



Relationship Between Self-Efficacy and Academic Achievement of Students in Mathematics

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Abstract

This study investigated the relationship between academic self-efficacy and academic achievement of students in Mathematics. Employing correlational and expo-facto research designs, the study raised four questions and tested four hypotheses at the 0.05 significance level. It randomly sampled 187 out of 4,275 students from 39 public and private senior secondary schools in Ethiope East Local Government Area, Delta State, Nigeria. Data were collected using school terminal results and a Mathematics Self-efficacy Scale (MSES). The MSES yielded high reliability (Cronbach's alpha = 0.845). Analysis revealed a strong positive relationship between academic self-efficacy and mathematics achievement. The study further revealed positive but not significant relationship between academic self-efficacy and academic achievement of male and female, public and private school and urban and rural school students, respectively. The study suggests implementing counseling services to address low self-efficacy and promoting awareness among students about the benefits of high self-efficacy for enhanced academic achievement in Mathematics.

Keywords: Self-efficacy, Academic achievement, Mathematics

Introduction

Academic achievement is one of the top priorities of school Mathematics curriculum assessment and evaluation. It is used to measure the extent to which a student, teachers, school or institution has achieved the stated educational goals. Academic achievement which is the yardstick to measure educational outcomes is paramount to the economic, scientific and technological advancement of a nation. It is so important that parents, teachers and society in general are much worried and concerned about the way to improve on it. Studies have indicated that students' academic achievement in schools have been affected by many psychosocial factors, such as motivation, attitude, anxiety and stress (Li, 2012; Adediwura & Tayo, 2007). Academic achievement has been much more investigated with relation to cognitive ability. Contrarily, Chamorro-Premuzic and Furham (2006) reported that cognitive abilities alone are not sufficient to account for individual differences in academic success or failure. One of such other determinants is self-efficacy.

Self-efficacy is one of the concepts under social learning theory of Bandura which postulates that human achievement depends largely on interactions between one's behaviours, personal factor (e.g. thoughts, beliefs), and environmental conditions (Bandura 1977). It also refers to beliefs about one's capabilities to learn or perform behaviours at designated levels. It could be referred

to as a person's belief in his or her ability to successfully accomplish a specific task and reach goals (Ormrod, 2006). Self-efficacy influences self-confidence, which in turn affects whether or not an individual will attempt and persist at a particular task (Artino, 2012). Later, Bandura (1997) expanded this theory to emphasize the importance of self-efficacy on behavioral change. Bandura explained that self-efficacy is a person's beliefs in his or her ability to perform a task or to learn a topic. This belief can be influenced by a person successfully completing a task, a person witnessing someone else successfully completing a task, an outside individual persuading a person that they can complete the task, and by a person's current emotional state. Self-efficacy plays a role in the learning process by influencing the amount of time and effort a student will put towards mathematics task and how well that individual uses coping techniques in difficult situations. In past research, self-efficacy has been found to play a critical role in student academic success: students with greater self-efficacy tried more difficult activities, persisted longer, and displayed more mature and efficient techniques in academic efforts (Artino, 2012; Hill, Zwahr-Castro & Gonzalez, 2022).

Li (2012) studied the relationship between 153 City University of Hong Kong social science students' attitude, self-efficacy, effort and academic performance towards research methods and statistics.

The study found that only attitude towards statistics ($B = .106, p < .01$) and academic self-efficacy ($B = .324, p < .01$) could significantly predict academic achievement). The two variables could explain 61.1% of variation of the actual course grade that students obtained ($R^2 = .611, F(152) = 78.128, p < .05$). In Nigeria, Okafor-Agbala and Okigbo (2021) investigated the relationship between self-efficacy and 5,096 secondary school two (SS 2) students' academic performance in mathematics from 261 public schools in Anambra State, Nigeria. The study revealed moderate positive relationship between mathematics self-efficacy, and students' performance in mathematics. Also, school location did not influence the relationship between self-efficacy and students' performance in mathematics. In a different study, Motlagh, Amrai, Yazdani, Altaib Abderahim, and Souri (2011) investigated the relation between self-efficacy and academic performance amongst 250 high school students by employing the use of completed self-efficacy scale in addition to measuring achievement score grade point average in classes. The study confirmed that self-evaluation, self-directing, and self-regulation, which are some of the components of self-efficacy, are correlated with academic The findings further showed that self-efficacy amongst high school students can be a good basis for enhancing academic performance.

