

Influence of Teachers' Academic Self-Concept on the Academic Achievement of Secondary School Physics Students': The Mediating Role of Academic Motivation

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Abstract

The study investigated the influence of teachers' academic self-concept on the academic achievement of secondary school physics students: the mediating role of academic motivation in Agbani Education Zone of Enugu State. Four null hypotheses tested at .05 level of significant guided the study. An Ex-post-facto and correlational survey research design was adopted for the study. A simple random sampling procedure was used in selecting 275 SS II Physics students comprising 144 males and 131 females from twelve selected schools in the Zone. Teachers Academic Self-Concept Scale (TASCS) adapted from Marsh (1992), Physics Academic Motivation Scale (PAMS) adapted from Sinan (2018) and Students' Achievement Scores obtained from their promotion examination results from the schools used were used for data collections. The instruments (TASCS) and (PAMS) was validated by three experts and tested for reliability using Cronbach's alpha with the reliability indices of 0.82 and 0.86 respectively. Data were analyzed using path analysis to test the proposed hypotheses. The findings of the study amongst others showed that academic motivation positively mediated the relationship between teachers' academic self-concept and academic achievement of secondary school physics students. Based on these findings, it was recommended that Teachers should adopt teaching strategies that would stimulate students' academic motivation through their academic self-concept in teaching Physics.

Keywords: Physics, Teacher, Academic self-concept, Academic motivation and Academic achievement.

Introduction

Physics plays a critical role in a country's technological development and provides citizens with essential tools to carry out their day-to-day responsibilities properly. The knowledge of Physics contributes to technology, engineering, medicine, biotechnology, nursing, agriculture, and other range of fields for humankind. As a result, the Federal Republic of Nigeria (FRN, 2014) designated physics as a fundamental subject to be taught from junior secondary school as integrated science to senior secondary school to tertiary institution in its national policy on education. Physics is a science subject that studies matter, objects, energy, and their interaction in a given system or environment (Onah, 2022). Physics is the most fundamental and the root of every field of science (Eryilmaz, 2016). Anyakoha (2016) defined physics as a natural science that involves the study of matter and energy and their interactions. Physics is the study of the natural phenomena at their most fundamental levels and manner (Onah & Anamezie, 2022). Physics deals with the study of laws that determine the structure of the universe regarding the matter and energy in the universe (Ike, 2014). Physics

as the core subject taught in secondary school contributes to the cognitive development of students. Physics is the most utilized basic science subject in most technology and technology-based profession. The knowledge of physics exposes the students to the true nature of the universe around them; and as well forms the basis for the nation's technological advancement and human resource development for proper integration (Onah, Anamezie & Nnadi, 2022). Physics knowledge has impacted positively to the production of tools and devices of tremendous advantage to the human race for quality of life and sustainable development (Onah, 2022). This indicates that the enormous role Physics plays in the technological growth of any nation must not be undermined. Physics is the most basic of science and its concepts and techniques underline the understanding of all other branches of science. The knowledge of physics facilitates clearing the ground for an understanding of other disciplines; for instance, understanding quantum mechanics is necessary to chemists and material scientists since the structure of every atom in the universe is determined by quantum mechanics. Physics is also a cross-cutting discipline

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that has applications in many sectors for economic development, including health, agriculture, water, energy, and information technology. The knowledge of physics according to Gabriel (2012) offers learners the opportunity to think critically, reason analytically and acquire the spirit of inquiry. The researcher also maintained that the knowledge of physics develops in students, the scientific and technological knowledge, skills, and attitudes which will assist them to make based on the observation decisions through experimentation. Particularly, in our world developing with technological changes, the place of physics and its applications is quite important. The discovery in Physics led to the discovery of valuable devices like computers, lasers, transistor etc. these devices have been found paramount to the development of technological science (Onah & Achufusi, 2022). Notwithstanding, the numerous benefits of physics especially in the development of science and technology; students find physics concepts boring and difficult owing to the composition of mathematical processes. These students especially those in secondary schools, argue that physics is abstract.

