

Secondary School Students' Self Efficacy and Motivation as Correlates of Their Achievement in Physics

Achufusi, N.N., Utakaj.N., Onuh Chris .C., Okonkwoe.O.

Dept of Science Education Dept of Science Education Enugu State University Yola State University
Nnamdi Azikiwe University, N.A.U of Technology, Enugu Yola Awka
Corresponding Author: Achufusi, N.N.

Abstract: *Studies in Nigeria have reported students' underachievement in Physics and some other subjects. This explained why science education researchers among others have concentrated their efforts on finding teaching method that promote teaching and learning of sciences, physics inclusive. Consequent upon the foregoing, this study explored secondary school students' self-efficacy and motivation as correlates of their achievement in Enugu State. The influence of gender on students achievement was also determined. Seven research questions and seven null hypothesis were used to guide the study. The research adopted a correlation survey design. The sample comprised of 384 SS II Physics students drawn from 12 out of 25 government owned schools in Enugu education zone of Enugu State using multi-stage sampling technique. The Physics self-efficacy (PSEQ) and Physics Motivation Questionnaires (PMQ) were used for data collection. The PSEQ consisted of 20 items measured in a 5 point Likert Scale format adapted from Sawtelle (2011) while the PMQ also consisted of 20 items measured in 5-point Likert scale format adapted from Mubeeh and Reid (2014). Pearson Product Moment Correlation and Regression analysis were used to answer the research questions and test the hypothesis at 0.05 level of significance. The findings of the study indicated that self-efficacy was not significant on students achievement, motivation was a significant influence on both male and female students' achievement. Conclusion from the findings led to Recommendations some of which are:- Teacher education programmes should train teachers on ways to improve their students' motivation, ministries of education, both state and federal should organize workshops and seminars and sponsor teachers to attend in-service courses on how to improve their teaching skills in order to enhance achievement motivation.*

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I. Introduction

Education is described as development of desirable qualities in people. This is why basic principle of education in Nigeria is equipping her citizenry with skills, knowledge, attitudes and values to derive maximum benefits in the society equally contributing to welfare and development of same society. Science as a branch of study and part of education is as old as man. Since inception of science, emphasis has been laid on study and improvement of science because of its impact on the technology of nations. Ezema (2011) stated that science is an ever expanding dynamic subject involving the study of natural phenomena and matter. The introduction of science into Nigeria's post primary institutions according to Ebe (2009) started as at 1878. Then, taught as "general science" with basic ideas of Chemistry, Physics and Biology.

Physics as a branch of science is one of the core subjects taught in schools and is highly needed for our technological breakthrough. Achufusi (2018) stated that Physics is an aspect of Science that helps to explain the cause effects relationships of matter and energy and their applications to natural phenomena. Danjuma (2008) described Physics as the soul of science that not only play a role in human endeavours but also serve as pre-requisite subject for courses such as medicine, engineering, pharmacy, space navigation astronomy among others. The objectives of physics at the Senior Secondary School Education are to stimulate and enhance creativity, provide basic literacy for functional living, enable students acquire the essential skills and attitudes as preparation for technology (FRN 2013).

Academic achievement in Physics or any subject is a mark of success as measured by a test. Academic achievement could be defined as self-perception and self-evaluation of ones success having undergone a test (Achufusi 2018).

Awan, Noureen and Naz (2011) defined academic achievement as the examination marks, teachers given grades and percentages in academic subjects earned by students. Achufusi (2018) refers it as level of success as shown by marks gotten from a standardized tests or teacher given grades.

Self-efficacy is the belief in one's capabilities to organize and execute the courses of action required for producing a given attainment. The way people think, feel, act, and motivate themselves is effected by self-

efficacy. Researchers studying self-efficacy suggest that people lacking in self-efficacy have problems with motivating themselves to carry out tasks.

Jamali, Noroozi and Tahmasobi (2012) referred academic self-efficacy to student's perceptions of their competence to do their class work. Academic self-efficacy refers to individuals' convictions that they can successfully perform given academic tasks at designated levels. This belief is linked to self-concept which is general self-descriptive belief that incorporates many forms of self-knowledge and self-evaluative feelings. On another hand motivation is an inner drive that directs a student's behavior towards the fulfillment of a goal. It influences how & why people learn as well as their academic achievement. To perceive the relationship between self-efficacy and motivation, self-efficacy is observed to be a major ingredient in motivation (Bandura 2006).

