
Beyond teachers' cognitive domain: the role of teachers self- efficacy on students' academic achievement in basic science in secondary schools

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ABSTRACT

The study looked at how teachers' feelings of self-efficacy affect how well their basic science students do in secondary school in the State. All of the students and all of the science teachers from all of the junior secondary schools were part of the study. Using proportionate stratified random sampling, a group of 200 students and 100 teachers were chosen from the whole population. Two research questions were made to guide the study, and at the 0.05 level of significance, two null hypotheses were formulated and tested. The validated Teachers Self-Efficacy Scale was used to collect data for the study. The test-retest and method were used to check the reliability of the Science Teacher Self-Efficacy scale and $r=.08$. The Students' termly score, which comes directly from the primary source, does not need a reliability test. To answer the research questions, the mean and standard deviation were used, and the t-test was used to test the null hypotheses. The results showed that a teacher's sense of self-efficacy and attitude have a big effect on students' interest in basic science, which helps students do better in school. So, it was recommended that science teachers should improve their own sense of how well they teach and how well their students learn.

KEYWORDS

Students; academic achievement; basic science; secondary schools; teacher; academic; self-efficacy

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INTRODUCTION

Many factors are taken into account for effective teaching and learning. According to Cohen, Manion and Morrison (1) effectiveness of the teaching refers to the extent the teaching brings about the desirable effects. Some of these factors pertain to the teacher, and several others are linked to the students. On the side of the teachers, pedagogy and appropriate understanding or mastery of the subject and the content of what makes the experience meaningful are the most important factors which fall under the cognitive domain. Many authors believed that the greatest impact of teachers on students' progress is the cognitive processes. Pedagogical competencies enable a teacher to effectively convey his or her instruction. The teacher's knowledge, on the other hand, relates to the qualifications he or she possesses are basically in the cognitive domain. However, there are also important aspects that aid both the teacher and the students in achieving their educational objectives. One of the affective domains which include self-efficacy, attitude, interest and so on. These are important teachers' factors that are almost never considered in the teaching and learning processes. The success of these instructional approaches and activities rely heavily on the emotional domain of teachers. This study will investigate teachers' self-perception and confidence in their professional ability to adopt innovations and adapt to changes in teaching and learning processes. According to Thoonen, et al (2). Self-efficacy has a significant impact in how teachers choose assignments and activities, in their efforts and tenacity when confronting specific problems, and even in their emotional responses to challenging situations. Self-efficacy is a cognitive concept that eventually mediates between knowledge and behaviour. This factor, along with others, influences to a great measure the success of the acts themselves (Tzioti et al, (3).

Self-efficacy

When it comes to a teacher's self-efficacy, it is defined as his or her appraisal of the capacity to achieve desired results in student engagement and learning, particularly among students who are difficult or unmotivated. Individuals' expectations of what will happen as a result of a certain behavior are known as outcome expectancies, and they must be distinguished from self-efficacy (Bandura, (4). Self-efficacy is not the same as one's overall self-perception, which is formed by one's interactions with and interpretations of one's environment (Jennasin, Hunnan & Yew, (5). Tzur(6) describe self-efficacy as a belief system that focuses on the future (prospective in nature). When someone has confidence in their own talents, they are said to have "self-efficacy" (Bandura, (4). In Pakarinem et al. (7), Bandura is credited with laying the foundation for the socio-affective concept of self-efficacy. When it comes to efficacy, a person's ability to execute at a certain level of performance, and their ability to cope with challenges and obstacles and lead their actions are all factors that are considered (Bandura, (4). Teachers who have faith in their own talents as instructors have an impact on their students' academic success. There is a strong correlation between students' emotions of self-efficacy and their success in science, according to Reyes et al (8). Having a strong sense of self-efficacy motivates teachers to try harder to complete a challenge or job, say researchers. It is possible to explain self-efficacy as "beliefs in one's capacity to design and execute courses of action essential to manage impending problems," yet it also decreases effort or even causes a person to quit a job or task. Problem-solving methods and strategies, such as those employed by individuals, are all a part of this concept (Moafian & Gbanizadeh,(9). Teachers' sense of self-efficacy (TSE) refers to teachers' belief that they are capable of enhancing the rate at which their students learn, even in the face of difficulties (Slaalvik & Slaavik (10). Active mastery, vicarious experience, verbal persuasion, and physiological and emotional state are all sorts of information that Bandura (4) claims contribute to self-efficacy. Being confident about your own abilities has a major effect on your behavior and, more importantly, your capacity for self-restraint. As a result of his future articles, Bandura argued that our actions and beliefs have a considerable influence on our success or failure (Rastegar (11). The overt self-referential character of self-efficacy beliefs and their concentration on perceived skills in specific activities, according to Bandura (4), may be major determinants of behavioral outcomes. As a result, the relevant literature has supported this assertion. Teacher self-efficacy is now part of a bigger study on human behavior and perceived self-efficacy. It has also been studied for its impact on student performance. Studies such as Jimmieson, Hannam and Yeo (5), Lee, Cawthon and Dawson (12) as well as Skaalvik and Slaavik. (13) demonstrate this point. Teaching quality is a significant predictor of student achievement, according to a study published by Faez and Valeo (14). People's perception of self-efficacy can influence their desire to accomplish a task in a variety of ways. People's self-belief in their capacity to do a certain activity is connected to this idea (Gou, (15).

