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Exploring the Relationship between Self-Efficacy and Academic Performance of Ogun State Senior Secondary School Biology Students

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Abstract

This study explored the relationship between self-efficacy and academic performance of Ogun State Biology students in the senior secondary school level. We used a correlational research design and selected 4,029 respondents from senior secondary schools in Ogun State (Public). The data collection instrument was an adopted Academic Self-Efficacy Scale. Descriptive statistics, including mean, frequency counts, and percentage addressed the research questions, while PPMC (Pearson Product Moment Correlation) tested the research hypothesis guiding the study. It was revealed from the results that self-efficacy level of Ogun State senior secondary school Biology students was high (Mean self-efficacy score = 130.94; Standard Deviation = 18.744), there was a significant difference in self-efficacy of Biology students based on gender ($p < 0.05$). However, in the academic performance of biology students based on gender, there was no difference observed ($p > 0.05$). Moreover, a significant but weak relationship was found between self-efficacy and academic performance of Biology students ($r = 0.084$, $p = 0.000$). It was recommended from the study that there should be provision of support and guidance to sustain students' high self-efficacy level which will further improve their academic performance. Biology teachers should focus on developing students' self-efficacy.

Keywords: Self-efficacy, Academic performance, Senior Secondary School, Biology Students.

INTRODUCTION

Education is the complete method of learning which in turn has an effect on students' knowledge, skills, and thoughts (Odukwe & Nwafor, 2022). Bandura's social cognitive theory incorporates self-efficacy theory. Self-efficacy theory is one of Bandura's most enduring contributions to the study of motivation, learning, and academic accomplishment, according to researchers (Pajares, 2004; Schunk, 1991). As stated by Bandura (1986), self-efficacy is "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" in the context of social learning theory. According to Bandura's theory, a person needs to believe in his ability to perform a task under challenging circumstances in addition to having the necessary skills and abilities. Both skill and efficacy belief are necessary for effective functioning; this is known as "reciprocal causation," which means that functional efficacy belief depends on functioning skill and vice versa (Bhati & Sethy, 2022).

Additional research by Bernacki et al. (2015) indicates that students' involvement with various learning tasks and their applicability in real-life scenarios are more important indicators of self-efficacy than past performance or prior mastery. Additionally, research has demonstrated that self-efficacy can

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be increased by teacher pedagogy, an enabling learning environment, specific learning objectives, and relevant learning materials (Kristianto & Gandajaya, 2023; Mohammadi et al., 2020). Additionally, the study indicates that students' self-efficacy is fostered by their own interests (Bonitz et al., 2010; Charleston & Leon, 2016), mentor and parental support, and personal behaviors (Mohammadi et al., 2020; Schunk & Dibenedetto, 2021). Additional factors influencing student self-efficacy include family background, school environment, and extracurricular activities (Cheng, 2020; Liu et al., 2019b; Phan et al., 2020; Serena Shim, 2018; Simpkins et al., 2019; Yang & Tu, 2020; Zhou et al., 2020).

Students are exposed to a wide range of contextual and personal circumstances throughout their school years, which can significantly affect their development. This is especially true during adolescence, which is a critical time for academic and personal growth, as well as the formation of an adult personality (Usán et al., 2022). While some students might not face any academic or personal difficulties throughout this phase of their lives, others might stagnate at some point due to various situations, and be impacted by certain psychological traits, which could then negatively affect their academic performance (Köseoglu, 2015). Therefore, studies on certain psychological factors can benefit education and help understand the cognitive and motivational processes that can result in both academic and personal growth (Yokoyama, 2019).

According to Thompson et al. (2022) and Usher and Schunk (2017), students who have stronger academic self-efficacy are more likely to decide to take action, work hard, and endure longer than those who have lower self-efficacy. A key motivating element that results in more highly motivating outcomes is self-efficacy (Schunk & DiBenedetto, 2021).