It is a well-documented fact that the disciplines of Science Technology, Engineering and Mathematics (STEM) are predominated by male students. Agreeing to these studies, women in Physics appear about 39% of under and graduate students (AIP 2014). Some other studies indicate that women show lower levels of conceptual knowledge than men in introductory Physics courses (Madsen, Mackagan & Sayre 2013). Studies by Kost-Smith (2011), Ghazanfar & Akram (2014), Denice & Hattice (2016) found that women entered physics classes with lower self-efficacy than men and this disparity also increased with development of the course. The study by Ghazanfar and Akam (2014) revealed a highly significant positive relationship between student self-efficacy and their CGPAS. Saleh (2014) in a research on Malaysian students found no significant difference between male and female students with regard to motivation while Chow and Seng Yong (2013) found a significant positive association between students' motivational orientations and science achievement between boys and girls. Therefore it is important to determine the variables that influence students' achievement in Physics. The focus of the study is to investigate secondary school students' self-efficacy and motivation as correlates of their academic achievement in physics, equally influence of gender on physics self-efficacy and motivation among others.

Statement of the Problem: The development in technology in Nigeria is poor and contributes immensely to the state of underdevelopment in Nigeria. The teaching and learning of physics

Research Questions: The following questions guided the study:

- (1) What is the nature of relationship between students' self-efficacy and their academic achievement in Physics?
- (2) What is the relationship between male students' self-efficacy and their academic achievement in Physics?
- (3) What is the relationship between female students' self-efficacy and their academic achievement in Physics?
- (4) What is the relationship between male students' motivation and their academic achievement in Physics?
- (5) What is the relationship between female students' motivation and their academic achievement in Physics?
- (6) What is the contribution of students' self-efficacy and motivation to the relationship of their academic achievement in Physics?

Hypothesis: The study tested the following Null hypotheses at 0.05 level of significance.

- (1) There is no significant relationship between secondary school students' self-efficacy and their academic achievement in physics
- (2) There is no significant relationship between students' motivation and academic achievement in Physics
- (3) There is no significant relationship between male students' self-efficacy and their academic achievement in physics.
- (4) There is no significant relationship between female students' self-efficacy and their academic achievement in physics.
- (5) There is no significant relationship between male students' motivation and their academic achievement in Physics.
- (6) There is no significant relationship between female students' motivation and their academic achievement in Physics.
- (7) There is no significant correlation among secondary school students' self-efficacy, motivation and their academic achievement in Physics.

II. Methods

Research Design: The correlational survey design was used in this study. The correlation survey design seeks to establish what relationship that exists between two or more variables (Nworgu 2015). Usually such indicates the direction and magnitude of the relationship between the variables.

Area of Study: The study was conducted in Enugu education zone of Enugu State. The zone consists of 3 local government areas, and there are 25 public secondary schools in the zone. The choice of this area is that they have reasonable number of school types (Boys, Girls, Co-educational) and the people show great zeal and interest to study the sciences.

Population of the Study: Made up of 1,911 senior secondary school II (SS II) Physics students in the 25 government owned secondary schools.

Sample and Sampling Technique: The sample comprised of 384 (20%) SS II Physics students drawn from 12 out of the 25 government owned schools. Multi-stage sample technique was employed, firstly purposive in selecting 3 girls, 3 boys and six co-educational schools then simple by lucky dp in selecting 2 girls, 1 co-edu while 1 boy was purposely sampled.

Instrument for Data Collection: Two Instruments were used the Self-Efficacy Questionnaire (SEQ) and Physics Achievement Motivation Questionnaire (PAMQ). The self-efficacy questionnaire was developed by Sawtelle (2011) and adapted by researcher and it consisted of 20 items where participants' responses were measured using 5-point Likert Scale ranging from SA to SD. The Physics achievement motivation questionnaire developed by Mubeen and Reid (2014) was adapted to determine students' achievement motivation in Physics. Equally it is on a 5 point scale of SA to SD while the annual cumulative marks of physics students in 2017/2018 were used.

