

EFFECTS OF TRANSFORMATION LEARNING STRATEGY ON JUNIOR SECONDARY TWO STUDENTS' INTEREST IN BASIC SCIENCE AND TECHNOLOGY IN KACHIA KADUNA STATE, NIGERIA

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Abstract

The Basic Science and Technology curriculum states that the teaching should be done in such a way that make students develop interest and become prepared for further studies in science and technology at the higher levels. This can be done by relating students' experiences with what they are learning by using local examples. Therefore, the purpose of this study was to investigate the effects of transformation learning strategy on Junior Secondary two students' interest in basic science and technology in Kachia-Kaduna State, Nigeria. Quasi-experimental pretest posttest non randomization experimental control groups' research design was adopted. The population for the study was 2,210 (1,190 males and 1,210 females) junior secondary two (JSS2) students offering basic science and technology in all the 22 public junior secondary schools (coeducational) in Kachia-Kaduna State. Purposive Sampling Technique was used to draw a sample of one hundred (47 female and 53 male) JS2 students in two intact classes. Two research questions and two research hypotheses guided the study. The instrument used for data collection was Students' Interest in Basic Science and Technology Scale (SIBSTS), the instrument was scrutinized using two experts; the reliability of the instrument was established using Cronbach Alpha method and found to be 0.879. Findings revealed that the mean scores of experimental group interest improved more than that of the control group after exposure to treatment and that male students had higher interest mean scores than female students. The researchers concluded that transformation learning strategy is an effective method of teaching for improving students' interest. They recommended that Basic Science and Technology teachers should adopt the use of transformation learning strategy to enhance students' interest and sustain them in Basic Science and Technology subject irrespective of their gender.

Keywords: Effects, Basic Science, Technology, Interest, Transformation Learning Strategy.

INTRODUCTION

The importance of science and technology in our society today cannot be overemphasized because the world has become a global village and life has been made easier and faster with the help of science and technology. However, Melyssa, Ferro and Idaho (2016); Libata, Ali and Ismail (2023) state that teaching and learning of basic science and technology is much more than imparting scientific knowledge but it is about creating more opportunities for employing hands-on and minds-on activities to make science more meaningful, interesting, engaging and inspiring to help students develop interest and see themselves as scientists and engineers instead of passively observing as the teacher at work in the classroom. It should involve creating dynamic relationships between teachers, students, and a shared body of knowledge to challenge the students' negative interest in learning the subject. This can be done by providing modeling and mastery experiences to challenge and encourage the students to pay personal attention in the classroom to promote ample opportunities for pre-reflection and reflection about the world's challenges.

Basic science and technology has been unified from the integrated science curriculum consisting of basic science, basic technology, physical and health education and computer studies and its' the only subject that prepares students at the junior secondary school level for the study of core science subjects (Physics, Chemistry, Biology) at the senior secondary school level. Achimugu (2013) attributes that there is a continuous use of lecture method in teaching basic science and technology which is an ineffective strategy of teaching in secondary schools. According to Achimugu, lecture method is a teacher-centred approach in which the teacher does most of the activities while the students are either passive listeners or are slightly involved. This type of strategy makes students perceive science to be difficult, boring and inaccessible and tend to develop lack of interest in the subject. For these sequel reasons, many students do not want to continue studying science Anwar and Bhutta (2014). Therefore there is need to reverse our methods of teaching to embrace new innovative methods to help students relate what is taught in the classroom with what they experience outside the classroom.

Interest is the feeling one has in trying to learn something. Ugwuanyi (2015) views interest as a feeling of concentrating by given attention to enjoy some activities in a subject. Interest in junior secondary students needs to be stimulated in order to learn because personal interest has been found to influence attention in achieving said goals at all levels of schooling. It has been observed by researchers that students offering basic science and technology at the Junior Secondary School level have been developing lack of interest in the subject irrespective of their gender (Oludipe & Oludipe 2018; Okafor 2020). The researchers believe that interest helps students to value, think, act, behave and achieve their aim towards the subject. Derez (2021) opines that students are to be inspired by their teachers and get encouraged to promote their own understanding to be able to conceive that learning of basic science and technology is not for memorization of formulas and terms. Studies have shown that students generally have weak interest towards Basic Science and Technology (Ekon, Ekwueme and Meremikwu, 2014; Eriba and Samuel, 2018). The teaching of Basic Science and technology should be student-centered, activity oriented where rote learning and memorization of isolated facts is discouraged (Atoo, Zam & Tafi 2021). This can be done by enriching the lessons with various students' activities and relevant learning materials to give students enough time to manipulate and experience the learning to develop positive interest towards the subject.

