

# Self-concept, Test Anxiety and Achievement Motivation as Predictors of Academic Achievement in Physics among Secondary School Students in Rivers State, Nigeria

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## Abstract

This study was conducted to ascertain the extent self concept, test anxiety and achievement motivation jointly, and independently predict secondary school students academic achievement in Physics in Port Harcourt Local Government Area of Rivers State. Population for the study comprised all the senior secondary class two (SSS 2) Physics students. The sample for the study was made up of 254 SSS 2 Physics students which comprised 144 male and 110 female students drawn from four secondary schools through simple random sampling and stratified random sampling techniques. The instrument for the study was Self-concept, Test Anxiety and Achievement Motivation as Predictors of Secondary School Students Academic Achievement Instrument (STAAMPSSAAI) and the reliability co-efficient were determined through Cronbach Alpha as 0.64, 0.75 and 0.62 respectively. Two research questions were answered while two hypotheses were tested. The results were that self-concept, test anxiety and achievement motivation jointly and independently significantly predicted secondary school students' academic achievement in physics. The predictions of test anxiety on students academic achievement in physics was the highest and negative. Some recommendations were made among which were that teachers should help students to have positive self-concept and also help them to reduce test anxiety.

**Keywords:** Self-concept, test anxiety, achievement motivation, stress, eustress.

## 1. Introduction

Academic achievement is a score that shows the extent a learner has benefited from the process of teaching and learning. Academic achievement is a way of proving whether learning has taken place or not, and if yes, to what extent did the learning occur. According to Wikipedia (2017), academic achievement or performance is the extent to which a student, teacher or institution has achieved their short or long-term educational goals. Cumulative Grade Point Average (CGPA) and completion of educational programme such as high school and Bachelors degree represent academic achievement. Academic achievement is the end product of any academic endeavour. According to (Aremu, Oluwole and Fayombo, (2001), learning outcome is seen as the end product of any academic endeavour and this outcome has different appellations which include academic achievement, academic performance and academic success.

The criterion for this study is academic achievement, in physics. Physics is the branch of science concerned with the nature and properties of matter and energy. Physics is a science that deals with matter, energy and their interactions. Physics, as a scientific discipline could be distinguished from other scientific fields such as chemistry and biology based on its components which include mechanics, heat, light and other radiation, other components of physics include sound electricity and the structure of atoms. The importance of physics therefore in the scientific and technological development of any country cannot be over emphasized. Physics also plays an important role in the education of scientists such as: chemists, engineers, computer Scientist and practitioners of the other physical and biomedical sciences.

Despite the great importance of physics, the performance of students in the subject at Senior Secondary School Certificate Examination (SSCE) and National Examination Council (NECO) remains below expectation. For instance in NECO 2010 only 29.49% obtained five credits and above in physics (Osugwu cited in Amuche, Amuche, Bello & Maruwan (2014). In 2015 only 38.68% of the students who sat for SSCE examination obtained credit in five subjects and above including English Language and Mathematics (WEAC 2015). Eguridu (2014) stated that only 31.28% obtained five credits and above including English and Mathematics in 2014 SSCE.

## 1.1 Self-concept

Self-concept refers to a person's self perception. Thus self-concept is the way one thinks of one's self (Onukwufor, 2012). According to Brehm, Kassim and Fein (2005:56) "Self concept refers to the sum total of beliefs that people have about themselves". In this regard, self-concept is seen as the beliefs a person has about himself. On the other hand, Myers (2005:41) saw self-concept as a person's answer to the question "who am I". Implicit in Myers definition is that the words I will use to describe my self, in response to the question "who am I" constitute my self-concept. In their own definition Bernstein, Bernstein, Benner Clarke – Stewart and Roy (2006:74) defined self-concept as the beliefs we hold about who we are and what characteristics we have. Huitt (2011) saw self concept as the basis for all motivated behavior. Brigham cited in Huitt (2011) stated that people develop and maintain their self-concepts through the process of taking action and then reflecting on what they have done and what others tell them about what they have done.