In another study, Komarraju and Nadler (2013) examined motivational orientations, cognitive-meta-cognitive skills, and resource management towards predicting the academic performance of 407 undergraduates students. Findings from this study indicated that low self-efficacy students tended to believe that intelligence is innate and unchangeable whereas high self-efficacy students had the belief that intelligence is about mastery of goals, which is attainable through gaining of knowledge in addition to focusing on performance goals. Meral, Colak and Zereyak (2012) examined the relationship between self-efficacy and 82 sophomore students who attended Instructional Planning and Evaluation class at the Marmara University Technical Education Faculty. Calculated correlation was .45 ($p < .01$) showing significant relationship between academic performance and self-efficacy scale. On gender and academic self-efficacy, Tenaw (2013) studied the relationship between self-efficacy, academic achievements and gender in analytical chemistry at Debre Markos College of Teacher Education in Ethiopia. The results indicated that students' level of self-efficacy is medium (50.8), and that there was no significant difference in the self-efficacy between sexes, but there was a significant difference in the achievement between the sexes. The

results further showed that a significant relationship existed between self-efficacy and achievement ($r = 0.385, 0.01$ level).

Kolo, Jaafar and Ahmad (2017) investigated the relationship between academic self-efficacy and academic performance among 339 final year students in a College of Education in Nigeria. Their study revealed that 80.82% of the students have higher level of academic self-efficacy, and a positive and significant relationship between academic self-efficacy with students' academic performance ($r = 0.342, p < 0.01$). Fakhrou and Habib (2022) investigated the relationship between academic self-efficacy and academic achievement of 43 students in Qatar and found a positive correlation between self-efficacy and academic achievement, but not significant between male and female students.

Most of the literature reviewed though reported a positive relationship between self-efficacy with academic achievements but were conducted outside Nigeria, hence this study investigated the relationship between academic self-efficacy and academic achievement in Mathematics of senior secondary school students in Ethiopie East Local Government Area, Delta State, Nigeria.

Statement of the Problem

Academic achievement is interestingly an important issue: a fundamental premium upon which teaching-learning activities are measured using some criteria of excellence. Student's academic achievement in Mathematics in secondary school seems not to have been encouraging, and those who have behavioral problems in school have been a source of concern and debate for many years. Inappropriate behavior leads to consequences, such as low self-efficacy and lack of academic success which often lead students to develop a poor or negative attitude towards academic activities. The Senior School Certificate Examinations (SSCE) of the West African Examinations Council (WAEC) Chief Examiners' Report (WAEC, 2019) showed that between 2012 and 2018 credit passes performance lies between 37% and 52.97%. It was only in 2019 students' achievement rose to 64.18%. These fluctuations in students' achievement in Mathematics may have resulted from the wrong perception people have of studying Mathematics as school subject. In Nigeria, students, parents, teachers and the public perceived Mathematics as a difficult, abstract and a complex subject to study (Harbor-Peters, 2001; Obodo, 2004, Eraikhuemen, 2017; Idehen, 2017). These beliefs might have led to general hatred and misconceptions about school Mathematics and have brought some anxiety and lack of confidence, interest and

motivation in studying the subject. The current misconceptions, anxiety, deteriorating interest, low motivation and achievement in secondary school Mathematics may be traceable in part to students' level of self-efficacy. Therefore, this study investigated the relationship between academic self-efficacy and academic achievement in Mathematics of secondary school students in Ethiope East Local Government Area of Delta State, Nigeria.