Self-efficacy beliefs have a big effect on goals, direction, and compliance by affecting a person's decisions, motivation, pliability, and emotional responses. On the other hand, these will make a job easier and take less work and persistence to finish. This means that self-efficacy affects either the learning or cognitive dimensions. High levels of self-efficacy can have both good and bad effects on motivation. People with high self-efficacy are more likely to try than people with low self-efficacy because of this. Low self-efficacy can lead to a condition called "learned helplessness," which is bad. That is, how a person acts after being exposed to repeated bad stimuli that they have no control over. Some of the things that can happen when you don't believe in yourself are: (i) It might lead people to think that things are harder than they really are. (ii) Teachers with a high sense of self-efficacy look at the task from a wider perspective to come up with the best plan. (iii) When teachers do a job, they don't think they can do well, they are inconsistent and hard to predict. (iv) When people with high self-efficacy face problems, they tend to work harder, while people with low self-efficacy are more likely to give up and give up on the task. (v) A person with high self-efficacy will blame outside factors for their failures, while a person with low self-efficacy will blame their own lack of ability.

Teacher self- efficacy

Akbari (16) contrasted self-efficacy with outcome expectancies, or expectations that a behaviour will have certain effects. Self-efficacy is different from self-concept, which is based on surroundings and interactions (Canrinus, Helms-Lorenz, Beijaard, Buitink & Hofman, (17). Marsh et al. say self-efficacy is future-focused (prospective in nature). Self-efficacy is task confidence. Teachers' efficacy beliefs (outcome expectations) refer to their beliefs about the likely consequences of performing specific tasks/behaviors at specific levels of competence.

Teachers' self-efficacy reflects their ability to bring about positive learner change despite unforeseen difficulties. Differentiate self-efficacy and instructional efficacy (Skaalvik & Saalvik, (17). Teachers' efficacy beliefs (outcome expectations) refer to their beliefs about the likely consequences of specific tasks or behaviours. Teaching self-efficacy reflects how teachers evaluate their ability to create positive student change. Teacher self-efficacy is context-dependent, says Bandura. Bandura described self-efficacy as task-, realm-, or domain-specific, which means individuals may have different levels of self-efficacy beliefs for different behavioural domains such as classroom management, student engagement, instructional methods, and communication abilities. Teacher self-efficacy predicts student achievement, according to Hultell, Melin, and Gustafsson (18). Reyes et al (8) found a link between self-efficacy and science grades. Self-efficacy motivates teachers to work harder on a challenge or assignment. Low teacher self-efficacy causes people to quit jobs or projects. It's "beliefs in one's ability to organise and execute courses of action to manage future challenges." It involves arranging goals, ideas, or actions, as well as overcoming obstacles. Instructors' self-efficacy (TSE) is teachers' confidence in their skills to boost students' learning despite psychological, emotional, and mental limitations (Ross & Bruce, (9). Bandura (4) says teachers boost self-efficacy through enactive and vicarious mastery, persuasion, and physiological/emotional state.