There are certain factors that determine self-concept, these include social identity: this refers to the social groups we identify with such as our nation, state, town, religion and club. Success and failure: if one succeeds in a task, he feels more competent and develops positive self concept, on the other hand, if one encounters failure he develops negative self concept and may be discouraged from putting in extra effort. Judgement of other people: our self concept is usually influenced by what people say about us. For instance if many people commend us for being hard-working then we tend to see ourselves as being hard working. In addition, if different people have been telling us that we are kind, then we tend to see ourselves as being kind. The two instances are examples of positive self concept. If an individual sees himself as being ugly, it is an example of negative self concept. The role we play in the society also determines our self concept. For instance if we are learners in secondary or tertiary institutions, we see ourselves as students but if we are teaching in secondary or universities, we see ourselves as teachers or lecturers. Genetic factor is another determinant: our gender and complexion including height are genetically determined.

Huitt (2011) identified several components of self concept as follows: physical self concept. The physical self concept relates to concrete issues such as how one looks like, person's gender, weight and the type of dress or car the person uses. The next is academic self-concept which is concerned with how well an individual performs in the school or how well an individual demonstrates an ability, to learn an academic material. Social self-concept relates to the extent some one interacts with other people. The fourth component of self-concept is transpersonal self-concept. This aspect of self-concept describes how a person relates to the supernatural or unknowns. Hamachek (1995), reported that self –concept and school achievement are related.

## 1.2 Test Anxiety

For learning to be effective, there is need to evaluate the learner periodically in order to ascertain if learning has taken place or not. However, many learners are scored by act of evaluation which may be in the form of test or examination. The fear and worry which the examinee exhibits during test or examination is known as test anxiety. According to Bernstein, Penner, Clarke – Stewart and Roy (2006:370) "people whose over-arousal impairs their ability to do well in testing situations are said to suffer from test anxiety". People who are suffering from test anxiety exhibit symptoms such as heart palpitations, sweating and negative thoughts, such as thoughts of failure and disregard by other people. In a study by Bernstein et.al (2006), they found that up to 46% of elementary and secondary school students experience test anxiety during tests and examinations, and that male and female students suffer from the problem equally. They further found that it was correlated with lower IQ scores. At the height of test anxiety, some of the students affected may not successfully complete the test. Colman (2003:736) saw test anxiety as "a form of state anxiety aroused by the event or prospect of taking a test or examination". Bernstein et al (2006) postulated that too much arousal, or even too little, tends to result in decreased performance. However, Ormrod (2008) is of the opinion that a small amount of anxiety can actually enhance performance.

## 1.3 Achievement Motivation

Colman (2003) explains that achievement motivation is another name for need for achievement. This view implies that people have desire to achieve a specified objective. In addition, individuals who have the trait of achievement motivation tend to put in every possible effort to achieve success both in academic and other fields of human endeavour. Murray cited in Myers (2005), sees achievement motivation as a person's high need for achievement and further described it as a desire for significant accomplishment, for mastering skills or ideas, for control and for rapidly attaining a high standard. Implicit in Murray's description is that it has to do with a person's great zeal to accomplish any desired objective. Thus, if a person is pre-occupied with the pursuit of a

goal or any goal he undertakes, such a person has achievement motivation. Myers (2005) observed that people with achievement motivation tend to prefer moderate difficult tasks where success is attainable and is attributable to their skills and efforts. Myers further stated that people with low achievement motivation tend to cherish very easy or very difficult tasks where failure is quite unlikely or not embarrassing. The person who is low in achievement motivation prefers tasks that are very simple so that they will be able to pass or the task that is very hard so that when the person fails no body will blame him, rather the blame will go to the item difficulty. Copper cited in Myers (2005) stated that people with achievement motivation tend to persist more when the task is difficult while under achievers or those with low achievement motivation persist less in completing difficult test. Secondary school students who are low in achievement motivation are academic under achievers and may end up as school drop outs. Students who are low in achievement motivation may also be economically and socially affected. For instance, when such persons are employed, they may not be able to retain their job for a long time. In addition, according to McCall (1994) they may not be able to maintain their marriages. It has also been observed that people with high achievement motivation tend to achieve more (Myers 2005). In a study conducted by Bloom as cited in Myers (2005), it was found that outstanding scholars, artists and athletes were high in achievement motivation, self-discipline and were desirous to spend hours every day to the pursuit of their goals.

According to Bernstein, Penner, Clerk-Stewart and Roy (2006) achievement motivation tends to be learned in early childhood. In a study between parents of low achievement and high achievement, motivation by Andrade, and McClelland as cited in Bernstein et al (2006) it was found that fathers whose children scored low in achievement motivation task discouraged them from continuing, interfered or even completed the task for them when they were given a difficult task which they were sure to fail. The reaction of parents whose children scored high in achievement motivation test was a sharp contrast from that, of parents for whose children scored low in achievement motivation who were given the same difficult task. The response of parents whose children scored high in achievement maturation test were as follows:

1. They encouraged their children to try difficult tasks especially new ones.
2. Parents gave praise and other rewards to their children for success or good performance.
3. Parents also encouraged their children to find ways to succeed rather than complaining about failure.
4. In addition, parents prompted their children to go to the next, more difficult task. The above findings tend to show that parents behavior to their children contributes towards the children being low or high in achievement motivation.

