TECHNOLOGICAL ATTITUDE AND ACADEMIC ACHIEVEMENT OF PHYSICS STUDENTS IN SENIOR SECONDARY SCHOOLS IN IMO STATE

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Abstract

This study investigated the influence of technological attitude of students on academic achievement of secondary school Physics in Imo state. The study was guided by two research questions and two null hypotheses formulated were tested for the study. Causal-comparative research design was used for the study. The population of the study comprised 4785 co-educational senior secondary school students in Imo State. Two co-education schools were randomly drawn from the State using simple random sampling technique. This produced a sample size of 162 senior secondary two physics students. Two instruments were used for data collection titled, Students' Attitude towards Technology Questionnaire (SATQ) and Physics Achievement Test (PAT) were used in generating the data for the study. All research questions were analyzed using mean and standard deviation while t test of independent was used to test the null hypotheses at 0.05 levels of significance. The results revealed that students with positive technological attitude achieved better than their counterpart with negative technological attitude and that, there was no significant difference in Physics achievement between students with positive technology attitude and those with negative technological attitude. Based on these findings, it was recommended that Physics teachers should devise means of encouraging students technological attitudes towards Physics as students with positive attitudes performed better in academic achievement.

Keywords; **Technological Attitude, Academic Achievement, Gender**

Introduction

Physics is a branch of physical sciences that concerns mainly with matter in relation to energy. Physics, as a science subject, has been acknowledged as a pre-requisite for the study of several courses in the universities, for examples engineering, medical and other applied science courses need physics. Physics is everywhere. It describes the world around us, from explaining the workings and making possible the luxuries and conveniences inside our homes such as energy efficient heat pumps, cordless phones, microwave ovens, and CD players to describing the motions of the galaxies in our universe (Ezeife, 2019). Physicists find answers to almost everything. Their studies range from the tiniest particles of matter to the largest objects in our universe. Their research has a range of applications which includes the computers that allow us to communicate with others across the globe, as well as the vehicles that allow us to traverse the globe faster, more safely, and more efficiently than would be possible without advances in physics. Physicists of the future will move society even faster along the information superhighway and drive further progress in the area of transportation (Igwebuike, 2020).

Physics underlies all other basic sciences and is the basis for much of technology because it is concerned with the most fundamental aspects of matter and energy as well as the laws that govern their interactions (Mandor, 2020). The interactions which make the physical universe work. Scientists in other fields use the knowledge discovered by physicists to guide them in the study of their respective disciplines. Much of the technological equipment and techniques used by other scientists were originally developed by physicists, such as, x-rays, and other instruments used by medical doctors to safely study the human body and diagnose and treat diseases (Pratoomtong, 2015). From saving lives to saving our environment to promoting knowledge in other areas of science.

In view of the obvious importance of physics in scientific and technological advancement of any nation, and its usefulness in nearly all fields of human endeavour, the poor performance of students in the subject at both secondary and post-secondary levels in the state in particular and country at large has been a source of concern to various people and government at various times (Ikeobi, 2020). According to previous studies, a lot of factors are attributed to this poor performance in secondary and post secondary school physics. Okedeyi (2017) attributed this to insufficient man power, equipment, poor attitude (technological) of students and poor understanding of the concepts due to their difficult nature. In school, the child is the major tool of the teacher's trade. If the process of teaching is to proceed smoothly, efficiently, pleasurably and result oriented, it is essential that the teacher should have some knowledge of human nature in general and in the individual students in particular.

The knowledge of the individual student is both desirable and necessary because inspire of the many references that are made to class teaching, such teaching cannot bring about high achievement without the students (Akpan, 2020). The teacher must be familiar with present knowledge regarding growth in physique, intellect, interest, emotions, attitudes (technological) and character traits of the physics students and the corresponding influences of these factors on students' achievement in physics. For any nation to attain self-reliance, science must be an important component of the knowledge to be given to her citizens, irrespective of tribe/ethnicity, creed or gender (Ezenwa, 2020).

Gender refers to the economic, social, social, political and cultural attributes and opportunity associated with being women and men. The social definition of what it means to be a woman or man vary among cultures and changes characteristics and roles that are associated with certain group of people with reference to their sex and sexuality. However, investigation of gender technological attitude and academic achievement becomes necessary for fostering and elimination of gender differences in technological innovation.

