AJSTME, Volume. 12, Issue 2. 318-326, March, 2026. https://www.ajstme.com.ng
ISSN: 2251-0141 (Print), 2971-6233 (Online)

Self-Efficacy as a Predictor of Students' Academic Achievement in Magnetic Field Physics

[1]Oluebube Njoku[1]; & [2]Emmanuel I. Orji
[1]Department of Science Education, University of Nigeria, Nsukka
[2]Department of Science, Mathematics, and Technology Education, University of Pretoria, South Africa
Corresponding Author: [2]emmanuel.orji@up.ac.za;

Abstract

In the literature, the magnitude of the prediction of students' academic achievement in a magnetic field of physics by their self-efficacy has been under-investigated. The study, therefore, offers actionable insight into the explicit roles self-efficacy plays in predicting students' academic achievement in magnetic field physics, with gender examined as a moderating variable. A correlational survey research design was adopted for the study, using a sample of 317 (156 male and 162 female) senior secondary school three (SSIII) students. Two validated instruments were used for data collection: the Magnetic Field Self-Efficacy Scale (MFSES) and the Magnetic Field Achievement Test (MFAT) instruments. The reliability coefficient of MFSES is 0.74 and 0.85 for MFAT, which were obtained through Cronbach's Alpha and Kuder-Richardson-20 (KR-20), respectively. Linear regression analyses were used to address the research questions, while hypotheses were tested at a 0.05 significance level using regression ANOVA and t-test. Findings showed that self-efficacy is a significant predictor of students' achievement in the magnetic field (F=9.69, P=0.002). Gender is not a significant moderator of the prediction of achievement in the magnetic field by self-efficacy. The study highlights that meaningful students' academic achievement is predicated upon their self-efficacy. It was suggested that an instructional intervention be used to promote academic self-efficacy for improved physics learning outcomes.

Keywords: Self-efficacy, magnetic field, Academic Achievement, Gender

Introduction

Physics plays a pivotal role in human advancement, as its understanding equips individuals with the foundational knowledge required across various scientific fields. Given this, acquiring sound knowledge of physics is essential. Mastery of physics concepts enables learners to have a proper grasp of how the universe operates through mathematical reasoning. The discipline explores everything from galaxies and planets to atoms and quarks, along with the fundamental forces and their interactions with matter (Patrick, 2018). Physics is a field that investigates the universe through experimentation, measurement, and mathematical analysis to identify quantitative physical laws. Similarly, Usman and Abubakar (2019) portray physics as the cornerstone of science and technology, offering fundamental insights into the laws and principles that govern scientific phenomena.

In essence, physics can be viewed as a branch of science concerned with studying matter, its properties, and energy, while establishing the relationships between them to formulate laws and principles that explain physical behavior. According to Usman and Abubakar (2019), the continued discoveries in physics have significantly accelerated the progress of modern society. Given the importance of physics, it becomes necessary to examine the achievement of students in the subject, which is a pointer to the knowledge acquired in the subject.

Despite government interventions, curriculum reforms, teacher capacity-building, and technological integration, achievement levels on the West African Senior School Certificate Examination (WASSCE) have fluctuated with no marked improvement over the last decade. Analysis of the West African Senior School Certificate Examination (WASSCE) Chief Examiners' Reports from 2013 to 2023 indicates that although the number of candidates increased from 636,924 to 846,875, the mean raw scores fluctuated between 13 and 34 out of 60, with standard deviations generally below 10 (West African Examinations Council [WAEC], 2018–2023).

Several trend analyses and regional studies report variable pass rates and only modest gains in physics achievement across different states and periods (Awodun, 2021; Obafemi & Ugonwa, 2025).

Students' achievement in field-related physics (especially electricity and magnetism) remains low internationally and across many classroom contexts. Large assessments and subject-specific diagnostics reveal weak conceptual mastery. For example, Lindquist et al. (2019) show poor scores on electricity and magnetism items compared with other physics subdomains. Also, conceptual survey of electricity and magnetism (CSEM) pretest averages are typically low (often 30–40% correct) in introductory grade level, evidence that many learners enter or complete instruction without a robust understanding of field concepts (Lindquist et al., 2019). According to Internal Formative Assessment (IFA,2019), in magnetic field topics, examiners frequently report the inability of the candidates to articulate and express in clear terms key ideas needed to secure a point. Also, a measure of inability to apply field principles in solving problems relating to the magnetic field.

Further evidence from one of the researchers' observations shows that achievement scores obtained from some schools in the Nsukka education zone also show that a good number of the students are below average in concepts relating to the field.

Field concepts (electric, magnetic, and gravitational fields) are foundational to both modern physics theory and numerous technologies. For instance, Maxwell's unification of electricity and magnetism underlies electromagnetic theory and modern electronics. Further, magnetic and electric field principles are used in electric motors, generators, and medical imaging devices (Hernández et al., 2025). A weak grasp of fields, therefore, limits students' access to advanced physics learning and to conceptual links between classroom physics and real-world applications.

