Hence, in order to settle the controversies regarding the use of Convergent Thinking Strategy, there is the need to determine its efficacy in Wave. Thus, the study determined the effect of Convergent Thinking Strategy on the Senior Secondary School Students' Achievement in Physics.

There are also controversies among scholars on whether Convergent Thinking Strategy is a teacher-centered or student-centered strategy. Olutola, Ogunjimi, Daramola and Sheu (2017) regarded the Convergent Thinking Strategy as a Teacher centered strategy. This is because according to the authors, the Convergent Thinking Strategy is highly structured and teacher-centered; the students are passive recipients of knowledge transmitted to them and learning achievements are measured by standardized tests and Convergent thinking stands firmly on logic that is not significantly creative while according to Bar-Yam, Rhoades, Sweeney & Bar-Yam (2012), convergent thinking strategy encourages that the students to be typically assessed by a formal written test where the only right answer is the one that is being given to them by the teacher.

Finally, disparity in Physics achievement especially as regards to gender has been a source of worry to Physics scholars judging by the number of studies done to that effect. While some scholars have opined that there was no significant difference between the mean achievement scores of male and female students in Physics (Galadima & Yusha'u, 2017; Olutola, Daramola and Bamidele, 2016; Spence, 2014; Bada and Dokubo, 2011), others have revealed contradictory findings by revealing that there was significant difference between the mean achievement scores of male and female students in Physics.



Among the scholars that had contradictory findings, some scholars like Meremikwu (2012) and Bosire, Mondoh and Barmao (2018) in their respective studies revealed that the Physics achievement of female students were significantly better than their male counterparts while others like Onah (2015) and Juhun and Momoh (2001) in their respective studies revealed the opposite by indicating that the male students achieved and achieved better than the female students. Hence, there is need to determine if the efficacy of CTS on achievement of secondary school male and female students in Physics.

Statement of the Problem

The WAEC Chief Examiners Report revealed persistent failure in Physics was because of the candidates' lack of skill in answering almost all the questions asked on Physics concepts. WAEC (2020) Chief Examiners Report revealed that candidates' weakness in mathematical Physics expression and word problems among others that led to poor achievement of students towards the subject. This neglect by students has prompted the researcher to investigate on the effect of Convergent Instructional Strategy on Senior Secondary School students' Achievement in Physics despite the fact that there are numerous methods (like Discovery, Constructivism, Laboratory, concept mapping, computer-aided instruction, analogy method, Programmed Instruction, gaming and Computer Assisted Instruction methods) developed by Physics scholars but yet there seems to be no effect in the Senior Secondary School students' achievement in Physics

The study determined the effect of Convergent Thinking Strategy on the Senior Secondary School students' achievement in Physics. This is because the Convergent Thinking Strategy (CTS) ensures proper thinking, and proper thinking directs and guides learning and also, there are so many controversies surrounding the use of Convergent Thinking Strategy (CTS) and there is need to settle the controversies in the teaching and learning of Physics. In addition, the study determined the efficacy of CTS on male and female senior secondary school students' achievement in Physics.

Purpose of the Study

This study determined the Effect of Convergent Thinking Strategy (CTS) on Senior Secondary School Students' Achievement in Physics in Enugu Education Zone. Specifically, the study aimed at determining the:

1. mean achievement scores and standard deviations of Senior Secondary two (SS 1) students taught waves using Convergent Thinking Strategy (Experimental group) and those taught waves using expository method (Control group)
2. mean achievement scores and standard deviation scores of male and female SS 1 students taught waves using the Convergent Thinking Strategy.

Research Questions

The following research questions guided the study

1. What are mean achievement scores and standard deviations of SSS 1 students taught Waves using the Convergent Thinking Strategy (Experimental group) and those taught Waves using expository method (Control group)?
2. What are mean achievement scores and standard deviations of SSS 1 male and female



students taught Waves using the Convergent Thinking Strategy (Experimental group)?

Research Hypotheses

The following null hypotheses which were tested at 0.05 levels of significance guided this study:

HO₁: There is no significant difference between the mean achievement scores of SSS 11 students taught Waves using Convergent Thinking Strategy (Experimental group) and those taught waves using expository method (Control group).

HO₂: There is no significant difference between the mean achievement scores of male and female SSS 1 student taught Wave using Convergent Thinking Strategy (experimental group).

HO₃: There is no significant interaction effect of method and gender on the achievement scores of SSS 1 students in Waves.