However, developing students' positive interest towards basic science and technology learning is important because it will lead them to diversify their learning experiences and tend to focus their experiences; leading them to pay attention to certain things in the classroom and value what they have learnt and not to other things that will stimulate their attention outside the context. Therefore, there is need for innovative methods of teaching basic science and technology to reverse the trend

Transformation learning strategy is that type of learning that changes the way learners behave, think and value science and technology in the world they live. It is a type of teaching method that construes, validates and reforms the beliefs, emotional values, behaviours and assumptions of students through life experiences to develop interest in science and technology irrespective of the student's gender (Nerstrom 2014). In educational system, developing students' cognitive, psychomotor and affective domains are the targets of the teacher to enable learners develop positive interest towards learning the subject (Alrawili, Osman, Almunasher, (2022). In another version Asiri (2018) and Ugulu (2020) note that students' demonstration in basic science and technology classroom is briefly about their interest towards the subject by fostering good scientific attitudes to achieve their essential aim in science education to choose a career in science and taking science courses at the higher levels.

The process of promoting students' positive interest towards basic science and technology subject is one of the most significant objectives of the curriculum of the subject (Cheng & Tsai, 2020). Hence, interest is described as a common character that plays a vital role in emotional feelings of students Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, (2020). Several studies showed that the process of adopting and engaging effective instructional methods in teaching the subject may help students develop more positive interest in learning the subject (Sopuruchi 2017; Altiparmak, & Eryilmaz-Muştu, 2021; Alvan & Ebele 2021). Singleton (2015) also assures us that teaching using transformation learning strategy will not only develop students' interest but will also retain and sustain them in the subject.

Statement of the problem

Over the years, there has been a general decline in students' interest in Basic Science and Technology. A lot of students in Kaduna State junior secondary schools exhibit non-challant attitudes leading to lack of interest towards learning Basic Science and Technology and this has contributed to their lack chosen science subjects at the senior secondary school after the Basic Education Certificate Examination. It is disheartening that a subject of great importance to human development but, yet students are showing lack of interest in the subject. Many researchers and scholars such as Arop, Ummanah & Effiong (2015); Okwara, Adejoh & Tafi, (2019) blamed the ugly situation on teachers for using ineffective method of teaching the subject. Therefore, this study aimed at investigating the effects of transformation learning strategy on junior secondary two students' interest in basic science and technology in Kachia, LGA of Kaduna State. Specifically, the objectives of the study are:

1. To determine the interest mean scores of JSS2 students in Basic science and technology before and after exposure to transformation learning strategy and lecture method.
2. To ascertain the interest mean scores of male and female JSS2 students in Basic Science and Technology after exposure to transformation learning strategy.

Research Questions

1. What are the interest mean scores of JSS2 students in Basic science and technology before and after exposure to transformative learning strategy and lecture method in Kachia-Kaduna State?
2. What are the interest mean scores of male and female students in Basic Science and Technology after exposure to transformation learning strategy in Kachia-Kaduna State?

Hypotheses

Ho1. There is no significant difference between the post-test interest mean scores of JSS2 students in Basic Science and Technology in the experimental and control groups in Kachia-Kaduna State.

Ho2. There is no significant difference between the interest mean scores of male and female JSS2 basic science and technology students exposed to transformation learning strategy in Kachia-Kaduna State.