Shah (2003) was of the view that even the slightest cue that a parent provides can boost people's efforts to achieve a specified goal. Achievement motivation can as well develop due to moral encouragement and reinforcement which students receive from teachers and parents. According to Teevan and McGhee cited in Myers (2005) highly motivated children or children with high achievement motivation often have teachers and parents who encourage their independence from early age, praise and reward them for their achievements. Such parents actually encourage their children to be independent. For example, parents of children who are high in achievement motivation encourage them right from infancy to dress and feed themselves and to be successful in school.

## **2 Statement of Problem**

The way a person sees himself may have positive or detrimental consequences on such an individual, especially in the realm of academics. In a situation where a student sees himself as unintelligent which is an indication of negative self concept may discourage the student from putting extra effort in his studies, thus the students performance may continue to dwindle and the student may end-up as a school drop-out. Also in a situation where a student is consistently frightened by the thought of test or the actual act of writing tests and examination may lead to poor academic achievement in physics. In addition, a student who has low, achievement motivation may not see the need to put in extra effort in his studies since he may not be desirous of great achievement. What so ever that has negative consequence on students academic achievement in physics has negative consequence to the development of science and technology in Nigeria since physics appears indispensable in the science and technological development of any nation.

The problem of this study therefore is to verify the extent self concept, test anxiety and achievement motivation predict secondary school students academic achievement in physics in Rivers State of Nigeria.

## 2.1 Research Questions

Two research questions guided the study:

1. To what extent do self concept, test anxiety and achievement motivation jointly predict physics academic achievement of secondary school students in Port Harcourt LGA of Rivers State.
2. To what extent do self concept, test anxiety and achievement motivation independently predict academic achievement in physics of secondary school students in Rivers State?

## 2.2 Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. Self-concept, test anxiety and achievement motivation, do not significantly jointly predict physics academic achievement of secondary school students in Port Harcourt LGA of Rivers State.
2. Self-concept, test anxiety and achievement motivation do not significantly independently predict physics academic achievement of secondary school students in Port Harcourt LGA of Rivers State.

## 3 Methodology

The research design adopted for the study was correlational. The population for the study was made up of all physics senior secondary school class two (SSS 2) students in Port Harcourt local Government Area of Rivers State. The sample for the study was made up of 254 SSS 2 physics students which comprised 144 male and 110 female students. The sample size was drawn from four secondary schools using simple random sampling and stratified random sampling techniques. The researchers' designed instrument used for the study was captioned self-concept, test-anxiety and achievement motivation as predictors of secondary school students academic achievement inventory (STAMPSSAAI). The instrument was made up of four sections and 33 items. Sections B, C, and D measured self-concept, test anxiety and achievement motivation respectively. Sections B,C and D contained 11 items each. Cronbach Alpha was used to determine the internal consistency of the instrument and the co-efficients obtained for the various subsections were, self-concept (section B) 0.64, test anxiety 0.75 (section C) and achievement motivation (section D) 0.52. The instrument was validated by three experts in the department of Educational Psychology Guidance and Counselling University of Port Harcourt and their suggestions were reflected in the correction of the instrument. The instrument contained four Likert rating scale of strongly Agree, Agree, Disagree and strongly disagree. The six positively cued items in section B were scored as follows: SA = 4, A = 3, D = 1, while the five negatively cued items in the section were scored in reverse order. The same scoring pattern also applied to section D where six and five items were positively and negatively cued respectively. The statistical technique used for data analysis was multiple regression associated with analysis of variance. The dependent variable which is students academic achievement was obtained from the respondents schools physics score, which was converted to standard score (T Score)

## 4 Results

### Research Question 1

To what extent do self-concept, test anxiety and achievement motivation jointly predict physics academic achievement of secondary school students in Port Harcourt Local Government Area of Rivers State?

This research question was answered using multiple regression whereby the scores of the students in self-concept test anxiety and achievement motivation, constituted the predictor variables, while the students scores in physics was the criterion variable.