Research Questions

The following research questions guided the study:

1. What is the relationship between academic self-efficacy and academic achievement of students in mathematics?
2. What is the difference in relationship between academic self-efficacy and academic achievement of male and female students?
3. What is the difference in relationship between academic self-efficacy and academic achievement of public and private school students?
4. What is the difference in relationship between academic self-efficacy and academic achievement of urban and rural school students?

Hypotheses

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

1. There is no significant relationship between academic self-efficacy and academic achievements of students in mathematics.
2. There is no significant difference in relationship between academic self-efficacy and Academic achievement of male and female students in mathematics.
3. There is no significant difference in relationship between academic self-efficacy and academic achievement of public and private school students in mathematics.
4. There is no significant difference in relationship between academic self-efficacy and academic achievement of urban and rural school students in mathematics.

Methodology

The study adopted the correlational research design to establish the relationship between academic self-efficacy and academic achievement of students in Ethiope East Local Government Area of Delta State. The population of the study comprised of 4275 senior secondary schools two (SSS 2) based on the enrolment of 2020/2021 session. The simple random

sampling technique was used to sample an arm of SS2 from each of the 12 schools sampled. The sample size was 187 students.

The instruments for the study were the school terminal results and a structured questionnaire titled "Mathematics Self-efficacy scale (MSES)", which was adapted from the Mathematics Self-efficacy (MSE) scale of Green and Miller (1996). Academic achievement was determined from students' end of term school-based examination scores in Mathematics of the 12 schools for the 2019/2020 academic session. Section A of the MSES questionnaire contained the respondents' demographics while section B contained 15 self-efficacy items on a 4 point rating scale of Strongly Agree, Agree, Disagree and Strongly Disagree. The instruments were validated by three Measurement and Evaluation and two Mathematics Education experts for relevance and accuracy. The Cronbach alpha statistic was used to determine the reliability of the MSES instrument which yielded a reliability coefficient of 0.85.

The research questions were answered using Pearson Product Moment Correlation Coefficient(r), and the Fisher's Z statistic was used to test the hypotheses at the 0.05 level of significance. Decision rule was based on r -value, where any calculated r -value between 0 and 0.20, 0.20 to 0.40, 0.40 and 0.60, 0.60 and 0.80, and 0.80 and 1.0 was regarded as very low, low, moderate, high, and very high correlation, respectively.

Results

Table 1: Pearson r on the relationship between academic self-efficiency and academic achievement of students in mathematics.

Variable	N	r
Self-Efficacy	187	
Academic Achievement	187	0.789

Table 1 presents the Pearson ($r = 0.789$) correlation coefficient value on the relationship between self-efficacy and academic achievement of students in mathematics. This indicates a strong positive relationship between self-efficacy and academic achievement of students in mathematics. The Pearson r test statistic was employed to test for significant relationship between self-efficacy and academic achievement as shown in Table 2.

Table 2: Pearson r test of the relationship between academic self-efficacy and academic achievement of students in mathematics

Variable	N	r	P-value	Remarks
Self-Efficacy	187	0.789	0.002	Sig.
Academic Achievement	187			

Table 2 shows that the Pearson r test of relationship between academic self-efficacy and academic achievement of students in mathematics is significant ($r = 0.789$; $P < 0.05$). Therefore, the null hypothesis is rejected. There is a significant relationship between self-efficacy and academic achievement of students in Ethiope Local Government Area of Delta State, Nigeria.

Table 3: Pearson r showing the difference in relationship between academic self-efficacy and academic achievement of male and female students.

Variable	N	R
Male	82	0.292
Female	105	0.297

Table 3 presents the Pearson r values for the relationship between self-efficacy and academic achievement of male and female students. These indicate low positive correlation for both variables. To test for significant difference in the relationship (r), the Fisher 2-test statistic was employed as shown in Table 4.

Table 4: Fisher's Z statistic showing difference in the relationship between academic self-efficacy and academic achievement of male and female students.