Technological attitude on its own is the process by which human modify nature to meet needs and want (Chukwu, 2021). Technological attitude include the response towards the entire infrastructure necessary for design, manufacturing, operation and repair of technological artifacts. Technological attitude is a product of engineering and science, the study of natural world. It is therefore on the basis of the above views and findings that this study is undertaken to find out the influence of technological attitude of students on academic achievement of senior secondary school physics students in selected schools in Imo State, Nigeria.

Statement of the Problem

Despite constant emphasis on Physics teaching and learning because of its central role in technological advancement, the performance of students in secondary school Physics are observed to be very poor. Many factors have been attributed to this ugly and unwholesome situation. These factors include poor teaching methods, lack of instructional materials, lack of functional, laboratories, poor students' technological attitude and lack of qualified Physics teachers. Many research studies have been carried out on other factors mentioned except technological attitude whose empirical data are very few to base

advisory role upon. This is the gap that this study is conceived to fill.

Purpose of the Study

The purpose of this study was to:

1. find the influence of technological attitude on secondary school academic achievement of students in Physics,

2. determine the influence of gender on academic achievement of Physics students with respect to their technological attitude,

Research Questions

The following research questions were posed to guide the study:

1. What is the difference in Physics achievement between students with positive technological attitude and their counterparts with negative technological attitude?

2. What is the difference in Physics achievement between male and female students with positive technological attitude?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance

Ho_1. There is no significant difference in Physics achievement between students with positive technology attitude and those with negative technological attitude.

Ho_2. There is no significant difference in Physics mean achievement scores between male and female students with positive technological attitude.

Methodology

The design of the study was causal-comparative research design. The population of the study comprised 4785 co-educational senior secondary school students in Imo State. Simple random sampling technique was used to select two co-educational secondary schools from Imo state. All the Senior Secondary Two (SS2) Physics students in the schools selected formed the sample. This gave the sample size of 162 Physics students. 92 of the samples were boys while 70 were girls. Two instruments were used for data collection, which are Students' Technology Attitude Questionnaire (STAQ) and Physics Achievement Test (PAT). Students Technology Attitude Questionnaire sought information from the respondents' knowledge in technology. It was an instrument to classify students' positive and negative technological attitudes. The questions were drawn from Physics concepts in SS2 syllabus taught in all schools chosen for the study. A 4 point likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) was used in scoring the items on the questionnaire.

Strongly Agree (SA) was scored 4 point, Agree (A) was scored 3 points, Disagree (D) was scored 2 points while strongly disagree was scored 1 point.

The scores of respondents with positive technological attitudes were then compared with those with negative technological attitude, giving their gender. The content of the instruments were validated by the researcher's colleagues in the university and Physics teachers from different secondary schools. Their comments and corrections were greatly considered and incorporated into the final form of the instruments before they were administered on the pilot sample of 30 Senior Secondary Two (SS2) physics students randomly drawn from the target population who were not part of the sample for the study. Their reliability coefficients were determined using Kudar Richardson formula 21 (KR-21) and the reliability indices were 'students', attitude towards technology questionnaire, 0.74 and Physics achievement test, 0.86 The researcher administered the instruments directly to the respondents in their normal class room setting. The data obtained were analyzed using t-test statistics at .05 level of significant.

Results

Research Question One

What is the difference in Physics achievement between students with positive technological attitude and their counterparts with negative technological attitude?

The above research question was analyzed using mean and standard deviation. The results of these analyses are presented in Table 1.

Table 1: Mean Difference in Physics Achievement between Students with Positive Technological Attitude and their Counterparts with Negative Technological Attitude

Group	N	MEAN	SD	Mean difference
Positive technological attitude	75	41.95	7.68	
Negative technological attitude	87	36.76	6.17	5.19
Average Mean	**169**	**39.36**	**6.93**	

Data in Table 1 above showed that students with positive technological attitude had mean achievement scores of 41.95 and standard deviation of 7.68 while students with negative technological attitude had mean achievement scores of 36.76 and standard deviation of 6.17. However, the mean difference of 5.19 implies that the students with positive technological attitude achieved better than their counterpart with negative technological attitude.

Hypothesis One

There is no significant difference in Physics achievement between students with positive technology attitude and those with negative technological attitude.