According to Hall and Vanice (2010), self-efficacy are defined as "thoughts or ideas people hold about their abilities to perform those tasks necessary to achieve a desired outcome". The relationship between self-efficacy and achievement intensifies as students' progress through their education. Helping students develop a strong sense of self-efficacy is crucial if they want to perform well on academic assignments. Self-efficacy is conceived as the individual's assessment of capacity to plan and carry out a course of action in order to achieve specific educational performance goals (Li, 2012). It's pertinent to note that Nwosu and Okoye (2014) characterized self-efficacy as an important psychological construct that merits research attention because it influences the following: the activities a person chooses to do, the amount of effort put forth to finish a task, and the amount of time they persevere when confronted with difficult situations while working on a task. When discussing educational issues in society, it is a well-established truth that students' academic achievement is a significant topic.

Test scores define academic performance as the knowledge and skills learned in a school-taught subject (Ismail, 2020). According to Ahmad et al. (2015), a teacher evaluates the material acquired by assigning grades and/or setting educational objectives that students and instructors must meet within a specific time frame. Suleman et al. (2019) defined academic performance as the extent to which students gain information, skills, and attitude from educational activities. It is often referred to as academic success or academic achievement. According to Okoye et al. (2021), the degree to which students in the educational system meet their learning goals is referred to as academic performance. This implies that a student's academic success reflects how effectively they are meeting the intended learning goals. Okoye et al. (2021) note that students' academic performance and graduation rates have raised significant concerns, leading scholars to examine factors associated with the academic performance of secondary students. This issue may arise because schools, designed with children in mind, depend on academic achievement as a measure of the system's effectiveness.

Academic performance is defined by Ali et al. (2013) as the extent to which students achieve their learning objectives. Goldfinch and Hughes (2013) explain that academic achievement can be understood in terms of the number of courses passed or failed, as well as the success or failure of individual course units. It serves as a measure of performance outcomes, indicating how well a person has performed relative to specific goals that are central to activities in educational settings, including schools, colleges, and universities (Steinmayr et al., 2014).

Previous studies have generally stated that academic self-efficacy and academic achievement are significantly related (Ahmad & Safaria, 2013; Akram & Ghazanfar, 2014; Cheng, 2020; Enny & Pujar, 2017; Hassan et al., 2015; Honicke & Broadbent, 2016; Shkullaku, 2013; Yokoyama, 2019). Students whose self-efficacy level are high tend to blame their errors on internal variables, including their efforts and assignment tactics, that they can somewhat control (Yantraprakorn et al., 2018). Conversely, low self-efficacy students attributed their failures to outside forces like their instructors or course of study (Morán-Soto & Benson, 2018).

Abd-Elmotaleb and Saha (2013) investigated the mediating function of academic self-efficacy in the association between academic performance and perceived academic climate using a sample of 272 undergraduate students at the University of Assiut, Egypt. Their results showed that there was significant correlation between academic performance and academic self-efficacy, along with a notable negative correlation between the two sexes. The degree of academic self-efficacy beliefs among final-year students at a Nigerian education college and the connection between academic achievement and academic self-efficacy were examined by Ali Garba et al. (2017). According to the results, 80.82% of the participants said they were confident in their capacity to succeed academically in college. Furthermore, the students' judgments of their own academic efficacy and their academic accomplishment were found to be strongly positively correlated ($r = 0.342$, $p < 0.01$). This indicates that as students' self-efficacy in their academic skills increased, their academic performance also improved. The academic performance and academic self-efficacy of undergraduate students were evaluated by Bhati et al. (2022) in connection to their fields of study and gender. 120 undergraduate students, both male and female, from the arts, commerce, and science disciplines participated in the study. Primary data were acquired using an academic self-efficacy questionnaire. Students' perceptions of academic self-efficacy and academic success were found to be strongly correlated. Additionally, the findings showed that students' academic performance was highly impacted by their academic self-efficacy. Additionally, undergraduate students in the Science stream outperformed their peers in other fields and demonstrated higher levels of academic self-efficacy.