To address poor outcomes in field topics, researchers have tested a range of instructional interventions. Studies report improvements using interactive simulations and inquiry-based activities (Ogegbo & Ramnarain, 2022), scaffold/generative instructional methods (Bell & Birceanu, 2025), cooperative learning, and blended approaches that combine analogical reasoning with peer discussion (Bonitasya et al 2021) Each study shows modest to substantial gains on achievement These studies suggest pedagogy matters, by providing learner-centered and scaffold experiences that provide multiple mastery opportunities reliably improve electromagnetism learning relative to traditional lecture (Aragaw et al., 2022). However, much of this work concentrates on how to teach (methods and materials) and less on the learner's psychological variable**s** that shape whether students translate instruction into durable learning. Syntheses of motivational research show that academic self-efficacy (task-specific beliefs about one's ability) is consistently associated with academic outcomes and can influence effort, strategy use, and persistence (Bandura, 1977; Honicke & Broadbent, 2016). Importantly, meta-analytic longitudinal work finds a reciprocal relation between self-efficacy and achievement (Arens et al, 2022); According to Basith et al. (2020), self-efficacy has a positive relationship and is also a predictor in determining academic achievement. This shows that any improvement in academic self-efficacy will be accompanied by an improvement in academic achievement. These findings indicate that self-efficacy is a plausible predictor of learning achievement .Contrary to these, Achufusi and Utaka (2021) found out that self - efficacy was not a significant factor on students' academic achievement in physics. While Nduji et al (2021) noted that self - efficacy have significant predictive power on students' achievement in physics. Recent research suggests that cognitive factors alone do not explain students' performance. Motivational constructs such as self-efficacy can significantly influence students' engagement, persistence, and eventual achievement in physics (Schunk, 2012; Ugwuanyi et al., 2023). Yet, empirical studies focusing on the prediction of self-efficacy on students achievement in a specific physics domains, particularly magnetic fields, remain limited. In other words, while pedagogical reforms improve average outcomes, it remains an open and important question whether boosting or measuring students' physics-task self-efficacy would meaningfully predict or mediate gains in field learning

Furthermore, findings on gender differences in self-efficacy beliefs are mixed, prompting the need to explore whether gender moderates the influence of self-efficacy on physics performance. Students' persistent underachievement in physics, particularly in the field component, remains a major concern in science education. Although self-efficacy has been widely recognized as a motivational construct influencing learning outcomes, limited research has focused specifically on how self-efficacy influences achievement in field physics, or whether gender moderates this relationship. This study investigated the predictive power of self-efficacy on students' academic achievement in magnetic field physics, with gender examined as a potential moderating variable.

Two research questions guided the study. They are:

1. What is the magnitude of the prediction of self-efficacy on students' academic achievement in the field?
2. What is the magnitude of the prediction of self-efficacy on students' academic achievement in the field as moderated by gender?

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

$H0_1$: The magnitude of prediction of self-efficacy on students' academic achievement in the field is not significant

$H0_2$: The magnitude of prediction of self-efficacy on students' academic achievement in the field, as moderated by gender, is not significant.

Literature Review

Self-Efficacy in Science Learning

Self-efficacy pertains to individuals' belief in their own capabilities when faced with different situations. Albert Bandura utilized self-efficacy to explain the varying performance outcomes among individuals subjected to similar treatments. According to Artino (2012), self-efficacy is defined as the confidence in one's ability to organize and carry out actions necessary to handle potential situations. While general self-efficacy relates to an overall belief in one's capacity to succeed, there exist numerous specific forms of self-efficacy as noted by Ackerman (2018). Individuals base their task performances on their belief in specific situations. Bandura (1997) defines self-efficacy for learning as personal assessments of one's competence to effectively carryout actions essential for achieving an academic goal. In a similar vein, Nugroho et al (2020) characterized self-efficacy for learning as students' confidence in their ability to regulate their own learning. Consequently, self-efficacy reflects individuals' evaluations of their capabilities as influenced by the interplay of cognition, behavior, and environment. It represents the trust individuals have in their abilities, particularly in facing upcoming challenges and completing tasks successfully. For students, self-efficacy is vital in evaluating their performance as it directs their attention towards their beliefs regarding the efficacy of their learning methods. Bandura (1977) introduced the concept of self-efficacy and identified four sources of self-efficacy beliefs: mastery learning, vicarious learning, verbal persuasion, and emotional responses. Students with high physics self-efficacy are more likely to be motivated to learn the subject (Cai, et al, 2020). By fostering a positive sense of self-efficacy, educators can empower students to approach physics with confidence, leading to better learning outcomes. This highlights the importance of creating learning environments that promote self-belief and encourage students to embrace challenges in physics. In academic contexts, self-efficacy influences task persistence, cognitive engagement, and resilience during difficult learning tasks (Schunk, 2012). Self-efficacy, as a belief in one's ability, is dynamic and task-specific. The assessment of self-efficacy is reliant on the particular task at hand. The Science Motivation Questionnaire (SMQ) developed by Glynn, et al (2009) serves as a tool for gauging students 'self-efficacy in science education. Various similar instruments have been utilized for assessing students 'self-efficacy in physics by different researchers.