Beliefs in self-efficacy affect behaviour and change. Bandura's prior research supported the idea that beliefs about our talents affect our behaviour and motivation, affecting our success or failure (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, (19). Bandura (4) suggested that self-efficacy beliefs can predict behaviour because they are self-referential and focus on perceived competence. Studying self-efficacy and human behaviour includes teacher efficacy. Its impact on student achievement is studied. Multiple studies link student achievement to teacher self-efficacy as a key indicator of teacher effectiveness (e.g., Jimmieson, Hannam, & Yeo, (5); Lee, Cawthon, & Dawson, (12); Skaalvik & Skaalvik, (13). Creswell (20) found that teacher self-efficacy predicts student success. Self-efficacy affects how people feel, think, and are motivated. This refers to how some people work with joy (Gou, et al (15). Beliefs in self-efficacy affect a person's decisions, motivation, resilience, and emotional reactions, which affect goals, direction, and compliance. Teacher self-efficacy can affect students' ability, motivation, and resilience, and thus their development. This reduces work and persistence needed to finish a project or assignment. Cognitive or learning is affected by self-efficacy. Self-efficacy can boost and decrease motivation. High self-efficacy leads to more effort. Self-efficacy causes learned helplessness. A subject's behaviour after repeated, uncontrollable negative stimuli. Poor teacher self-efficacy causes: Makes things seem harder than they are. Teachers with high self-efficacy have a broader view of developing the best method. Teachers lack self-efficacy and are inconsistent. People with high self-efficacy are more resilient. A person with low self-efficacy blames skill for failure. (Mustafa et al. (21)

Both teacher self-efficacy and student academic achievement are well-researched. Studies show self-efficacy boosts academic performance. Carroll, Houghton, Wood, and Bower (2008) say academic and social self-efficacy affect academic achievement. Teacher self-efficacy boosts student motivation and goal setting (Alibakshi, (22). Moafian and Ebrahimi (2015) found teachers' self-efficacy affected science grades. Lee, Cawthon, and Dawson (12) found that teachers' self-efficacy predicts student success. Comparing instructional behaviours, self-efficacy, and student achievement shows a long-standing link between the two (Wyatt (23). Zee and Koomen (24) found that teacher self-efficacy is linked to student motivation but not academic adjustment or achievement. According to the authors, classroom practise is more important than academic success for student motivation. Studies show that teachers with high self-efficacy are more productive, open to new ideas, willing to try new teaching strategies, and able to manage, control, and organise their classes (Moe, Pazzaglia & Ronconi, (25). Cognitive abilities are affected by self-efficacy. According to other research, teacher self-efficacy influences student achievement more in younger age groups than in older age groups, suggesting that secondary school students may do better when their teachers' subject-matter competence is acknowledged. Guo, Connor, Yang, Roehrig, and Morrison (15) found that teachers' supportive classroom behaviours explain teacher self-positive efficacy's effects on children's reading skills. Both students and teachers benefit from self-efficacy and self-regulated learning. More research links instructors' self-perceptions to student progress. Karimi (26) shows a link between teachers' self-efficacy and students' intelligence. Although most prior research supported a link between teacher self-efficacy and academic achievement, few state data contradicted these findings. Even when students are tough or indifferent, teacher self-efficacy is the confidence to teach them.

High-self-efficacy teachers are more open to new ideas and teaching strategies, more prepared and organised, and more constructive in handling student failures. Teacher self-efficacy is a highly relevant teaching concept shaped by teachers' affective, classroom, school, and principal characteristics. All are crucial for teacher self-efficacy (Fackler & Malmberg, (27).

Most past studies suggested a link between teacher self-efficacy and academic success, but few state data refuted this. Even with difficult or indifferent students, teacher self-efficacy is the belief that learning can be achieved. Cakiroglu (28) says teachers with high self-efficacy are more open to new ideas and instructional tactics, better prepared, and more constructive with student failures. Self-efficacy is a key teaching concept influenced by teachers' emotional traits, classroom features, school characteristics, and principal aspects. All are key to teachers' self-efficacy (Fackler & Malmberg, (27). Even with difficult or disengaged students, teacher self-efficacy is the belief that one can achieve positive results (Pakarinem et al., (7). Self-efficacy makes teachers more sensitive to new ideas and instructional strategies, prepared and organised, and helpful in coping with student failures. Self-efficacy has been extensively researched in relation to students' academic progress and performance in different fields and subject areas as well as location. However, there was a paucity of data linking teachers' self-efficacy and students' achievement in basic science in the area under investigation. There are papers claiming the opposite and a lack of in-depth study on the topic. To better understand the two, this study was conducted.