Table 2: T-test Analysis of the Mean Achievement Scores of Students with Positive Technology Attitude and those with Negative Technological Attitude

Variables	N	Mean	SD	Df	Standard Error	t_{cal}	t_{tab}	P-value	Remarks
Positive technological attitude	75	41.95	7.68						
				160	1.09	4.75	1.98	0.001	Ho rejected
Negative technological attitude)	87	36.76	6.17						

The results of the above analysis show that the calculated t-value of 4.75 was greater than the critical t-value of 1.98 when tested at 0.05 level of significance with 162 degree of freedom. This shows that the result is significant. Therefore, the null hypothesis which states that there is no significant difference in Physics achievement between students with positive technological attitude and those with negative technological attitude is thereby rejected. This implies that, there was a no significant difference in Physics achievement between students with positive technological attitude and those with negative technological attitude. This suggests that students with positive technological attitude performed better than students with negative technological attitude.

Research Question Two

What is the difference in Physics achievement between male and female students with positive technological attitude?

The results of these analyses are presented in Table 3.

Table 3: Mean Difference in Physics Achievement between Male and Female Students with Positive Technological Attitude

Gender	N	X	SD	Mean Difference
Male	39	41.94	7.68	
Female	36	46.75	7.17	4.81
Average mean		44.35		

N = 75

Data in Table 3 above showed that the mean difference of male and female Physics students' with positive technological attitude is 4.81. This implies that the female students with positive technological attitude performed better than male students with positive technological attitude as indicated by their mean achievement score of 46.75 (Female) and 41.94 (Male) respectively.

Hypothesis Two

There is no significant difference in Physics mean achievement scores between male and female students with positive technological attitude.

Table 4: T-test Analysis of Physics Mean Achievement Scores between Male and Female Students with Positive Technological Attitude

Variables	N	Mean	SD	Df	Standard Error	t_{cal}	t_{tab}	P-value	Remarks
Male students	39	41.94	7.68						
				73	1.72	2.80	1.99	0.007	Reject Ho
Female students	36	46.75	7.17						

The results of the above analysis show the calculated t-value of 2.80 was greater than the critical t-value of 1.99 when tested at 0.05 level of significance with 73 degree of freedom. This shows that the result is significant. Therefore, the null hypothesis which states that there is no significant difference in Physics mean achievement scores between male and female students with positive technological attitude is thereby rejected. It implies that there was a significant difference in Physics mean achievement scores between male and female students with positive technological attitude. This suggests that female students had more positive attitudes than their male counterparts.

Discussion of the Findings

The study revealed that students with positive technological attitude had mean achievement scores of 41.95 and standard deviation of 7.68 while students with negative technological attitude had mean achievement scores of 36.76 and standard deviation of 6.17. However, the mean difference of 5.19 implies that the students with positive technological attitude achieved better than their counterpart with negative technological attitude. The corresponding hypothesis affirmed that, there was a no significant difference in Physics achievement between students with positive technological attitude and those with negative technological attitude. This suggests that students with positive technological attitude performed better than students with negative technological attitude. The finding is in line with the finding of Chukwu (2021) who reported that technological attitude on its own is the process by which human modify nature to meet needs and want.

The study revealed that the mean difference of male and female Physics students' with positive technological attitude is 4.81. This implies that the female students with positive technological attitude performed better than male students with positive technological attitude as indicated by their mean achievement score of 46.75 (Female) and 41.94 (Male) respectively. It was also revealed that the female students with positive technological attitude performed better than male students with positive technological attitude. The corresponding hypothesis affirmed that there was a significant difference

in Physics mean achievement scores between male and female students with positive technological attitude. This suggests that female students had more positive attitudes than their male counterparts.

Conclusion

The study investigated the influence of technological attitude of students on academic achievement of secondary school Physics in Imo state. Based on the findings the researchers concluded that the students with positive technological attitude achieved better than their counterpart with negative technological attitude and that, there was a no significant difference in Physics achievement between students with positive technological attitude and those with negative technological attitude. This suggested that students with positive technological attitude performed better than students with negative technological attitude.

Finally, the researcher concluded that the female students with positive technological attitude performed better than male students with positive technological attitude, and that there was a significant difference in Physics mean achievement scores between male and female students with positive technological attitude. This suggested that female students had more positive attitudes than their male counterparts.

Recommendations

Based on the findings and conclusions of the study, the following recommendations were made.

1. Physics teachers should devise means of encouraging students technological attitudes towards Physics as students with positive attitudes performed better in academic achievement.
2. Teachers should be encourage to make use of the supplementation of strategies in teaching for positive attitudes and better academic achievements in Physics for both male and female students.

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