**Table 1:** Summary of Multiple regressions of Students Self-Concept, Test Anxiety and Achievement Motivation as Predictors of Students Academic Achievement in physics.

| R    | R-square | Adjusted r-square | Standard Error of the estimate |
|------|----------|-------------------|--------------------------------|
| .240 | .058     | 0.046             | 9.21438                        |

Table one showed that the multiple regression of students self-concept, test anxiety and achievement motivation combined is not strong (R = 0.240). The table also indicated that multiple co-efficient of determination (R<sup>2</sup>) is 0.058 while the adjusted multiple co-efficient of determination (Adj R<sup>2</sup>) is 0.046.

Based on the adjusted multiple co-efficient of determination, it could be construed that self-concept, tests anxiety and achievement motivation jointly predicted 4.6% of secondary school students academic achievement in physics in Port Harcourt LGA of Rivers State. Other extraneous variables are responsible for 95.4% of students academic achievement in physics.

**Hypothesis 1:**

1. Self-concept test anxiety and achievement motivation do not significantly jointly predict physics academic achievement of secondary school students in Port Harcourt LGA of Rivers State.

**Table 2: Analysis of Variance of the Multiple Regression showing the significance of prediction of self-concepts Test anxiety (TA) and Achievement Motivation (AM) on Students Academic Achievement in Physics.**

| Sources of Variances | Sum of Squares | Of  | Means   | F     | Sig. |
|----------------------|----------------|-----|---------|-------|------|
| Regression           | 1301.439       | 3   | 433.813 | 5.109 | .002 |
| Residual             | 21333.110      | 251 | 84.905  |       |      |
| Total                | 22612.547      | 254 |         |       |      |

Predictors: SC, TA, AM

Dependent variable: Academic Achievement in Physics

In table 2, the analysis of variance shows that the calculated F value of 5.109 at the degrees of freedom of 3 and 251 and at P value of .002. Since the P value obtained was less than the alpha of 0.05, it therefore suggest that the joint prediction of self concept, test anxiety and achievement motivation on physics achievement was statistically significant.

**Research Question 2:** To what extent do self-concept, test anxiety and achievement motivation independently predict academic achievement in physics of secondary school students

**Hypothesis 2:** Self-Concept, test anxiety and achievement motivation do not significantly independently predict academic achievement in physics of secondary school students in Port Harcourt Local Government Area of Rivers State.

The research question was answered using the standardized partial regression (Beta), while the corresponding null hypothesis was tested using the t-test that is linked to the multiple regression. The results obtained multiple regressions. The results obtained are summarized and presented in tale 3.

**Table 3:** independent prediction of self-concept (SC) Test anxiety (TA) and Achievement motivation (AM) of Secondary School Students Academic Achievement in Physics.

| Variables | Unstandardized |           | Standardized co-efficient |       | Sig.  |
|-----------|----------------|-----------|---------------------------|-------|-------|
|           | B              | Std error | Beta                      | T     |       |
| Content   | 40.230         | 8.189     |                           | 4.913 | .000  |
| SC        | 0.528          | 0.232     | 0.141                     | 2.271 | 0.024 |
| TA        | 0.319          | 0.113     | 0.178                     | 2.835 | 0.005 |
| AM        | 0.387          | 0.154     | 0.157                     | 2.518 | .012  |

Table 3 above showed that in answer to research question 2, the unstandardized multiple regression co-efficients as 0.528, 0.319 and 0.387 for self-concept test anxiety and achievement motivation respectively.

The standardized regression co-efficient (Beta Weights) for self concept, test anxiety and achievement motivation are: 0.141, 0.178 and 0.157 respectively: Therefore the explained variance of the prediction are as follows: 14.1%, 17.8% and 15.4%, for self concept, test anxiety and achievement motivation respectively. This implies that the variations in students academic achievement in physics can be explained by self-concept 14.10%, test anxiety 17,8% and achievement motivation 15.4%. Therefore self-concept, test anxiety and achievement motivation predicted 14.1%, 17.8% and 15.4% of students academic achievement in physics. In terms of prediction in order of magnitude, apparently test-anxiety had the highest prediction of secondary school students academic achievement of 17.8% this was followed by achievement motivation 15.4% and the least predictor was self-concept 14.1%.

In addition, the result yielded p-values of 0.024, .005 and .012 for self-concept, test anxiety and achievement motivation respectively. These values were less than the chosen alpha of 0.05; therefore indicating that they had significant independent predication on academic achievement of physics.