Research Questions

1. Is there any difference in the mean interest and achievement scores of students taught by teachers with high or low Self- Efficacy in Basic science?
2. Is there any difference in the mean interest and achievement scores of students taught by teachers who attend professional training and those who do not attend in basic science?

Hypotheses

- 1: There is no significant difference between the interest and achievement scores of students in basic science based on teachers' low or high self -Efficacy.
- 2: There is no significant difference in the mean interest and achievement scores of students taught by teachers who attend professional training such as workshops, seminars or conferences and those who do not attend in Basic science.

METHODOLOGY

Ex-post facto research methods were utilised throughout the course of this investigation. This approach was carried out in order to ascertain the manner in which the independent factors impacted the variables that were under investigation. All of the students and teachers of basic science who were enrolled in the Upper Basic Education (UBE) programme at one of the state's public secondary schools in Rivers State, Nigeria, were asked to take part in the study. Two hundred (200) basic science students and one hundred (100) basic science instructors from the junior secondary division (UBE) were chosen to take part in the research project using a stratified random selection approach. The research was conducted with the participation of a total of thirty (30) junior secondary schools. To choose 20 students from each of the 30 selected schools, the basic random selection approach was employed. This resulted in a total of 200 students being chosen, which was accomplished by employing the basic random selection technique. The Science Interest Survey is one of the instruments that are utilised in the process of data collection (SIS). The level of interest shown by students is broken down into two categories: A and B. The first part of this study, Section A, examines the ways in which the characteristics of the teachers contribute to the preservation of the students' interest in science. It is made up of ten different items that are arranged in a framework that is similar to a Likert scale but with certain modifications. In this portion of the survey, respondents are given the option to either "strongly agree" or "strongly disagree." To assemble the elements in this part, Joseph (28) utilised the students' interest scale that he had previously constructed. The students' performance in the UBE basic science tests served as the primary criterion for determining their overall level of academic accomplishment.

The information was obtained from the principals of the schools that were designated for the research project or from anybody else who was permitted to distribute the findings of the research project. According to Gable (29), any score obtained from the primary source does not call for any additional re-validation on the researcher's part. Because of this, the results obtained by the pupils did not require any extra testing in order to validate and verify them. The information that was acquired was put through a process of analysis using descriptive statistics. Analysis of Variance (ANOVA) was employed to test the null hypotheses, and the mean and standard deviation were utilised to provide answers to the study questions. The mean and the standard deviation were calculated in order to provide answers to the research questions presented at 0.5 level of significance.

RESULT

Research question 1: Is there any difference in the mean interest and achievement scores of students taught by teachers with high or low self-efficacy in basic science?

TABLE 1: The difference in the mean interest and achievement scores of students taught by teachers with high or low self-efficacy in Basic Science

	Self-efficacy	Academic Achievement
High self-efficacy	Mean	56.5918
	N	49
	Std. Deviation	18.19217
Low self-efficacy	Mean	59.6471
	N	51
	Std. Deviation	14.60934

Table 1 displays the difference between the mean achievement and interest scores of students taught by teachers with high and low self-efficacy in basic science. It indicates that the mean interest of students whose teachers had high self-efficacy was 73.40, SD = 10.60, whereas their mean academic success was 56.59, SD = 18.19. The mean interest of students whose teachers had poor self-efficacy was 75.25, SD=8.83, but their mean academic achievement was 59.64, SD=14.