Research Method

The design adopted for this study was a pretest-posttest non-equivalent control group quasi-experimental design. This study was conducted in public secondary schools in Enugu Education zone of Enugu State. The population of this study consist of all 2025/2026 co-educational senior secondary class one (SS1) physics students numbering 5442 (2,162 males and 3,280 females) in Enugu Education Zone. The sample size of the study consists of a total of two hundred and ninety-four (294) senior secondary school two (SSS I) students drawn from two (2) intact classes out of twenty-one (21) co-educational secondary school in Enugu Education Zone in the three (3) out of twenty-three (23) coeducational secondary schools in Enugu Education zone. One hundred and forty-four (144) of the students were male while one hundred and fifty (150) were females. Purposive sampling technique was employed in drawing the sample for the study. In each of the schools sampled, one intact class was drawn using simple random technique, making it a total of two intact classes. The intact classes were randomly assigned to treatment students and control conditions through simple balloting, so that in each Local Government Areas, there was one experimental and one control group. the experimental group is made up of one hundred and forty-eight (148) students while the control group is made up of one hundred and forty-six (146) students. The instrument that was used for pretest and posttest is the Wave Achievement Test (WAT), which was developed by the researchers.

Presentation of Results

Research Question 1: What are mean achievement scores and standard deviations of SS 1 students taught Wave using Convergent Thinking Strategy (Experimental group) and those that were taught Wave using the Expository method (Control group)?

Table 1: Mean Achievement Scores and Standard Deviations of students taught Wave using Convergent Thinking Strategy (Experimental group) and those taught with Expository method (Control group)

Groups	Number	Pretest		Post-test		Gained Mean
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Experimental	148	35.26	12.63	65.41	12.64	30.15
Control	146	35.42	12.96	49.77	5.38	14.35



Table 1 above displayed the result of Mean Achievement Scores and Standard Deviations of students taught Wave in both pretest and posttest. From the results in Table 2, the pre-test mean achievement score and standard deviation for the experimental group were 35.26 and 12.63 respectively, while the post-test mean achievement score and standard deviation were 65.41 and 12.64 respectively while for the control group, pre-test mean achievement score and standard deviation were 35.42 and 12.96 respectively, while post-test mean achievement score and standard deviation were 49.77 and 5.38 respectively.

The table revealed that the Secondary School students taught Wave using the Convergent Thinking Strategy (CTS) gained higher with the gained mean of 30.15 than those that were taught using expository teaching method (ETM) with the mean gain of 14.35. From this result, it showed that learning took place in both groups. This is because the both groups had higher posttest mean scores than their pretest mean scores. The result also showed that the mean scores of the Control group were more homogeneous than the Experimental group from pretest to posttest. This is because the Control Group had smaller standard deviations than the Experimental group.

Research Question 2: What are mean achievement scores and standard deviations of SSS 1 male and female students taught Wave using Convergent Thinking Strategy (experimental group)?

Table 2: Mean Achievement Scores and Standard Deviations of Male and Female SS1 Students taught Wave using Convergent Thinking Strategy (Experimental Group)

Gender	Number	Pretest		Posttest		Gained Mean
		Mean ($\bar{x}$)	Standard Deviation (s)	Mean ($\bar{x}$)	Standard Deviation (s)	
Male	75	35.20	12.00	63.07	11.73	27.87
Female	73	35.35	13.33	67.81	13.17	32.46

Table 2 showed the mean achievement scores and standard deviations of male and female students in experimental groups. From the results in Table 2, the pre-test mean achievement score and standard deviation for the male students were 35.20 and 12.00 respectively, while the post-test mean achievement score and standard deviation were 63.07 and 11.73 respectively while for the Female students, pre-test mean achievement score and standard deviation were 35.35 and 13.33 respectively, while post-test mean achievement score and standard deviation were 67.81 and 13.17 respectively.

The lower standard deviation in male students showed that the mean score of the male students was homogeneous, which means that the female students had more extreme scores than their female counterparts in the experimental group. The table also showed that the female students gained higher than their male counterparts with the gained mean of 32.46 as against that of the male students of 27.87.



Testing of The Research Hypotheses

Six (3) null hypotheses which were tested at 0.05 levels of significance guided the study. The hypotheses were tested using the Analysis of Covariance (ANCOVA).