Stakeholders like parents, teachers, government, curriculum developers, and planners have been particularly worried about students' academic performance. These stakeholders are pleased when the results of education are reflected in Biology exams that are focused on results, but when the results fall short of the input, as demonstrated by subpar academic achievement, the opposite is true. (Ogbonnaya et al., 2023). There are many factors which could lead to students' poor academic performance and one of these factors is self-efficacy. The combination of other factors with self-efficacy could affect positively or negatively students' academic performance, hence, this study explored the relationship between self-efficacy and academic performance of Ogun State senior secondary school Biology students. To achieve the aim of the study, the following research questions and hypothesis were raised to guide the study:

i. What is the self-efficacy level of Ogun State senior secondary school biology students?
ii. Is there any significant difference in the self-efficacy of Biology students based on gender?
iii. Is there any significant difference in the academic performance of Biology students based on gender?
iv. There is no significant relationship between self-efficacy and academic performance of Ogun State senior secondary school Biology students.

METHODOLOGY

Research Design

A correlational research design was adopted for this research.

Population and Sample of the Study

All senior secondary school one (SSS 1) and senior secondary school two (SSS 2) Biology students registered in senior secondary schools in Ogun State made up the study's target population. Four thousand and twenty-nine (4029) Biology students from Senior Secondary School One (SSS1) and Senior Secondary School Two (SSS2) were selected from among the senior secondary schools in Ogun State to make up the sample. Simple random procedures and convenience sampling were used to choose the study's sample and schools. All public senior secondary schools in Ogun State were given equal chances of being selected, so fifteen (15) public senior secondary schools were randomly selected. For the samples, convenience sampling was used to administer the questionnaires to the students based on the fact that not all students in the senior secondary schools offer Biology, hence the need to only give students offering Biology the questionnaire.

Instrument and Procedure for Data Collection

The instrument for data collection was an adopted questionnaire on academic self-efficacy (Academic Self-Efficacy Scale -2006- Gafoor & Ashraf, 2007). The ASES is a standardized, validated instrument used to measure students' academic self-efficacy beliefs. The scale consists of 40 items rated on a 5-point Likert scale, ranging from 1 (Exactly False) to 5 (Exactly True). The study adopted a validated questionnaire with reliability coefficient: Academic Self-Efficacy Scale-2006 (r= 0.85) and this indicated a high level of internal consistency and reliability of the measures used. The academic self- efficacy 2006 is a standardized measure with established reliability by the researchers. Thus, the reason for the adoption as a research instrument for this study. For its cultural adaptation for our study, Cronbach Alpha was used to test the reliability of the items on the questionnaire and it had an internal consistency reliability coefficient of 0.626. Data for this study were gathered from selected senior secondary schools in Ogun state after obtaining permission from the management of the schools. After the permission, the questionnaires were distributed, more explanations on how to fill the questionnaires were given and some uncomprehending questions were also explained by the researchers to the students in the selected schools. Necessary monitoring was duly observed and the questionnaires were retrieved from the students. Academic performance of the students were gotten from Biology teachers of the selected senior secondary schools. The Biology score of the students for the first term continuous assessment and examination (100%) of the 2023/2024 session was collected uniformly across all the selected schools for the study.

Statistical Analysis

Both descriptive (mean, median, standard deviation, and frequency count) and inferential (t-test and Pearson's product-moment correlation) statistics were used to assess the data collected for this study.

RESULTS AND DISCUSSION

Results

The analysis of collected data based on senatorial location of school showed that 2480(61.6%) respondents were from Ogun East, 511(12.7%) respondents were from Ogun West and 1038(25.8%) respondents were from Ogun Central. The data indicated that 96 respondents representing 2.4% were less than 13years of age, 3933 respondents representing 97.6% were 13-20years of age. The data also indicated that 1901 were males and 2128 were females. The percentages for male and female respondents were 47.2% and 52.8% respectively. It showed that the majority of the respondents were females. In addition, the analysis of demographics based on the type of school showed that 523(13.0%) respondents were from single-sex schools while 3506(87.0%) were from mixed schools.

Table 1. Demographic Data of Respondents.