Validation of Instrument: The instruments were validated by three experts, two in measurement and evaluation and one in physics. They established the face and content validity of the instrument and their corrections effected.

Reliability of the Instrument: The reliability was established by administering to 25 students who were not part of the study sample. Cronbach alpha was used to determine the reliability which yielded 0.87 for PSEQ and 0.89 for PAMQ.

DATA COLLECTION: The researcher with the aid of the research assistants who were subject teachers in the sampled schools distributed the questionnaires to the respondents. A meeting was earlier organized with the research assistants where the objectives of the study were discussed. They understood clearly the objectives of the study and asked questions. The responses were collected on the spot. The students' cumulative annual results were collected from their teachers.

III. Presentation And Analysis Of Data

Research Question I: What is the relationship between students' self-efficacy and their academic achievement in Physics?

Table 1: Correlation of students' self-efficacy and Achievement in physics

Predictor	N	Achievement
Self-efficacy	384	Pearson Coefficient(r) 0.074 Significance 0.073

Table I showed the relationship between physics students' self-efficacy and achievement, which indicated a positive Pearson's coefficient of 0.074. This means that as self-efficacy goes up, their value of achievement also is high.

Hypothesis 1: There is no significant relationship between secondary school students' self-efficacy and their academic achievement in physics.

The data on table I, showed that the positive correlation that existed between physics students' self-efficacy and their academic achievement was not significant. Since the p-value of 0.073 obtained was greater than 0.05 level of significance in which the hypothesis was stated.

Research Question 2: What is the relationship between students' motivation and their academic achievement in physics?

Table 2: Correlation of students' motivation and achievement in physics

Predictor	N	Achievement
Motivation	384	Pearson Coefficient 0.182 Significance 0.001

Table 2, shows the relationship between physics students motivation and achievement, which indicated a positive Pearson' coefficient of 0.182. This shows that the achievement of student increased as their self-efficacy. The strength of this positive relationship between variables is weak since 0.182 is less than 0.3.

Hypothesis 2: There is no significant relationship between students' motivation and their academic achievement in physics.

The data on table 2, showed that the positive correlation that existed between students physics motivation and their achievement was significant since the p-value of 0.001 obtained was less than 0.05 level of significance in which the hypothesis was stated.

Research Question 3: What is the relationship between male students' self-efficacy and their academic achievement in physics?

Table 3: Correlation of male students' self-efficacy and achievement in physics

Male Students	N	Achievement
Self-efficacy	192	Pearson Coefficient 0.040 Significance 0.292

Table 3, showed that the relationship between male physics students' self-efficacy and achievement, which indicated a positive Pearson's coefficient of 0.040.the strength of this positive relationship between the variables is weak since 0.040 is less than 0.3.

Hypothesis 3: There is no significant relationship between male students' self-efficacy and their academic achievement in physics. The data on table 3, also showed that the positive correlation that existed between male physics students- self-efficacy and their achievement was not significant, since the p-value of 0.292 obtained was greater than 0.05 level of significance in which the hypothesis was stated.

Research Question 4: What is the relationship between female students' self-efficacy and their academic achievement in physics?

Table 4: Correlation of female student self-efficacy and achievement in physics.

Female Students	N	Achievement
Self-efficacy	192	Pearson Coefficient 0.112 Significance 0.060

Table 4, showed the relationship between female physics students' self-efficacy and achievement, which indicated a positive Pearson's coefficient of 0.112. The strength of this positive relationship between the variables is weak since 0.112 is less than 0.3.

Hypothesis 4: There is no significant relationship between female students' self-efficacy and their academic achievement in physics.

The data on table 4, also showed that the positive relationship that existed between female students' self-efficacy and their achievement was not significant since the p-value of 0.060 obtained was greater than 0.05 level of significance in which the hypothesis was stated.

Research Question 5: What is the relationship between male students' motivation and their academic achievement in Physics?

Table 5: Correlation of male students' motivation and achievement in Physics

Male	N	Achievement
motivation	192	Pearson Coefficient 0.184 Significance 0.005

Table 5, showed that relationship between male physics students motivation and achievement indicated a positive relationship between the variables is weak since 0.184 is less than 0.3.

