

Effects of Self-Efficacy on the Academic Achievement of Biology Students in Secondary Schools in Delta State

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Abstract

This study assessed the effects of self-efficacy on the academic achievement of biology students in secondary schools in Delta State. The study population comprised all biology students in public senior secondary schools in Delta State. The sample was 245 biology students drawn from six (6) schools using stratified random sampling technique. The pre-test post-test control group quasi-experimental design was used in this study. Biology Achievement Test (BAT) and self-efficacy questionnaire were used as instruments for data gathering. The data collected were analysed using the mean, standard deviation, and t-test. Findings revealed that, although there is a significant difference between the post-test scores of biology students taught with the self-efficacy strategy and those taught with the lecture method, there is no significant difference between the post-test scores of male and female biology students taught with the self-efficacy strategy. The study concludes that self-efficacy is a major variable that affects the academic achievement of biology students in secondary schools in Delta State. The study recommends that the government, through the Ministry of Education, train teachers to acquire self-efficacy skills to help them teach more effectively, efficiently, and make the teaching-learning process more meaningful in order to improve the academic achievement of biology students, boost students' confidence in their ability to perform a task efficaciously, and not give up while facing difficulties.

Keywords: Self-Efficacy, Biology, Academic Achievement.

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INTRODUCTION

Self-efficacy is an individual's level of self-confidence in their abilities to manage certain tasks (Bandura, 1997), and it influences how people think, act, and motivate themselves (Bandura, 2002). Self-efficacy is confidence in one's own ability to achieve intended results. Self-efficacy is related to the belief that someone has to evaluate his abilities to perform a given task successfully. This strongly affects the task approach, this insistence to accomplish the task, and the degree/level of effort put into completing the task. People who think that they have a high degree of self-efficacy can work longer hours and withstand difficulties, while those who believe that their self-efficacy is low avoid completing tasks (Bandura, 2002). Self-efficacy determines how motivate or stimulated and conduct themselves, think, and feel. Self-efficacy affects all aspects of life, including exercise and health behaviours, emotional responses, academic pursuits, and career choices. High self-efficacy makes one more inclined to set and focus on higher goals, maintain

tenacity when faced with challenges, and learn and achieve more than those without it (Ormrod, 2008).

In teaching and learning, self-efficacy can greatly influence the process; self-efficacy influences level of skilful performance (Schunk, 1991). Self-efficacy also influences the choice of activities to engage in by students and even teachers. Low-efficacy students may attempt to avoid tasks, while those who think they are more effective would participate more eagerly. Self-efficacy motivates students to learn and also motivates teachers to teach. Self-efficacy helps students to have or maintain a positive attitude towards the task to be learned and also affects their scholarly performance. Self-efficacy is required by students to help them persist longer on tasks and complete tasks effectively. Self-efficacy helps students develop greater intrinsic interest and focus on their class activities.

The need for this study on self-efficacy and biology students' performance is one of the old but ongoing search for strategies to improve the low

academic achievements of learners in biology and other science subjects. For this reason, there is a need for a shift in teaching and learning from an instructivism to a constructivism approach. One of the main goals of science education is to develop student's problem-solving skills and help them become independent, autonomous, efficient, and lifelong learners (Kuo, Walker, Bellan, & Schroder, 2013). Science education reformers have supported the idea that learners should be actively engaged in a science class, they should be helped to discover the value of evidence-based reasoning and higher-order cognitive skills, and they should be taught to become innovative and efficient problem solvers.

The role of students' self-efficacy in empowering academic outcomes has been proven, where students with a high level or degree of self-efficacy often persevere longer with tasks and in the main, set and monitor their goals (Bandura, 2006; Britner & Pajares, 2006). Zimmerman (2008) established that those students who have faith in their own abilities of adequately achieving success in a task and have more faith in their capacity to accomplish the task at hand typically display the highest level of academic achievement and, additionally, participate in scholarly activities that are conducive to learning. The majority of this research demonstrated that an individual's level of self-efficacy is critical to their success in learning challenging topics such as biology and other scientific disciplines. Against this backdrop, this study investigates the effect of self-efficacy on the achievement of biology students.

RQs

1. Is there any difference between posttest scores of Biology students taught with self-efficacy strategy and those instructed with lecture method?
2. Is there any difference in the posttest scores of male and female Biology students instructed with self-efficacy strategy?

Research Hypotheses

- i. There is no significant difference between post-test scores of Biology students instructed with self-efficacy strategy and those instructed with lecture method.
- ii. There is no significant difference in post-test scores of male and female Biology students instructed with self-efficacy strategy.