	Frequency	Percentage (%)
Senatorial Location of School		
Ogun East	2480	61.6
Ogun West	511	12.7
Ogun Central	1038	25.8
Age		
Less than 13 years	96	2.4
13-20 years	3933	97.6
Gender		
Male	1901	47.2
Female	2128	52.8
School Type		
Single-sex	523	13.0
Mixed school	3506	87.0
Total	**4029**	**100.0**

Research Question 1: What is the self-efficacy level of Ogun State senior secondary school Biology students?

Table 2 shows the level of self-efficacy among Ogun State senior secondary school Biology students. The result shows that the students recorded the highest mean for examination followed by adjustment, curricular activities, memory, reading, utilization of resources, comprehension, peer relationship, learning process, teacher-student relationship and goal orientation. The lowest mean score was reported for time management. The overall mean value shows that there was high level of self-efficacy among Ogun State senior secondary school Biology students (Mean = 130.94, Std = 18.744).

Table 2. Self-efficacy Level of Ogun State Senior Secondary School Biology Students.

	N	Minimum	Maximum	Median	Mean	STD
Learning Process	3679	2	10	6	7.96	2.108
Reading	3663	3	15	9	10.10	2.069
Comprehension	3651	3	63	33	9.40	2.683
Memory	3615	3	57	30	10.44	2.592
Curricular Activities	3531	4	64	34	13.83	2.879
Time Management	3655	2	10	6	5.76	1.916
Teacher-Student Relationship	3681	2	10	6	6.68	1.983
Peer Relationship	3791	2	28	15	7.98	2.050
Utilization of Resources	3568	3	15	9	9.56	2.269
Goal Orientation	3771	2	11	6.5	6.53	1.759
Adjustment	3281	7	51	29	22.85	4.499

Examination	3364	9	36	22.5	25.50	4.927
Self-efficacy (OVERALL)	4029	0	208	104	130.94	18.744

Keys
N- Total Number of Respondents; Std- Standard Deviation

Research Question 2: Is there any significant difference in the self-efficacy of Biology students based on gender?

Table 3 shows the mean scores of the self-efficacy of Biology students based on gender. The result shows that the female Biology students had higher self-efficacy compared to the male Biology students in the following subscales of self-efficacy; learning process, reading, comprehension, memory, curricular activities, teacher-student relationship, peer relationship, utilization of resources, goal orientation, adjustment and examination while for time management subscale, the male had higher self-efficacy. In addition, significant differences were recorded for learning process (p= 0.000), comprehension (p= 0.029), memory (p= 0.005), curricular activities (p= 0.014), teacher-student relationship (p= 0.024), peer relationship (p= 0.002) and examination (p= 0.003). The overall mean scores for male and female Biology students are 129.59 ± 19.129 and 132.13 ±18.315 respectively. The female Biology students had higher self-efficacy compared to the male Biology students. Furthermore, the table showed that there was a significant difference in the overall self-efficacy of Biology students based on gender (p= 0.000).

Table 3. Mean Scores of the Self-efficacy of Biology Students based on Gender.

		Mean	**N**	**SD**	**Sig**
Learning Process	Male	7.78	1727	2.171	0.000
	Female	8.12	2127	2.039	
Reading	Male	10.08	1713	2.049	0.728
	Female	10.11	1949	2.088	
Comprehension	Male	9.30	1706	2.905	0.029
	Female	9.49	1944	2.470	
Memory	Male	10.31	1687	2.391	0.005
	Female	10.55	1927	2.752	
Curricular Activities	Male	13.71	1653	2.805	0.014
	Female	13.94	1877	2.940	
Time Management	Male	5.79	1730	1.863	0.310
	Female	5.73	1924	1.964	
Teacher-Student Relationship	Male	6.60	1729	1.959	0.024
	Female	6.75	1951	2.002	
Peer Relationship	Male	7.87	1797	2.078	0.002
	Female	8.08	1993	2.020	
Utilization of Resources	Male	9.56	1686	2.167	0.971
	Female	9.56	1881	2.359	
Goal Orientation	Male	6.49	1780	1.781	0.172
	Female	6.57	1990	1.739	
Adjustment	Male	22.71	1560	4.403	0.099
	Female	22.97	1720	4.583	
Examination	Male	25.23	1600	4.979	0.003
	Female	25.74	1763	4.867	
Self-efficacy (Overall)	Male	129.59	1901	19.129	0.000
	Female	132.13	2127	18.315	

Keys
N - Total number of Respondents; SD - Standard Deviation; Sig - Significant Level.