Hypothesis 5: There is no significant relationship between male students' motivation and their academic achievement in physics. The data also showed that the positive correlation that existed between male physics students' motivation and their achievement was significant since the p-value of 0.005 obtained was less than 0.05 level of significance.

Research Question 6: What is the relationship between female students' motivation and their academic achievement in Physics?

Table 6: Correlation of female students' motivation and achievement in Physics

Female Students	N	Achievement
Motivation	192	Pearson Coefficient 0.179 Significance 0.007

Table 6, showed the relationship between female physics students' motivation and achievement, which indicated a positive Pearson's coefficient of 0.179. The strength of this positive relationship between the variables is weak since 0.179 is less than 0.3.

Hypothesis 6: There is no significant relationship between female students' motivation and their academic achievement in physics. Data notable 6 also showed that the positive correlation that exists between female students' motivation and their achievement was significant, since p-value of 0.007 obtained was less than 0.05.

Research Question 7: What is the nature of contribution of students' self-efficacy and motivation to the relationship of their academic achievement in physics?

Table 7: Regression Analysis of students' self-efficacy motivation and achievement in physics

Predictor	b	SEb	β	T	Sig.
Constant	31.375	5.497		5.798	.000
Self-efficacy	.060	.050	.061	1.200	.231
Motivation	.205	.058	.177	3.519	.000

Table 7, shows the combined relationship between physics self-efficacy, motivation and academic achievement. Both have positive b-values 0.060 (self-efficacy) and 0.205 (motivation) indicating positive relationships.

Hypothesis 7: There is no significant correlation among secondary school students' self-efficacy, motivation and their academic achievement in physics. The data on table 7 also show that the positive relationship between self-efficacy, achievement (self-efficacy, $+ (381) = 1.200$, $p = 0.231$) was not significant while the positive relationship between motivation and achievement (motivation $+ (381) = 3.519$, $p = 0.001$) was significant.

IV. Summary/Conclusion

Self-efficacy was not a significant factor on students many achievement in physics. Motivation was a significant factor on students' achievement in physics. Self-efficacy was not a significant factor on male and students' achievement in physics. Motivation was a significant factor on the male as well as female's student's achievement in physics.

The combined effect of self-efficacy and motivation and students' achievement in physics proved that motivation has a significant effect on students' achievement while self-efficacy had no significant impact.

V. Discussion

Self-efficacy was not a significant factor on students' achievement in physics. This showed self-efficacy had positive correlation with students' achievement but the positive relationship had no significant direct effect on achievement. This finding contradicted the result findings of Ghazanfar and Akram (2014), Deniz&Hatice (2016) whose results revealed significant factor on students' achievement in physics since the p-value of 0.001 obtained was less than 0.05 meaning that motivation positively correlated and significantly influenced students' achievement. This agreed with findings of Deniz and Hatice (2016); Chow &Seng Yong (2013) whose findings revealed that there is a significant influence of motivation on achievement.

Self-efficacy was not a significant factor on both male and female students' academic achievement in physics. This showed that there is no gender difference on the influence of self-efficacy on students' achievement in physics. This agreed with finding of Sahile (2014) that female students are better than male in their achievement. Equally motivation had a positive significant influence on both male and female achievement in physics. This finding agreed with that of Saleh (2014) that showed motivation had a positive significant influence on both male and female achievement in physics. This finding agreed with that of Saleh (2014) that

showed motivation had a positive significant influence on both male and female students' achievement. It contradicted finding of Chaw and Seng (2013) which revealed significant difference on influence of achievement, motivation on male and female students' achievement.

VI. Conclusion

The study had shown that achievement motivation was a significant predictor of students' academic achievement in physics, while self-efficacy was not a significant predictor of students' academic achievement in physics irrespective of gender and also combined influence of motivation and self-efficacy on students' achievement.

VII. Recommendation

Based on findings, it was recommended that Teacher education programmes should include training teachers on adopting different strategies and skills to improve students' achievement motivation.

2. Ministries of education (State & Federal) should organize workshops, seminars to sponsor teachers to attend in-service courses to improve their skills and enhance students' achievement.

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