H₀₁: There is no significant difference in the mean achievement scores of students taught by teachers with high or low self-efficacy in Basic Science

TABLE 2: Summary of independent sample t-test on the difference in the mean achievement scores of students taught by teachers with high or low self-efficacy in Basic Science

Variable	Self-efficacy	N	Mean	SD	T	Df	p-value
Academic Achievement	High self-efficacy	49	56.59	18.19	-.928	98	.356
	Low self-efficacy	51	59.65	14.61			

The summary of the independent sample t-test on the differences between the mean achievement scores of students taught by teachers with high or low self-efficacy in fundamental science is presented in Table 2. There is no significant difference in the mean achievement ($t = .928$, $df = 98$, $p = .356$) scores of children taught by teachers with high or low self-efficacy in elementary science. The null hypothesis five, that there is no significant difference in the mean achievement scores of students taught by teachers with high or low self-efficacy in basic science, was maintained at .05 levels of significance for achievement and interest in basic science.

Research question 2: Is there any difference in the mean achievement scores of students taught by teachers of varying attitudes towards basic science?

TABLE 3: The difference in the mean achievement scores of students taught by teachers of varying attitudes towards Basic Science

Attitude		Academic Achievement	
Positive Teachers' Attitude	Mean	55.0833	
	N	48	
	Std. Deviation	16.15857	
Negative Teachers' Attitude	Mean	60.9808	
	N	52	
	Std. Deviation	16.36051	

The result in Table 3 shows the difference in the mean achievement scores of students taught by teachers of varying attitudes towards basic science. It shows that the mean, their academic achievement mean score was 55.08, SD = 16.16. The mean interest of the students whose teachers their academic achievement mean score was 60.98, SD = 16.36.

H₀₂: There is no significant difference in the mean interest and achievement scores of students taught by teachers of varying attitudes towards Basic Science?

TABLE 4: Summary of independent sample t-test on the difference in the mean interest and achievement scores of students taught by teachers of varying attitudes towards Basic Science

Variable	Attitude	N	Mean	SD	T	Df	p-value
Academic Achievement	Positive teachers' attitude	48	55.08	16.16	-1.812	98	.073
	Negative teachers' attitude	52	60.98	16.36			

Table 4 shows the summary of the independent sample t-test that looked at the difference between the mean interest and achievement scores of students whose teachers had different views on basic science. It shows that the average interest ($t = 1.549$, $df = 98$, $p = .125$) and achievement ($t = 1.812$, $df = 98$, $p = .078$) scores of students taught by teachers with different attitudes toward basic science are not different in a way that is statistically significant. The sixth null hypothesis, that there is no significant difference between the mean interest and achievement scores of students taught by teachers with different attitudes toward basic science, was kept at .05 levels of significance over achievement and interest in basic science.

DISCUSSION

Table 1 display both high and low levels of self-efficacy among teachers. Teachers judged how effectively they believed they could teach basic science ideas to their students, and this rating was used to split the students into two groups. Table 1 also reveals that teachers' degrees of self-efficacy ranged from high to poor. Students whose teachers had low self-efficacy were more engaged and felt more successful than students whose teachers had high self-efficacy (mean score: 73.40, standard deviation: 10.60). Table 4.20 displays that there was no statistically significant difference between the students taught by teachers with high and low self-efficacy in basic science. One of the findings of the study was that a teacher's self-efficacy did not have a significant impact on their students' interest in and success with basic science.

The results were identical to those discovered by Gou (15), namely that there was no correlation between teachers' belief of self-efficacy and how well their students performed, regardless of whether the teachers were males or females. This was always the case. It corroborated the findings of Strelnieks (2005), who discovered that teachers' sentiments of self-efficacy neither predicted nor affected their students' achievement in science, nor increased their interest in the subject. The findings of the present investigation supported this conclusion. However, Carol et al. (20) discovered that teachers' self-efficacy had both good and negative effects on their students' academic achievement. This contradicts Silbereisen (30), who discovered that teachers' self-efficacy helps students do better in school and increases their interest in basic science. Carol et al. (20) discovered that instructors' confidence in their own talents had both a good and negative influence on the academic performance of their students. Silbereisen (30) discovers In addition, the results contradict what Cassidy (31) discovered, namely that there was a statistically significant correlation between a teacher's sexual orientation and how well they believed their kids were performing in school. Cassidy discovered this correlation between teachers' sexual orientation and their students' academic achievement. Those teachers who like science were separated from those who did not (Table 11). The study revealed that the average test scores of students whose teachers had negative views toward both interest and achievement were significantly greater than those of students whose teachers had favourable attitudes toward both.

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