Despite the importance of physics, students' academic achievement in the subject at secondary school has not been encouraging. In Nigeria, there has been recurring unacceptable attainment of students in physics. Record of student's performance at the Senior School Certificate Examination (SSCE) in physics conducted by the West African Examination Council (WAEC) according to Adolphous (2018) shows that between 2001 and 2009 (except in 2006), less than 50% of the students who enrolled for physics obtained credit level pass and above to secure admission into the university in order to pursue courses that require physics. The researcher also stressed that the failure rate continued from 2007 to 2009 (42.9%, 47.1% and 46.2%) and in 2013 (46%) with an improved achievement in 2010, 2011 and 2012 (50.2%, 62.6% and 67.2%). According to Onah and Achufusi (2022) the failure trends continued in 2015, 2017; and 2020 (47.83%, 41% & 36% respectively) with an improved achievement in 2016, 2018; and 2019 (71%, 87% & 80% respectively). In general, this cannot be considered an acceptable achievement as many have lamented that achievement of Nigerian students in physics at the Senior School Certificate Examination (SSCE) has been generally not so good (Adaramola & Obomanu, 2011). Even the WEAC chief examiners (2019), report that this poor achievement of the students could be linked to their poor motivation that emanates from

poor teachers' self-concept in the subject. They suggested as well that teachers should teach students with students centred approach to enhance their achievement in physics. They also suggested that teachers should attend coordination during WAEC marking to decipher viable methods to enhance students' achievement. According to Okigbo and Okeke, (2011) observed that students' poor achievement has been traced to their anxiety and fear in the subject which was evident in their poor achievement.

The students' poor achievement in physics in particular and sciences, in general, have been attributed to many factors. These include; poor methods of physics instruction by the teachers, insufficient number of qualified physics teachers, lack of indigenous textbooks, inadequate apparatus in the physics laboratory, poor classroom management by physics teachers, teacher's belief, self-concept and attitude towards physics, physics teacher's inability to improvise, inadequate instructional materials and aids, educational background and parental expectations on the learners and finally students' related factors or variables like students' academic anxiety, academic self-efficacy, academic locus of control, academic motivation and more (Adedayo & Jegede, 2013 pg 80-83). This study therefore, is set to find out the influence of teachers' academic self-concept on the academic achievement of secondary school Physics students: the mediating role of academic motivation.

The teacher plays an important role in the education process in the school, determining whether the students get involved or do not get involved through his pedagogical and epistemological approach. Academic self-concept is defined as the assessment, presumption and evaluation of a person's academic abilities. Academic Self-concept is defined as the intellectual ability and attitude of personality. It is commonly referred to as the complex, planned and self-motivated system of opinions, outlooks, and thoughts that each human comprehends to be accurate practically regarding his survival. Teachers' academic self-concept is the teachers' self-assessment regarding their educational abilities and the potentials they possess for effective teaching and learning processes. According to Ajmal and Rafique (2018), teachers' academic self-concept is defined as how an individual teacher feels about himself as a teacher and plays his role in academic settings through conceptualized pupils' awareness and perception of their academic capacities. Glotova and Wilhelm (2013), observed that





positive self-concept in teachers encourages student's self-regulation, motivation and a high level of selfesteem. The psychological attributes of teachers' selfconcept promote the students to obtain higher academic achievement. According to Kumari (2013), academic self-concept has a great impact on the achievement of students and it helps in determining the level of competence among students' potentials. The researcher noted that the way students behave in academic settings depends upon self-awareness. Individuals' approach regarding his/her talents and hidden potentials strengthens his/her belief in themselves and the individual gets better grades in school through their teachers' self-concept when positively impacted. She also found that self-concept creates the inspiration for the change in the behaviour of the individual. Teachers' academic self-concept is anchored in Covington's 1992 theory of self-worth. It states that all humans have capacity to build and keep constructive and optimistic self-image and a sense of pride for self-acceptance. Self-worth theory posited that it is important to improve and uphold constructive academic self-concept, in such a way that teachers teach with their own ability to influence students positively. According to Marsh (1992), teachers' academic self-concept is measured under the following subheadings: Teachers' self-concept: this can be seen as self-perceptions of the teacher on his own teaching effectiveness. Value: value is seen as the teachers' principles or standards of behaviour for desirable or undesirable ways of behaving in everyday life. Belief: belief is seen as the state of mind of the teacher in which confidence is placed in him for effective teaching and learning. Student-centered approach: This is seen as the strategy to place the learning condition and approaches of the student at heart for teaching-learning. effective Teacher-centered approach: This sees the teacher as the epitome of knowledge and discredits students' active engagement in the teaching-learning process. Apart from selfconcept, academic motivation is a significant and positive predictor of academic achievement (Mamah, Nnadi & Iwuagwu, 2021).