Table 3: Analysis of Covariance (ANCOVA) between Mean and Achievement Scores of SS1 students taught Wave using Convergent Thinking Strategy (Experimental Groups) and those taught Wave using Expository Methods (Control Group)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	18904.831 ^a	4	4726.208	51.067	.000	
Intercept	112330.579	1	112330.579	1213.741	.000	
PRETEST	.052	1	.052	.001	.981	
GROUP	18055.570	1	18055.570	195.092	.000	S
GENDER	779.180	1	779.180	8.419	.004	S
GROUP * GENDER	161.450	1	161.450	1.744	.188	NS
Error	26746.669	289	92.549			
Total	1022525.000	294				
Corrected Total	45651.500	293				

a. R Squared = .414 (Adjusted R Squared = .406)

b. WHERE S = Significant at $P < .05$; NS = Not Significant at $P > .05$

Table 3 above showed the Analysis of Covariance (ANCOVA) of the Mean Achievement Scores of the Experimental and Control Groups. The Table 5 was used to answer null hypotheses 1 to 3.

Hypothesis 1: There is no significant difference between the mean achievement scores of SS 1 students taught Quadratic Equation in the experimental and control groups

From the result of ANCOVA in Table 5, it was observed that Group (Experimental and Control) gave an F-value of 195.092 and was significant at 0.000. Since 0.000 was less than 0.05, the null hypothesis 1 was rejected as stated. Hence, the study concluded that there was significant difference between the mean achievement scores of SS 1 students taught Quadratic Equation in the experimental and control groups. This implied that the students that were taught Quadratic Equation using Convergent Thinking Strategy significantly achieved higher than their counterparts taught Wave using the Expository teaching method.

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female students in the experimental group.

From the result of ANCOVA in Table 5, it was observed that Group (treatment and Control) gave an F-value of 8.419 and was significant at 0.004. Since 0.004 was less than 0.05, the null hypothesis 2 was rejected as stated. Hence, the study concluded that there was significant difference between the mean achievement scores of male and female students in the experimental group. This implied that the female students significantly achieved higher than their male counterparts taught Wave using Convergent Thinking Strategy.



Hypothesis 3: There is no significant interaction effect of method and gender on the achievement scores of SSS 1 students in Wave.

From the result of ANCOVA in Table 3, it was observed that Group (treatment and Control) gave an F-value of 1.744 and was not significant at 0.188. Since 0.188 was higher than 0.05, the null hypothesis 3 was accepted as stated. Hence, the study concluded that there was no significant interaction effect of method and gender on the achievement scores of SS 1 students in Wave.

Discussion of Findings

The study discovered that the SS 1 students taught Wave using the Convergent Thinking Strategy achieved and better than their counterparts taught Wave using the Expository method and the differences were statistically significant. This finding tallied with the findings of these scholars, Olutola, Ogunjimi, Daramola & Sheu (2017) who revealed that there was significant effect of convergent and divergent learning strategies on secondary school student's performance in biology, Ahiauzu (2017) who revealed that there was a significant joint influence of field dependent/independent and convergent/divergent cognitive styles on the academic achievement of students and Kelly (2011) who revealed that Convergent Thinking strategy enhances students' academic achievement. This is because according to Kelly (2011), Convergent Thinking Strategy requires the ability to assemble and organize information and direct it towards a particular goal in the achievement of an effective solution to a problem.

The higher significant achievement scores of SSS 1 students taught Wave using Convergent Thinking Strategy was because Convergent Thinking Strategy tends to focus on the teacher transmitting the knowledge of Wave that they know to the students (Bar-Yam, Rhoades, Sweeney, & Bar-Yam, 2012). Convergent Thinking Strategy helps students to develop creativity and thinking faculty (Anyafulude, 2006). No student can learn Wave effectively if he does not think effectively and no teacher can succeed in teaching Quadratic Equation successfully if he does not stimulate the student to think in a convergent way (Anyafulude, 2006). Hence, the findings of this study provide a guide for Physics teachers teaching Wave to use Convergent Thinking Strategy in teaching Wave concepts. This is because it exposes the students to be self-regulatory in learning, which they will overtime begin to take responsibility for and control over their learning of Wave.

Students will then monitor their own achievement by checking steps along the way as the learning progresses. It will equip the students with better knowledge of Wave concepts and how best to study Wave Equations better. It will provide the students with the self-assessment guides. Based on the findings, relevant governments and professional bodies as Science Teachers Association of Nigeria (STAN) should sponsor and organize workshops and seminars on how to use the Convergent Thinking Strategy (CTS) in teaching different topics in Physics to enhance better achievement Wave concepts.