Variable	N	r	Zr	P-value	Decision
Male	82	0.292	0.301	0.971	Not Sig.
Female	105	0.297	0.306		

Table 4 shows that there is no significant difference in the relationship between academic self-efficacy and academic achievement of male and female students

Table 5: Pearson r showing the difference in relationship between academic self-efficacy and academic achievement of public and private school students?

Variable	N	r
Public	109	0.310
Private	78	0.450

Table 5 presents the Pearson r values for the relationship between self-efficacy and academic achievement of public and private schools students. These indicate low positive correlation for public schools students, and moderate positive correlation for private school students. To test for significant difference in the relationship (r), the Fisher's Z-test statistic was employed as shown in Table 6.

Table 6: Fisher's Z statistic showing difference in the relationship between academic self-efficacy and academic achievement of public and private school students.

Variable	N	r	Zr	P-value	Decision
Public	109	0.310	0.3206	0.277	Not sig.
Private	78	0.450	0.4847		

Table 6 shows that there is no significant difference in the relationship between academic self-efficacy and academic achievement of public and private school students.

Table 7: Pearson r showing the difference in relationship between self-efficacy and academic achievement of urban and rural school students?

Variable	N	R
Urban	124	0.528
Rural	63	0.487

Table 7 presents the Pearson r values for the relationship between academic self-efficacy and

academic achievement of urban and rural school students. These indicate moderate positive correlation of both variables. To test for significant

difference in the relationship (r), the Fisher's Z-test statistic was employed as shown in Table 8.

Table 8: Fisher's Z statistic showing the difference in the relationship between academic self-efficacy and academic achievement urban and rural school students.

Variable	N	r	Zr	P-value	Decision
Urban	124	0.528	0.5901	0.726	Not sig.
Rural	63	0.487	0.5361		

Table 8 shows that there is no significant difference in the relationship between academic self-efficacy and academic achievement of urban and rural school students.

Discussion

The study revealed that there was strong positive relationship between academic self-efficacy and academic achievements of students in mathematics. This implies that academic self-efficacy of students correlates positively to their academic achievement in mathematics in Ethiopia East local government area of Delta State, Nigeria. This finding is consistent with the findings of Okafor-Agbala and Okigbo (2021) and Matlagh et al (2011) that a positive and significant relationship exists between self-efficacy and academic achievement. This finding is also supported by the results of Komarraju and Nadler (2013) that self-efficacy, effort regulation, and help-seeking are some of the variables capable of explaining variances in GPA amongst a number of students. Nonetheless, the finding is in contrast to that of Li (2012) who showed that both attitude and self-efficacy could significantly predict effort but the prediction power of attitude, self-efficacy and effort failed to predict academic achievements.

The study further revealed positive but not significant relationship between academic self-efficacy and academic achievement of male and female, public and private school and urban and rural school students, respectively. This finding is in agreement with Fakhrou and Habib (2022), Tenaw (2013), and, Abdul and Muhammed (2012) who found no significant difference in the relationship between self-efficacy and academic achievement of male and female students. It is also in agreement with Okafor-Agbala and Okigbo (2021) and Abdul and Muhammed (2012) that school location did not influence the relationship between self-efficacy and students' performance in mathematics. However, in contrast to this finding, Abdul and Muhammed found that a significant difference existed between

academic self-efficacy and achievement with public and private school students.

Conclusion

It can be concluded that academic self-efficacy positively and significantly relates to academic achievement in mathematics in Ethiopia East Local Government Area of Delta State, Nigeria. Also, relationship between academic self-efficacy and Academic achievement is influenced by gender, school type and school location at the same rate.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Secondary school administrators should establish and promote counselling services so that students will be conscious of psychological factors (self-efficacy) that influence their academic achievement.
2. Students should be sensitized through seminars and other avenues on the benefits of developing high self-efficacy to have control of their mathematics learning outcome.