Research Question 3: Is there any significance difference in the academic performance of Biology students based on gender?

Table 4 shows the mean scores of academic performance of Biology students based on gender. The mean scores for male and female biology students are 61.253 ± 18.53 and 62.15±14.33 respectively. The female Biology students performed better compared to their male counterparts. The result of the analysis showed that there was no significant difference in the academic performance of male and female Biology students (p= 0.088).

Table 4. Mean Scores of the Academic Performance of Biology Students based on Gender.

		Mean	N	SD	Mean Difference	SD Error Difference	T	Df	Sig.
AP	Male	61.253	1842	18.5305	-8974	.5256	-1.707	3924	0.088
	Female	62.150	2084	14.3322	-8974	.5338	-1.681	3450	

Keys

AP- Academic Performance; N - Total number of respondents; SD - Standard Deviation; SD Error - Standard Deviation Error; T - Calculated differences in unit of standard error; DF - Degree of Freedom; Sig - Significant level

Research Hypothesis 1: There is no significant relationship between self-efficacy and academic performance of Ogun State senior secondary school Biology students.

The correlation between the academic performance of Biology students at Ogun State Senior Secondary School and their level of self-efficacy was displayed in Table 5. The result shows that learning process (r= 0.082**, p= 0.000), reading (r= 0.034*, p= 0.040), adjustment (r= 0.045*, p= 0.011) and examination (r= 0.058**, p= 0.001) showed weak significant relationship with academic performance while the other sub-scales; comprehension (r= 0.024, p= 0.154), memory (r= 0.032, p= 0.061), curricular activities (r= 0.025, p= 0.140), time management (r= 0.028, p= 0.093), teacher-student relationship (r= 0.002, p= 0.904), peer relationship (r= 0.024, p= 0.138), utilization of resources (r= 0.020, p= 0.229) and goal orientation (r= 0.017, p= 0.290) show weak non-significant relationship with academic performance. Generally, a weak significant relationship between the academic performance of senior secondary school Biology students and their self-efficacy was found when the data was evaluated using Pearson's correlation (r=0.084**, p=0.000).

Table 5. Correlations of Self-efficacy with Academic Performance of Ogun State Senior Secondary School Biology Students.

	Correlations with academic performance r (p)
Learning Process	0.082** (0.000)
Reading	0.034* (0.040)
Comprehension	0.024 (0.154)
Memory	0.032 (0.061)
Curricular Activities	0.025 (0.140)
Time Management	0.028 (0.093)
Teacher-Student Relationship	0.002 (0.904)
Peer Relationship	0.024 (0.138)
Utilization of Resources	0.020 (0.229)
Goal Orientation	0.017 (0.290)
Adjustment	0.045* (0.011)
Examination	0.058** (0.001)
Self-efficacy (OVERALL)	0.084** (0.000)

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2 tailed)

DISCUSSION

This study explored the relationship between self-efficacy and academic performance among senior secondary school Biology students in Ogun State. Our findings indicated that Biology students possess a high level of self-efficacy. We observed a significant difference in self-efficacy of Biology students based on gender but found no significant difference in their academic performance based on gender. Finally, a significant relationship exists between self-efficacy and the academic performance of Ogun State senior secondary school Biology students.
Data indicated Ogun State senior secondary school Biology students exhibited a high level of self-efficacy. A study by Bhati et al. (2022) showed that in the scientific stream, undergraduate students had stronger academic self-efficacy, corroborating our findings. The research conducted by Ducay and Alava (2021), which revealed a high level of self-efficacy in mathematics among junior high school students, corroborated our findings. Ali Garba et al. (2017) discovered that respondents in college had self-efficacy level that is higher and this supports our study.