The study discovered that the female students taught Quadratic Equation using the Convergent Thinking Strategy (CTS) achieved and retained higher than their male counterparts and the differences were statistically significant. This finding is in line with the findings of Meremikwu (2012) and Bosire, Mondoh & Barmao (2018) in their respective studies who revealed that the



Physics achievement of girls were significantly better than their male counterparts. The findings contradicted the finding of Onah (2015) and Juhun and Momoh (2001) in their respective studies who revealed that the male students achieved better than the female students.

Also, the study discovered that there was no significant interaction effect of method and gender on the retention scores of SS 1 students in Quadratic Equation. The female students achieved Wave concepts than their male counterparts were because according to Brazier (2016), the female students had better memories than male students and not because of the treatment provided. This implied that the Convergent Thinking Strategy (CTS) favors both genders equally. This finding is in line with the assertions of other scholars like Olutola, Ogunjimi, Daramola & Sheu (2017) and Achimugu & Onojah (2017) that disclosed in their separate studies that disclosed that there was no significant interactive effect of gender and instructional strategy (Convergent Thinking Strategy).

Since one can only achieve what one had known in the past, it follows therefore, that the female students who had acquired more Wave knowledge would be expected to retain such knowledge more than their male counterparts. This is because it follows naturally that one can achieve what one has learnt and vice versa. In Convergent Thinking Strategy (CTS), male and female SS 1 students are allowed to advance through the instructional process in a particular order as they provide the correct answers. The implication of this finding to the Physics teachers is Physics teachers should be provided with equal opportunity for both male and female students irrespective of gender that achieves well. The utmost purpose of the Physics teachers should be that both male and female students achieved and better.

Conclusion

This study examined the Effect of Convergent Thinking Strategy (CTS) on Senior Secondary School Students' Achievement in Wave. From the findings of the study, it was discovered that students taught Wave using Convergent Thinking Strategy achieved and retained better than their counterparts taught Wave using the Expository method and the differences were statistically significant, the female students taught Wave using Convergent Thinking Strategy achieved higher than their male counterparts and the differences were statistically significant and there was no significant interaction effect of method and gender on the achievement and retention scores of SSS 1 students in Wave.

Educational Implications of the Study

The result of this study has educational implications for the students, teachers, professional bodies, educational agencies and Ministries of Education. The study discovered that the SSS 1 students taught Wave using the Convergent Thinking Strategy significantly achieved better than their counterparts taught Wave using the Expository method. The higher significant achievement scores of SSS 1 students taught Wave using Convergent Thinking Strategy was because Convergent Thinking Strategy tends to focus on the Physics teacher transmitting the knowledge of Wave that



they know to the students. No student can learn Wave effectively if he does not think effectively and no teacher can succeed in teaching Wave successfully if he does not stimulate the student to think in a convergent way. Hence the educational implication of this finding is that students need to learn Wave using Convergent Thinking Strategy.

Second educational implication is that Physics teachers should endeavor to use Convergent Thinking Strategy in teaching Wave. The study advocates and sensitizes the government educational agencies like Nigeria Education Research and Development Council (NERDC), and the educational non-governmental organizations Science Teachers Association of Nigeria (STAN) to sponsor and organize workshops and seminars on how to use the Convergent Thinking Strategy (CTS) in teaching different topics in Physics to enhance better achievement of students in Wave.

Another educational implication is that, the policy makers of the Ministries of Education are expected to use the information provided by this study as a basis for taking decision on Convergent Thinking Strategy to be adopted in Nigeria for the teaching of Wave in Physics. Finally, authors of secondary school Physics textbook should use the findings in this study to write Wave Equation chapter of their Physics textbooks with vital information that will enable the chapter appeal to the interest, experience and abilities of the students.

Recommendations

Based on the above implications and findings of the study, the following recommendations are made:

1. Physics teachers should endeavor to use Convergent Thinking Strategy in teaching Wave concepts.
2. Government educational agencies like Nigeria Education Research and Development Council (NERDC), Science Teachers Association of Nigeria (STAN) and the educational non-governmental organizations like Mathematics Association of Nigeria (MAN), Science Teachers Association of Nigeria (STAN) should sponsor and organize workshops and seminars on how to use the Convergent Thinking Strategy (CTS) in teaching different topics in Physics.
3. Curriculum developers should inculcate the findings of this study into the Physics curriculum especially in the area of Wave.
4. Policy makers of the Ministries of Education should ensure that Convergent Thinking Strategy is adopted in the teaching of Wave in Physics.
5. Physics authors should in the act of writing their Physics textbook for secondary schools incorporate the use of Convergent Thinking Strategy as adopted in the teaching of Wave in Physics.
6. Physics teachers should be to provide equal opportunity for both male and female students irrespective of gender.



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