Concept of Self-Efficacy

Self-efficacy is the confidence that an individual has in his or her own skills to accomplish a goal. It also connotes personal efficacy, is confidence in one's capability to achieve intended results. Self-efficacy is an individual's level of self-confidence in their skills or abilities to manage certain tasks (Bandura, 2002), and it influences how people act, think, and

motivate themselves. People who think that they have a high degree or level of self-efficacy can work longer hours and withstand difficulties, while those who believe their self-efficacy is low avoid completing tasks. More research has revealed that strong self-efficacy is connected with greater self-regulation, including more efficient problem-solving and time management skills, greater and better effort, and persistence to accomplish a task, especially during challenges and adversity (Britner & Pajares, 2006; Zimmerman, 2008). Metacognitive methods help high-self-efficacy students succeed (Bratan, Samuelstuen, & Stromso, 2004).

Bandura's theory of self-efficacy suggests that individuals with high self-efficacy, or the certainty in one's own abilities to succeed, are more certainly to approach challenging tasks with an attitude of mastery rather than avoidance. Many researchers consider Bandura's theory of self-efficacy to be a scholarly breakthrough in understanding what it takes to succeed in school and why. According to Bandura (2002), a person's self-efficacy determines his or her perceptions about his or her ability to control situations, which in turn has a significant impact on the person's real ability to handle obstacles effectively and the decisions the individual is most inclined to make. Bandura hypothesized that self-efficacy level can determine whether a task will be initiated, the amount of effort that will be expended, and the level or degree of persistence needed to complete the task despite encountering difficulties and aversive experiences. This means that self-efficacy plays a significant role in determining what activities an individual will choose to engage in, how much effort he will put in, and how long that effort will be sustained when things get tough.

Empirical Studies on Self-Efficacy and Students Achievement

Self-efficacy affects all aspects of life, including exercise and health behaviors, emotional responses, academic pursuits, and career choices. Shoemaker (2008), in his study, gave a self-assessment to students enrolled in the course in the fall semesters of 2005–2008 to assess whether the learning objectives had been met. Students were asked to rate their assurance that they could do a variety of tasks in the fifty (50) item test. Majority of the students reported being "slightly confident" prior to the course and "confident" in the completion of the 50 assignments. Students who reported being "confident" at the end of the course associated with their overall academic achievement in three out of the four years studied.

Britner and Pajares (2006) found that the perceived student's self-efficacy mediated between their abilities and their performance in mathematics and science. There is substantial evidence from prior studies showing that respondents' levels of self-efficacy are positively associated with their subsequent performance

(Schunk, Pintrich, & Meece, 2008). In the academic setting, it is well established that self-efficacy is correlated with academic achievement, task persistence, motivation, and resilience (Komarraju & Nadler, 2013). The role of self-efficacy in empowering students' academic outcomes has been proven, where students with a high degree of self-efficacy often persevere longer with tasks and are more likely to set and monitor their goals (Bandura, 2006; Britner & Pajares, 2006). Zimmerman (2008) reported that students who are self-assured in their aptitude to execute an assignment have the highest academic accomplishment and engage in learning-promoting academic behaviours. Several of these researches demonstrated that self-efficacy is crucial for learning challenging or tough courses like biology and other sciences.

Self-Efficacy in the Classroom

The teaching to the test mentality, encouraged by "no child left behind," has eroded students' confidence and placed emphasis on learning to acquire information, achieve a score, and meet a standard. Our most important job as educators, however, is not to produce a generation of right answers; but to produce a generation of confident, accurate thinkers who can understand, effectively utilize, and enjoy their individual learning processes. Academic accomplishment, learning, and motivation are all influenced by self-efficacy (American Society for Horticultural Science, 2011). Therefore, increasing students' self-efficacy is crucial to their academic success. Teachers or educators can help to stimulate

critical thinking and comprehension and, thus, increase the self-efficacy of students through different strategies such as dialogic interaction, open-ended questioning, positive reinforcement, increased availability, and the flipped classroom. The first and easiest way to increase students' engagement and confidence with subject material is to make it available to them. Teachers should have regular office hours that work for students with various needs. Some students may need just a bit of extra help to boost their understanding and confidence in the material and themselves.

METHODOLOGY

This study adopted a quasi-experimental pre-test post-test control group design. The target study population for the study consisted of all Senior Secondary 2 (SS2) Biology students in Delta State which comprised 31,512 students (Delta State Ministry of Education, Statistics Department, Asaba, 2022). The stratified random sampling technique was adopted for this investigation, which produced a sample size of 245 biology students. The data collection instrument was the biology achievement test and self-efficacy questionnaire. The data generated were analysed with the inferential statistics of the mean and t-test.