Academic motivation is an innate drive to work towards a goal-oriented project. Academic motivation directs students' action towards learning a particular behavior in order to achieve higher desired academic goal. Academic motivation is an important concept in classroom teaching and learning of physics and it is linked to increased levels of academic achievement (Ajayi, Lawani & Salomi, 2012). A student who is academically motivated is seen as self-determined to succeed in academic work and has the urge to achieve, that is, the level of motivation varies from one student to another. Academic motivation means generating the energy needed for academic tasks (Bozanoglu, 2004). According to Eccles and Colleagues (1983) theory of expectancies. They explained that an individual's perception about whether he or she can successfully accomplish a task is dependent on the individual's ability belief and expectancies of success. The National Association of School and Psychologists (2014) stated that positive academic motivation shows the characteristics; willing to learn, liking related learning activities and believing that education is important. Students who have high motivation will negatively affect procrastination, meaning that the higher the intrinsic motivation in an individual, the lower the tendency for procrastination behavior (Ferrari et al., 1995). Deci and Ryan (2000) explained that there are three dimensions of academic motivation which include extrinsic motivation, intrinsic motivation and a-motivation. The extrinsic motivation dimension is defined as a behavior that is based on certain consequences, for example: external rewards, social acceptance, running from punishment and achieving certain achievements. The dimension of intrinsic motivation is based on individual behaviour that is carried out for self-satisfaction rather than separate consequences from the individual. The amotivation dimension is the absence of motivation in a person. Individuals who are a-motivated do not have will to carry out any activity within themselves. For example, a student who is highly motivated to do homework out of curiosity and interest is said to be intrinsically motivated while another student who is motivated to do homework to procure the approval of the teacher or parent is said to be extrinsically motivated. There is another student who may not value the homework or feels incompetent to do it and lacks the intention to act. This student is said to be a motivated

Based on the problem of the study, the study investigated the influence of teachers' academic selfconcept on the academic achievement of secondary school physics students: the mediating role of academic motivation. The main purpose of this study was to figure out the effect of teachers' academic selfconcept on the academic achievement of secondary school physics students through academic motivation.



The following null hypotheses were proposed for the study, which was tested at .05 level of significance.

- 1. Teacher' academic self-concept has no significant effect on academic motivation.
- 2. Academic motivation has no significant effect on academic achievement.
- 3. Teachers' academic self-concept has no significant effect on academic achievement.
- 4. Academic motivation does not mediate the relationships between teachers' academic self-concept and the academic achievement of secondary school physics students.

Conceptual Model



Figure 1.

Previous studies (Luthans & Youssef-Morgan, 2017; Diseth, 2011; Ajmal & Rafique, 2018) have shown that teachers with higher academic self-concepts could likely employ cognitive strategies while teaching students to achieve high grades and perform difficult tasks. From the foregoing, the researcher might expect that teachers' academic self-concept can directly affect the academic achievement of secondary school physics students and may indirectly affect academic achievement through academic motivation. The proposed hypotheses above follow the extant of the literature reviewed in the present study. Teachers' academic self-concept would predict students' academic achievement. This is to say that teachers with higher academic self-concepts might produce students with higher academic achievement and grades. The teachers' academic self-concept would predict academic motivation. This is to say that students with higher positive academic motivation could positively associate with their teachers' ability to expose them to a high level of cognitive construct. Again, this study proposed that students with high academic motivation may likely show higher academic

achievement. Academic motivation would mediate the relationship between teachers' academic self-concept and students' academic achievement.

Method

The study employed an ex-post-facto research design incorporating both the correlation and qualitative approaches to interpret the results of the test of null hypothesis. The ex-post facto research design was chosen because the condition of the (independent variables) learners and the results had already occurred as is expected in such designs that do not manipulate any independent variable (Orodho, 2012). The correlational strand enabled the researcher to determine the relationship between variables through the use of correlational statistics (Wenslaus, 2015). Orodho (2012) notes that in correlational research, relationships among two or more variables are studied without any attempt to influence them. Orodho (2012) and Brooks (2013) contend that a major purpose of expost-facto research design of a correlation subtype is to clarify an understanding of important variables that have already occurred through the identification of relationships among the variables. The study was carried out in Agbani Education Zone, located East of Enugu State, Nigeria. Enugu State has six Education zones which include: Enugu, Awgu, Agbani, Nsukka, Obollo-Afor and Udi. Agbani Education Zone consists of three local government areas; namely: Enugu South, Nkanu East and Nkanu West local government area. The area has the first indigenous tertiary institution of the state which is Enugu State University of Science and Technology, Agbani (ESUT). The area is predominantly semi-urban in nature with basic amenities such as good roads, hospitals, electricity, schools and markets. Most people living in the zone were civil servants, students, traders and many farmers. The researcher chose Agbani Education Zone due to the fact that most of the secondary schools have qualified physics teachers, laboratories and instructional materials and yet students experience difficulties in answering questions in physics in their external examinations which was evident in their final achievement scores and grades in WAEC results hence the need for the study in the area. Therefore, this research will help teachers to integrate academic selfconcept and academic motivation which will in turn enhance good academic achievement. The population for the study was 2,752 SS2 Physics students from 44 public secondary schools in the zone. Two hundred and seventy-five (275) SS2 physics students (144