Method and procedures

The research design employed in this study was quasi-experimental pre-test/post-test non-equivalent experimental control groups. The researchers chose this design because the students could not be randomized as intact classes were used in the sampled schools using their normal school time table. The population for the study was 2,210 (1,190 males and 1,210 females) junior secondary two (JSS2) students offering basic science and technology in all the 22 public junior secondary schools (coeducational) in Kachia-Kaduna State. Purposive Sampling Technique was used to draw the sample of the two schools with a total sample of one hundred (47 female and 53 male) JS2 students in their intact classes, one school was assigned for experimental group and the other for control group. The instrument used for data collection was Students' Interest in Basic Science and Technology Scale (SIBSTS). Students' Interest in Basic Science and Technology Scale (SIBSTS) constituted two sections: Section one was personal information about the participants and the second section was a five point Likert scale questionnaire (Strongly Agree, (SA), Agree (A) Undecided (UD), Disagree (D), strongly Disagree SD) containing 20 items. Instruction was given to students to tick the appropriate characters as reflecting the individuals' opinion and the statements meant to give uniform responses as reflecting their interest. The SIBSTS instrument was developed by the researchers and validated through two experts' judgment, one from Department of Science and Technology and one from Research Measurement and Evaluation Unit, all from University of Jos. For the purpose of validating the instrument, a pilot test was done on a small group outside the study sample and the reliability of the instrument was established using Chrombach Alpha Method which was found to be 0.879. A pretest was given to both the experimental and the control groups to prove the baseline for administering the treatment to the experimental group using four (4) topics from the first term of JSS2 syllabus while, the control group was taught the same topics using conventional /lecture method of teaching. The teaching in the experimental group was done using transformation learning strategy by the researchers. All lessons were planned enriched with students' activities while the teachers being the facilitators were directing students to manipulate the learning materials and communicate with themselves in groups, performing different learning activities to their satisfaction to experience the learning for the purpose of influencing interest. After the administration of the treatment, post-test was administered immediately to the respondents to ascertain the possible change on students. The data collected were analyzed using

descriptive statistics such as: mean and standard deviation, while Analysis of Covariance (ANCOVA) was used to test the hypotheses.

Results

Research Question One

What are the interest mean scores of JSS2 students in Basic science and technology before and after exposure to transformative learning strategy and lecture method in Kachia-Kaduna?

Table 1: Result of the Analysis of Interest mean scores of Basic Science and Technology students before and after exposed to transformation learning strategy and lecture method.

Group	Pre-test			Post-test			X-difference
	N	Mean	SD	Mean	SD	Mean Gain	
Experimental	48	22.69	2.21	43.63	6.2	20.94	19.24
Control	52	21.92	2.07	23.62	3.2	1.7	

Table 1 reveals the interest mean scores of JSS2 students in Basic science and technology before and after exposure to transformation learning strategy and lecture method in Kachia-Kaduna. From the result, the pre-test interest mean scores of experimental group is 46.21 with a standard deviation of 4.58 and that of the control group is 42.42 with a standard deviation of 4.56. It means that both groups had a low interest mean score and almost at the same level before treatment. Also, the post-test mean score of the experimental group was ($\bar{x} = 111.73$, $SD = 3.23$) higher than the mean score of the control group ($\bar{x} = 49.58$, $SD = 5.72$) with a mean difference of 58.36, indicating that the experimental group had a higher interest mean scores than the control group in Basic Science and Technology after treatment was given to experimental group. This means that transformation learning strategy improves the interest of basic science and technology students after exposed to treatment in Kachia.

Research Questions Two

What are the interest mean scores of male and female students in Basic Science and Technology after exposure to transformation learning strategy?

Table 2: Results of the Analysis of Students' interest mean scores based on Gender in Basic Science and Technology after Exposure to Treatment

Gender				
	N	Mean	SD	X-difference
Male	26	46.15	4.961	5.51
Female	22	40.64	6.306	

Table 2 shows the mean and standard deviation result of the post-test interest mean scores of male and female students in the experimental group. The mean scores for male yielded a mean score of 46.15 and standard deviation of 4.96, while females had mean scores of 40.64 and

standard deviation of 6.31. The results indicate that females had almost same interest mean scores as male with a mean difference of 5.51. This shows that transformation learning strategy improved the affective reaction mean scores of females and males.

Hypothesis One

There is no significant difference between the post-test interest mean scores of students in Basic Science and Technology in the experimental and control groups.