Our findings revealed a significant difference in the self-efficacy of Biology students based on gender. However, female biology students had higher self-efficacy compared to male Biology students. The result of this findings is in line with Ahmed et al. (2022) study who found a significant difference in self-efficacy of students in Biology based on gender, with females scoring higher than the males. Also, the findings of Yamtinah et al. (2017) that the female science students had higher self-efficacy corroborated our study. Furthermore, Matovu (2020) who reported there were gender differences in students' academic self-efficacy supported our findings. Our findings were also supported by the works of (Alon & Diprete, 2015; Eren et al., 2015; Meyers-Levy & Loken, 2015) who also reported there were gender differences in the level of academic self-efficacy of Biology students. Furthermore, our findings is corroborated by the study of Sachitra and Bandara (2017) who reported that the female students had higher self-efficacy compared to the male students

Our findings that there is a significant gender difference in the self-efficacy of Biology students is contradicted by the study of Muema et al. (2020) that reported no gender differences in the academic self-efficacy of students, even though female students had higher academic self-efficacy compared to the male students.

Analysis of our data reported no significant difference in the academic performance of biology students based on gender. However, the female Biology students performed better compared to their male counterparts. A study by Yamtinah et al. (2017) supported our finding that female Biology students had better performance than the male Biology students. Also, the study of Mohamed (2020) that reported no significant differences in the academic performance of students based on gender in senior secondary school in Nigeria agreed with our findings. The findings of Matovu (2020), who reported a difference in the performance of male and female university undergraduates and that male students performed better than the female students, do not support our findings that reported no significant gender differences in the academic performance of Biology students and that female students performed better than the male students.

The findings also revealed a significant but weak relationship between self-efficacy and academic performance of Ogun State senior secondary school Biology students. This is supported that by the finding of Matovu (2020) who reported that there was statistically significant relationship between academic performance and academic self-efficacy among university undergraduates but the relationship is strong. Furthermore, the study of Bhati et al. (2022) that reported a significant positive relationship between students' academic performance and academic self-efficacy was in line with our findings that also reported a significant relationship between self-efficacy and academic performance of Ogun State senior secondary school Biology students. Moreso, the study of Ducay and Alava (2021) supported our findings that there was a significant relationship between academic performance and self-efficacy of senior secondary school students offering Biology. However, there is the need for proportional representations of students from each zone of the states in subsequent studies involving self-efficacy and academic performance of Biology students in Ogun State, as it can be observed from the study that Ogun West was underrepresented in terms of the

number of respondents. This could pose a limitation to the study.

CONCLUSION

The study's findings indicated that Ogun State senior secondary Biology students had high self-efficacy level, suggesting they possess a robust comprehension and mastery in the field of Biology. It also shows that students demonstrate considerable proficiency in biological concepts, principles, and skills. Moreover, there was a significant difference in the self-efficacy of biology students based on gender, indicating that the self-efficacy of Biology students is influenced by gender.

Furthermore, there was no significant difference in the academic performance of Biology students based on gender. This shows that the research has revealed no statistically significant gap between Biology students' academic performance based on gender; hence, gender does not influence the academic performance of Biology students. A significant association existed between the self-efficacy and the academic performance of Ogun State senior secondary school Biology students. This indicates that self-efficacy significantly influences the academic performance of Biology students.

Recommendations

1. Assistance and advice should be given to students in order to develop their self-efficacy and motivation, leading to enhanced academic achievement.
2. Activities to sustain students' high self-efficacy level should be provided.
3. Students' self-efficacy and academic performance in Biology will be enhanced by encouraging them to engage in science-related activities like projects and experiments.
4. There should be instruction on self-efficacy in science topics, notably Biology.
5. Activities that would increase students' self-efficacy should be included in the Biology curriculum.
6. Teachers of Biology should concentrate on helping students become more self-efficacious so they can do better in class.

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