References

- Abdul, G. K. & Muhammed, A. P. (2012). Influence of school image on academic self-efficacy belief. *Innovations and Researches in Education*, 2(1), 51-58.
- Adediwura, A., & Tayo, B. (2007). Perception of teachers' knowledge attitude and teaching skills as predictor of academic performance in Nigerian secondary schools. *Educational Research and Review*, 2, 165-171.
- Alimi, O. S., Ehinola, G. B. & Alabi, F O. (2012). School types, facilities and academic performance of students in senior secondary schools in Ondo State, Nigeria. *International Education Studies*, 5(3) 44-48.
- Artino, A. R. (2012). Academic self-efficacy: from educational theory to instructional practice. *Perspectives on medical education*, 1, 76-85.

- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191.
- Bandura, A., (1997). *Self-efficacy: The Exercise of Control*. London: Macmillan.
- Eraikhuemen, O. O. (2014). Influence of teaching facilities on academic achievement of students in secondary schools. *Electric Journal of Research in Educational Technology*. 18(8), 40-54.
- Fakhrou, A. & Habib, L. H. (2022). The relationship between academic self-efficacy and academic achievement in students of the department of Special Education. *International Journal of Higher Education*, 2(2), 1-12.
- Frey, M. & Determan, D. (2004). The relationship between scholastic assessment and general cognitive ability. *Psychological science*, 15, 373-378.
- Green, J. & Miller, H. (1996). The causal ordering of self-concept and academic motivation and its effect on academic achievement. *International Education Journal*, 7, 534-546.
- Harbor-Peters, V. F. (2001). *Unmasking some aversive aspect of school Mathematics and strategies for averting them*. Inaugural lecture, University of Nigeria, Nsukka, 1-20.
- Hill, H. M., Zwahr-Castro, J. & Gonzalez, A. (2022). Evaluating research self-efficacy in undergraduate students: Experience matters. *Journal of the Scholarship of Teaching and Learning*, 22(1), 67-80.
- Idehen, F.O. (2017). Assessment of male and female students' conceptions of selected mathematical concepts in senior secondary school mathematics curriculum. *International Journal of Gender Studies and Research*, 5(1), 119 – 131.
- Kolo, A . G , Jaafar,W. M. B. W. & Ahmad, N.B. (2017). Relationship between academic self-efficacy believed of college students and academic performance, *IOSR Journal of Humanities and Social Sciences*, 22(1), 75-80.
- Komaraju, M., & Nadler, D. (2013). Self-efficacy and academic achievement: why do implicit beliefs, goals and effort regulation matter. *Learning and individual differences*, 25, 67-72.
- Li, L. K. (2012). A study of the attitude, self-efficacy, effort and academic performance of city U students towards research methods and statistics. *Discovery-SS Student E-Journal*, 1(54), 154-183.
- Meral, M., Colak, E. & Zereyak, E. (2012). The relationship between self-efficacy and academic performance. *Procedia - Social and Behavioral Sciences* 46, 1143-1146.
- Motlagh, S. E., Amrai, K., Yazdani, M. J., altaib Abderahim, H., & Souri, H. (2011). The relationship between self-efficacy and academic performance in high school students. *Procedia-Social and Behavioral Sciences*, 15, 765-768.
- Obodo, G. C. (2004). *Principles and practice of Mathematics education in Nigeria*. Enugu: Academic Forum, 7-15
- Okafor-Agbala, U. C. & Okigbo, E. C. (2021). Relationship between self-efficacy and academic performance of students in mathematics in Anambra State, Nigeria. *South Eastern Journal of Research and Sustainable Development*, 6(1),58-74.
- Tenaw, Y. A. (2013). Relationship between self-efficacy, academic achievement and gender in analytical chemistry at Debre Markos college of teacher education. *African Journal of Chemical Education (AJCE)*, 3(1), 3-2
- West African Examination Council (2019). *West African Senior School Certificate Examination (O'level) Chief Examiner Reports*: Lagos, Nigeria