Table 5: ANCOVA Result on Post-test Interest Mean Scores of Students in the Experimental and Control Groups

Source	Type III Sum of Squares	df	Mean Square	F	p-value	Partial Squared	Eta
Corrected Model	10074.043 ^a	2	5037.022	214.002	.000	.815	
Intercept	521.279	1	521.279	22.147	.000	.186	
Pre-test	80.441	1	80.441	3.418	.068	.034	
Group	9367.695	1	9367.695	397.994	.000	.804	
Error	2283.117	97	23.537				
Total	122714.000	100					
Corrected Total	12357.160	99					

a. R Squared = .815 (Adjusted R Squared = .811)

ANCOVA was used to determine the difference between post-test interest mean scores of students in Basic Science and Technology in the experimental and control groups. The result yielded $F(1, 97) = 397.99$, $P < 0.05$. Since the p-value of .000 is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that the interest mean scores of students in the experimental group significantly differ from that of the control group. The result reveals that the experimental group had higher interest than the control group. The result further reveals an adjusted R squared value of .811 which means that 81.1% of the variation in the dependent variable which is students' interest is explained by variation in the treatment using transformation learning strategy, while the remaining is due to other factors not included in this study. Hence, transformation learning strategy increases students' interest towards Basic Science and Technology.

Hypothesis Two

There is no significant difference between the interest mean scores of male and female basic science and technology students exposed to transformation learning strategy in Kachia – Kaduna State.

Table 4: ANCOVA Result of Post-test Interest mean score of Experimental Group in Basic Science and Technology based on Gender

Source	Type III Sum of Squares	df	Mean Square	F	P-value	Partial Squared	Eta
Corrected Model	365.182 ^a	2	182.591	5.674	.006	.201	
Intercept	677.284	1	677.284	21.047	.000	.319	
Pre-test	2.408	1	2.408	.075	.786	.002	
Gender	311.323	1	311.323	9.675	.003	.177	
Error	1448.068	45	32.179				
Total	93164.000	48					
Corrected Total	1813.250	47					

a. R Squared = .201 (Adjusted R Squared = .166)

The data were subjected to analysis of covariance (ANCOVA) having experimental and control. The main effect of gender yielded $F(1, 45) = 9.58$, $P < 0.05$. Since the p-value of .003 is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that the interest mean scores of male students in Basic Science and Technology do significantly differ from those of female students. The result further reveals an adjusted R squared value of .166 which means that 16.6% of the variation in the dependent variable which is students' interest is explained by variation in the treatment, while the remaining percentage is due to other factors not included in this study. It means that students' interest in Basic Science and Technology is affected by gender.

DISCUSSION

The findings of research question one indicates that the experimental group had higher interest mean scores than the control group in Basic Science and Technology after the treatment was given to the experimental group. This result is in agreement with the findings of Alvan and Ebele (2021) that blended learning approach positively enhanced interest of students towards basic science and technology than the conventional learning approach.

The findings of research question two also indicate that males had higher interest mean scores than females with a mean difference of 1.47. This result agrees with the result revealed by Godpower-Echie and Ihenko, (2017) that gender has an effect on interest of students in science learning. The result of hypothesis one reveals that the experimental group had higher interest than the control group. This result agrees with the findings of Alrawili, Osman and Almunasher, (2022) that there is a significant difference in the science student's interest in favour of students who were taught using scaffolding strategies compared with those taught using conventional teaching methods. The result of hypothesis two indicates that the interest mean scores of male students in Basic Science and Technology significantly differ from that of female students. It means that students' interest in Basic Science and Technology is affected by gender. This result is in agreement with the study by Atoo, Zam & Tafi (2021) that there is a significant difference between the interest mean scores of male and female students taught Basic Science with cooperative learning strategy

CONCLUSION

The research findings safely conclude that transformation learning strategy is an effective teaching-learning strategy in the junior secondary school compared with the conventional teaching-learning approaches. Hence, teachers teaching basic science and technology are encouraged to use transformation learning strategy to enhance students' learning interest and sustainability in the subject.

RECOMMENDATIONS

Based on the result revealed, it is recommended that more time be added in the periods to enable teachers use the strategy especially that the subject has been combined from the former integrated science subject. It requires extra effort and time. Curriculum planners need to adopt the strategy as an appropriate teaching technique for teaching basic science and technology syllabus and be included in the teachers' guide. Moreover, there is need to training and develop science teachers' professionalism, particularly in the use of transformational learning strategy.