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males & 131 females) drawn through a simple random sampling approach from twelve co-educational secondary schools in Enugu South, Nkanu West and Nkanu East Local Government Area of Enugu State were used for the study. In stage one, a simple random sampling technique (precisely by balloting) was used to select Enugu South and Nkanu West Local Government Areas. In the second stage, purposive sampling was used to select twelve co-educational schools in the two local government areas based on the existence in those schools of well-equipped physics laboratories and experienced physics teachers with teaching qualifications. A simple random sampling technique (precisely balloting) was next used to select 275 students.

The instruments used for data collection were the Marsh (1992) teachers' academic self-concept scales, Sinan (2018) academic motivation scales modified by the researcher and students' achievement scores retrieved from their school records through their form teachers were used for data collection. Originally, the self-concept scales are for teachers' general self-concept and academic motivation scales for technology but were modified to specifically physics ability belief and expectancies of the goal of the teacher. The instrument TASCS includes 20 items, and each item is scored on 5 – point likert-type scale:

(Exactly true 5: Exactly false 1 for positive construct and reverse for negative construct). While PAMS included 25 items and each item is scored on 4-point likert-type scale: (Strongly agree 4: Strongly disagree 1 for positive construct and reverse for negative construct).

The instrument Teachers' Academic Self-Concept Scale (TASCS) and Physics Academic Motivation Scales (PAMS) were face validated by three experts and tested for reliability using Cronbach alpha which vielded a coefficient of 0.82 and 0.86 indices respectively. Physics academic Achievement scores were extracted from the students' promotional examination of 2021/2022 academic session. This is because the Enugu state government conducted a unified examination across the state secondary schools for promotion course. The variable of academic achievement is an interval scale. A student's achievement score is lower or higher than another. The proposed hypotheses, a path analysis in AMOS version 22 was employed, and all estimates were calculated using the maximum likelihood with bootstrapping (5000 resampling at 95% bias-corrected confidence intervals (CI95%).

Results

| able 11 Dumm | Te for summary of regression weights of the observed varias | | | | | | | |
|------------------|---|-------------|-------------|---------|----------|--|--|--|
| Parameter | Estimates | S. E | C. R | P-value | Decision | | | |
| MV - IV | .687 | .051 | 13.385 | .000 | S | | | |
| DV - MV | .625 | .035 | 18.007 | .000 | S | | | |
| DV - IV | .144 | .038 | 3.805 | .000 | S | | | |

Table 1: Summary of regression weights of the observed variables

Table 1 shows that the probability of getting a critical ratio as large as 13.385 in absolute value is less than 0.000. The result figured out that academic self-efficacy influences academic motivation positively and significantly (β = .687, t (275) = 13.385, P < 0.05[.000]). In other words, the null hypothesis is rejected. Thus: the regression weight for Self-concept in the prediction of Motivation is significantly different from zero at the 0.000 level (two-tailed).

Table 1 shows that the probability of getting a critical ratio as large as 18.007 in absolute value is less than 0.000. The result figured out that academic motivation influences academic achievement positively and significantly (β = .625, t (275) = 18.007, P < 0.05[.000]).In other words, the null hypothesis is

rejected. Thus: the regression weight for academic motivation in the prediction of Academic achievement is significantly different from zero at the 0.001 level (two-tailed).

Table 1 shows that the probability of getting a critical ratio as large as 3.805 in absolute value is .000. The result figured out that academic self-concept influences academic achievement positively and significantly (β = .144, t (275) = 3.805, P < 0.05[.000]). In other words, the null hypothesis is rejected. Thus: the regression weight for Academic Self-concept in the prediction of Academic achievement is significantly different from zero at the 0.001 level (two-tailed).