RESULTS

RQ1: Is there any difference between post-test scores of students instructed with self-efficacy strategy and those instructed with lecture method?

Table 1: Difference between post-test scores of students instructed with self-efficacy strategy and those instructed with lecture method

Teaching Method	N	Mean (\bar{x})	SD
Self-Efficacy Strategy	130	71.25	12.49
Lecture Method	115	45.15	4.31

Table 1 shows the difference in post-test scores between students instructed with a self-efficacy teaching strategy and those instructed using the lecture method. The result shows that students instructed using the self-efficacy strategy had a mean score of 71.25, while those instructed using the lecture method had a mean score of 45.15. This is an indication that there is a

difference in achievement scores between the two teaching methods in favour of the self-efficacy strategy.

Hypothesis 1: There is no significant difference between post-test scores of biology students instructed with self-efficacy strategy and those instructed with lecture method.

Table 2: Independent sample t-test analysis of the difference between post-test scores of biology students instructed with self-efficacy strategy and those instructed with lecture method

Teaching Method	N	Mean (\bar{x})	SD	t	P	Decision
Self-Efficacy Strategy	130	71.25	12.49	22.37	0.000	Significant
Lecture Method	115	45.15	4.31			

$P < .05$

Table 2 shows an analysis of the difference between the post-test scores of students instructed with the self-efficacy strategy and those instructed with the lecture method. From the result, the p-value is less than 0.05. Hence, the null hypothesis is rejected. This means

that there is a significant difference between the post-test scores of students instructed with the self-efficacy strategy and those instructed with the lecture method, in favour of those instructed with the self-efficacy strategy.

RQ2: Is there any difference in the post-test scores of male and female students instructed with self-efficacy

strategy?

Table 3: Difference in the post-test scores of male and female biology students instructed with self-efficacy strategy

Sex	N	Mean (\bar{x})	SD
Male	60	72.98	12.22
Female	70	69.76	12.60

Table 3 shows the post-test scores of male and female biology students instructed with a self-efficacy teaching strategy. Male students had a mean score of 72.98, while female students had a mean score of 69.76. This means that there is difference in the mean achievement scores of male and female students

instructed with the self-efficacy teaching strategy, in favour of male students.

Hypothesis 2: There is no significant difference in the post-test scores of male and female biology students instructed with self-efficacy strategy.

Table 4: Independent sample t-test analysis of the difference in the post-test scores of male and female biology students instructed with metacognitive strategy

Sex	N	Mean (\bar{x})	SD	t	P	Decision
Male	60	72.98	12.22	1.48	0.14	Not Significant
Female	70	69.76	12.60			

$P > 0.05$

Table 4 shows an independent sample t-test, which was conducted to compare the difference in the post-test scores of male and female biology students instructed with a self-efficacy strategy. The result showed that $t = 1.48$, $p > 0.05$. Hence, the null hypothesis was not rejected. This connotes that there is no significant difference in the post-test scores of male and female students instructed with the self-efficacy strategy.

DISCUSSION OF RESULTS

Result from hypothesis 1 showed difference between the post-test scores of biology students instructed with the self-efficacy teaching strategy and those instructed with the lecture method. Results from research that measures students' gender and scholarly achievement in biology showed vividly no significant difference between the scores of male and female Biology students instructed with the self-efficacy strategy. This showed that the academic achievement of male and female biology students instructed using the self-efficacy strategy was not affected by students' sex. This finding is supported by the findings of some researchers (Arigbabu & Mji, 2004; Bilesanmi-Awoderu, 2006; David & Stanley, 2000; Atadoga, 2005; Bichi, 2004; Lawal, 2009; Nwagbo & Obiekwe, 2010; Olasehinde & Olatoye, 2014), who revealed no significant difference between male and female students' academic achievement in science.

CONCLUSION

The study explores the effects of self-efficacy on secondary schools students' achievement in biology in Delta State. From the study findings, it was concluded that:

- Self-efficacy strategies are a better teaching approach to improving the academic achievement of biology students in Delta State.
- Sex had no effect on the academic achievement of biology students in secondary schools in Delta State when instructed with a self-efficacy strategy.

RECOMMENDATIONS

- Biology teachers should use a self-efficacy strategy to teach their students. This strategy will boost students' confidence to perform a task efficaciously, help them understand the significance of effort and persistence, and encourage them to spend more time on their schoolwork and in difficulties not give up.
- The government, through the Ministry of Education, should organize seminars and workshops to train teachers on self-efficacy instructional strategy. Once these teachers have acquired these skills, they will teach efficiently and help their students perform better academically. This will help to enhance teaching-learning and also produce students who are skilled thinkers and able to self-regulate their learning.

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