## 5 Discussion

Table one above showed that self-concept test, anxiety and achievement motivation predicted 4.6% of secondary school students academic achievement in physic in Port Harcourt LGA of Rivers State. In table two the analysis of variance showed that the F value of 5.109 at the degrees of freedom of 3 and 251 and at P value of 0.002 which was less than the alpha of 0.05 showed that self-concept, test anxiety and achievement motivation jointly and significantly predicted secondary school students academic achievement in physics in Port Harcourt local government area of Rivers State. This finding is consistent with Oge cited in Amaeze (2016) that psychological variables influence students' academic achievement in physics. The finding does not correspond with Amaeze (2016) who found that self-concept and self-efficacy do not significantly predict secondary school students academic achievement in physics. The study result agreed with Siddiqui and Khan (2016) who found significant relationship between self-concept and academic achievement in physics.

In terms of independent prediction by the predictor variables as contained in table 3, the standardized regression co-efficient were: self-concept had a beta value of 0.141, test anxiety had beta value of 0.178, while the beta value for achievement motivation was 0.157. Based on the beta values obtained, it could be stated that self-concept, test anxiety and achievement motivation independently predicted 14.1%, -17.8% and 15.7% respectively of secondary school students' academic achievement in physics. In order of prediction magnitude test anxiety made the highest prediction of 17.8%, this was followed by achievement motivation prediction of -15.7%, while the least prediction of students' physics achievement was self-concept 14.1%.

In addition table 3 showed that self-concept had t value of 2.271 and P of .024 ( $P < 0.05$ ) test anxiety had t value of 2.835 and P. value of 0.005 ( $P < 0.05$ ) achievement motivation had t value of 2.518 and p. value of 0.012 ( $P < 0.05$ ) respectively. Since the P values were less than the alpha level of 0.05, it then means that self-concept, test anxiety and, achievement motivation significantly and independently predicted secondary school students' academic achievement in physics. Thus, the null hypotheses were rejected. The negative sign of test anxiety means that a unit increase in test anxiety which is a predictor variable will result in a unit decrease in students' academic achievement in physics.

The independent prediction finding of this study is in consonance with Balogun, Balogun and Onyencho (2017) who found negative prediction between test anxiety and academic performance among undergraduates. They also found that achievement motivation significantly moderated the relationship between anxiety and academic performance of the undergraduates. The finding of the study is also consistent with that of Utibeabasi cited in Siddiqui and Khan (2016) who found that physics students with high self-concept achieved high in physics.

### 5.1 Recommendations

The following recommendations were made based on the findings of this study.

1. Teachers should assist the students to increase their self concepts. This is because a unit increase in self-concept results in the same unit increase in physics academic achievement. Teachers should therefore create positive impression of students rather than negative. Students efforts in learning physics should be reinforced by the teachers.
2. Teachers should endeavour to reduce test anxiety among secondary school students. If test anxiety is reduced by five units or 5% for example, it will, result in 5 units or 5% increase in students physics academic achievement. In order to reduce students test anxiety in physics teachers should be regular in attending their physics periods and give many examples to the students while teaching. Also teachers should not used physics tests or examinations to threaten the students.
3. Parents should facilitate the development of achievement motivation in physics in their children by telling them the benefits of studying physics and encouraging them to be diligent in studying the subject so that they could be eminent scientists and engineers.

4. Parents should strive to buy recommended physics text books for their children who are studying physics in secondary schools.
5. School counselors should organize sensitization programmes on reduction of test anxiety among physics students in schools this will go along way in disseminating various tips on how to overcome test anxiety.
6. School counselors should organize workshops or playlets that will help to boost students self-concepts and other psychological variables that promote academic achievements

## 5.2 Conclusion

This study has revealed that self-concept, test anxiety and achievement motivation jointly significantly predicted secondary school students academic achievement in physics in Port Harcourt Local Government area of Rivers State. The study has also proved that self-concept test anxiety and achievement motivation independently significantly predicted students academic achievement in physics. The study further indicated that among the three predictor variables test anxiety which made negative prediction also made the highest prediction on secondary school students academic achievement in physics in Port Harcourt Local Government Area of Rivers State. It should therefore be noted that any substantial effort by parents and teachers to elevate students self-concept and achievement motivation will invariably lead to similar increase in students academic achievement in physics. In addition, any effort made by teachers to reduce student test anxiety in physics with increase students academic achievement in the subject.

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