Table 2: Summary of Mediation analysis



| Observable | Standardized Estimation | P –Value | Confidence Interval at 95.0% for β | | Decision |
|-----------------|----------------------------|----------|--|-------------|--------------------|
| | | | Lower bound | Upper bound | |
| Total effect | 0.622 | .000 | .539 | .695 | Significant impact |
| Direct effect | 0.157 | .002 | .064 | .238 | Significant impact |
| Indirect effect | 0.466 | .000 | .387 | .547 | Significant impact |

The results in Table 2 revealed that the total effect of academic self-concept on academic achievement was significant (HO4: $\beta = .622$, P < .05. with the inclusion of mediating variable (Academic motivation), the impact of self-concept and academic achievement became significant ($\beta = .157$, P < .05. the indirect effect of academic self-concept on academic achievement of secondary school physics students through academic motivation was found significant ($\beta = .466$, P < .05. This shows that the relationship between self-concept and academic achievement is partially mediated by academic motivation.

Discussion

The finding of the study showed that students' academic motivation partially mediates the role of teachers' academic self-concept and academic achievement of secondary school physics students in Agbani Education Zone. The study revealed that, academic motivation indirectly increases students' academic achievement scores and overall performance together with increased behaviour in performing academic tasks in learning activities. This indirect relationship is facilitated by strong academic motivation so that the tendency of student academic achievement is more/ increased.

Overall, academic achievement has the tendency and consequence of increasing performance, quality of students' life, positive influence in the society (becomes active, easily encouraged, gains of selfconfidence and anxiety), (Zusya & Akmal, 2016). In this study, the academic achievement of secondary school physics students can be increased through teachers, self-concept and academic motivation. This finding is consistent with previous research by Ajmal and Rafique (2018) who found that teachers' selfconcept is one of the highest predictors of students' academic achievement. Teachers who have high selfconcept in their ability to impact and demonstrate a high level of commitment to their job will tend to give out academic assignments and monitor the students' assignment (Sawi, 2015). Research conducted by Glotova and Wilhelm (2014) identified high teachers' self-concept as the results of higher self-esteem of the

students. Higher achievement allows the students to have efficacy in their abilities, lack fear of failure in carrying out tasks successfully. Students who score higher in achievement tend to have self-esteem and attribute the success to the teacher's ability, confidence, and good working relation with other students together with a serene atmosphere for studying.

In addition, academic motivation can be increased to increase academic achievement in students (Malkoc & Mutlu, 2018). This is in line with Cavusoglu & Karatas (2015) who showed that academic motivation is positively correlated with academic achievement. Students who have a high level of academic motivation make them focus and do their homework, assignments as well due. They tend to integrate with other students, ask questions and pursue a target goal for good life attainment. It means that, when the level of motivation increases, the tendency to high achievement increases (Mamah, Nnadi & Iwuagwu, 2021). Galugu and Samsinar (2019) observed that positive teachers' self-concept on the students encourages student's high achievement, self-regulation and a high level of self-esteem. In this study, the direct effect of teachers' self-concept on academic achievement is smaller than the indirect effect, which is only 15.7%. Therefore, teachers' self-concept can no longer directly influence academic achievement when academic motivation is added as a mediator. This means that the self-concept effect is explained better by the presence of academic motivation, where the effect size increases from 15.7% to 46.6%. The finding of this study is in agreement with Izuchi, Bruno, and Onyekuru, (2017) who found that motivation significantly predicted academic achievement. This showed that the more students are being motivated, the better their academic achievement.

Finally, the findings of this study also showed the dissimilarity with the results of Sari's (2016) which explains that academic self-concept is not a good predictor of academic achievement. Furthermore, research conducted by Reza (2015) and Reyes, et al



(2012) explained that there is no relationship between academic motivation and academic achievement.

Conclusion/ Recommendation

Academic motivation partially mediates the relationships between self-concept and academic achievement of secondary school physics students. The finding concludes that physics teachers' academic self-concept cannot directly increase student academic achievement without the role of academic motivation. The implication of this research is that it is important for teachers to increase their academic self-concepts in order to positively influence students' academic motivation to have confidence that they are capable to carry out certain tasks and assignments successfully. Then, students are expected to be able to increase their own academic motivation in order to be able to increase academic achievement. It was recommended that teachers should challenge the students with learning materials that will encourage them to develop self-concept through academic motivation. School authorities should engage the services of guidance and counselors that will help students to know how to improve their academic motivation and apply them to achieve their learning needs. More so, Physics teachers should arrange learning activities, in such a way that it will help students to be self-directed in their learning; which will help them apply all the motivation both extrinsic and intrinsic academic motivation in the learning of physics.

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