REFERENCES

- Achimugu, L. (2013). Instructional modes of teaching and learning Chemistry in SSS under MDGS, NEEDS, and Education Reform Agenda. *Proceedings of the 54th Annual Conference of STAN*, 248-253
- Alrawili, K. S., Osman, K., & Almunasher, S. S. (2022). Scaffolding Strategies in Promoting Attitudes of Saudi Middle School Science Students. *European Journal of Science and Mathematics Education*, 10(1), 71-86
- Altıparmak, T., & Eryılmaz-Muştu, O. (2021). The effects of SCAMPER technique activities in the 8th grade simple machines unit on students' academic achievement, motivation and attitude towards science lessons. *International Journal of Educational Methodology*, 7(1), 155-170
- Alvan, Anachuna, Ebele and Okigbo (2021). Effect of blended learning approach on the attitude of secondary school students in basic science in Anambra State. *South Eastern Journal of Research and Sustainable Development (SEJRSD)*, 5(1), 26-39.
- Anwar, N. P. & Bhutta, S. M. (2014). Students' attitude towards science in lower secondary classes: Comparison across regions. *Journal of Educational Research*, 17(1), 77-90.
- Arop, B.A., Umanah, F.I & Effiong, O.E. (2015). Effect of instructional materials on the teaching and learning of basic science in junior secondary schools in cross river state, Nigeria. *Global Journal of Educational Research*, 14(2015) 67-73
- Asiri, A. A. M. (2018). Attitudes of secondary school students in Saudi Arabia towards science. *International Journal of Education, Learning and Development*, 6(3), 30-36.
- Ato, S. F., Zam, J.A & Tafi, F. I. (2021). Effect of cooperative learning strategy on upper Basic education II students' performance and interest in Basic Science and Technology in Benue State, Nigeria. *International Journal of Research and Innovation in Applied Science (IJRIAS)* 6,(9), 1-9
- Cheng, K., & Tsai, C. (2020). Students' motivational beliefs and strategies, perceived immersion and attitudes towards science learning with immersive virtual reality: A partial least squares analysis. *British Journal of Educational Technology*, 0(0), 1-20.

- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Journal Applied Developmental Science*, 24(2), 97-140.
- Godpower-Echie, G. & Ihenko, S. (2017). Influence of gender on interest and academic achievement of students in integrated science in Obio Akpor Local Government Area of Rivers State. *European Scientific Journal*, 13(10), 272 – 279.
- Libata, I. A., Ali, M. N., & Ismail, H. N. (2023). Fostering science process skills through constructivist-based module among form two students of different cognitive levels. *Contemporary Mathematics and Science Education*, 4(1), 1-11
- Oludipe, B. D. & Oludipe, D. I. (2018). Effects of gender and science anxiety on Nigerian junior secondary students' academic achievement in basic science in Ijebu-Ode, Ijebu North-East, and Odogbolu Local Government areas of Ogun State. *Journal of Education and Practice*, Retrieved 12/3/2019 from www.iiste.org.
- Okafor, O. S. (2020). Interest as predictor of academic achievement of secondary school students in physics. *British Journal of Education, Learning and Development Psychology* 3(3), 1-9.
- Okwara, O. K., Adejoh, M. J & Tafi, F. I. (2019). Effect of Laboratory Teaching Method on Students' Achievement and Retention in Basic Science in Federal Capital Territory, Abuja, Nigeria. *International Journal of Advanced Education and Research*, 4(5), 11-17.
- Nerstrom, N. (2014). *An emerging model for transformative learning adult education Research Conference 2014 Conference Proceedings (Harrisburg, PA)*. New Prairie Press Kansas State University Libraries.
- Sopuruchi, E.G.I. (2017). Influence of Gender on Interest and academic achievement of Students in Integrated Science in Obio Akpor Local Government Area of Rivers State. *European Scientific Journal Vol.13(10)*, 272-279
- Singleton J, (2015). Head, heart and hands model for transformation learning: Place as context for changing. *Journal of Sustainability Education*. Retrieved on 27 October 2021 from <http://www.susted.org/>
- Ugulu, I. (2020). Gifted students' attitudes towards science. *International Journal of Educational Science*, 28(1-3), 7-14.
- Ugwuanyi, C. C. (2014). Meta-Analysis of Studies of effect of teaching method on students' achievement, interest and retention in Mathematics. *Published Ph.D Thesis, University of Nigeria, Nsukka*.