Students with high self-efficacy are more likely to attempt challenging problems, recover from failure, and allocate mental resources efficiently. Physics, being highly abstract and mathematically intensive, demands high levels of confidence and self-regulation. Numerous studies have demonstrated that physics self-efficacy correlates positively with achievement (Alhadabi & Karpinski, 2019). However, the strength of this relationship varies across physics domains, suggesting that topic-specific investigations are needed.

Self-Efficacy in Field Physics

The concept of a field requires students to mentally visualize invisible field lines, understand vector interactions, and apply rules like the right-hand grip rule. These cognitive demands often cause misconceptions (Esmeralda et al., 2020; Yuksel & Bryan, 2023). When confronted with abstract phenomena, students' confidence levels strongly influence how they approach problem-solving.

Higher self-efficacy can mitigate students' anxiety toward complex topics, enhancing performance even when knowledge is incomplete. However, inflated self-efficacy may lead to carelessness or poor study habits (Beck & Schmidt, 2018), highlighting the need for balanced self-efficacy beliefs. Studies (Nasir & Iqbal, 2019; Basith et al, 2020; Zysberg & Schwabsky, 2021; Meng & Zhang, 2023; Al-Abyadh & Abdel Azeem, 2022) self -self-efficacy relates to academic achievement in science. Also, previous studies have shown that gender could moderate the influence of self-efficacy in the sciences, but the direction of moderation remains a concern for researchers.

Extensive research documents gender differences in STEM-related self-beliefs. Some studies argue that female students tend to report lower academic self-efficacy despite comparable

achievement (Robinson, Perez, White-Levatich, & Linnenbrink-Garcia, 2022). However, other findings indicate minimal or no gender differences (Parajuli & Thapa, 2017). Whether gender moderates the effect of self-efficacy on achievement, especially in the field of physics, remains empirically unsettled.

Moderating influence of gender on the prediction of self-efficacy on students' achievement

Theoretical Framework

Bandura's Theory of Self-Efficacy

Albert Bandura's concept of self-efficacy stands as a central pillar in social cognitive theory. It delves into the core belief individuals hold regarding their capabilities to perform specific tasks and achieve desired outcomes. Understanding this concept is crucial in various domains, including education and motivation.

It's not simply about possessing the necessary skills but the confidence in applying those skills effectively. An individual can have high self-efficacy or low self-efficacy. High self-efficacy fosters a sense of optimism and willingness to tackle challenges, while low self-efficacy can lead to anxiety, avoidance behaviors, and a decreased likelihood of success. Self-efficacy refers to an individual's judgment of their capabilities to execute specific actions required to manage a particular situation (Bandura, 1977). Bandura (1977) proposed that individuals form their self-efficacy beliefs through the following mechanisms:

The primary source is mastery experiences, where individuals rely on their personal mastery achievements to shape their self-efficacy beliefs. Successful task completion experiences significantly boost an individual's confidence in their ability to handle similar tasks. Similarly, when an individual's understanding does not align with scientifically valid concepts during the learning process, they lose confidence in their misconceptions and strive to grasp the correct concepts. The second source is vicarious learning, which occurs when individuals observe others, similar to themselves, performing a task they are also attempting. Witnessing others' successes or failures in a task can influence one's belief in their own capabilities to perform that task. This observation of others' outcomes is especially crucial when the individual lacks personal experience with the task, relying instead on observations of others executing the task.

The third source of influence is verbal or social persuasion. Verbal recommendations from peers can impact an individual's beliefs regarding their capabilities. Encouraging words or societal cues may lead to a boost in self-efficacy, motivating individuals to exert more effort and persistence in task performance. Accuracy and constructive feedback are crucial as inadequate feedback could potentially undermine individuals' self-efficacy. The fourth source of influence pertains to emotional responses. Individuals often interpret their physical reactions during tasks as indicators of their abilities. For instance, students experiencing anxiety, nervousness, or stress during math assessments may perceive these emotions as proof of their incompetence in mathematics, irrespective of their actual performance. Conversely, feelings of joy, contentment, and serenity can have a positive impact on individuals' self-efficacy. Bandura (1997) believes that self-efficacy has significant ramifications for behavior, motivation, and well-being. Self-efficacy plays a role in fostering the willingness to set ambitious goals and persist in the face of obstacles, especially one with a high self-efficacy. Individuals believe they can achieve their goals, leading to increased motivation and effort.

Methods

A correlational research design was adopted by the researchers. Correlational research design is a type of research design that seeks to investigate the relationship that exists between two or more variables (Nworgu, 2015). This type of survey indicates the magnitude of the relationship between the predictor and criterion variables. In this case, the researcher established the magnitude of prediction of the predictor variable, self-efficacy, on the criterion variable, students' achievement in the magnetic field aspect of physics. The study was carried out in the Nsukka Education Zone of Enugu State, Nigeria. Nsukka Education Zone is one of the six education zones in Enugu State. There are three local government areas in the zone, which are Igboetiti with 15 public secondary schools, Nsukka with 30 public secondary schools, and Uzo-uwani with 15 public secondary schools, giving a total of 60 public secondary schools. The population of the study comprised 1528 senior secondary school three (SS3) Physics students (769 males and 759 females) from the 60 senior secondary government-owned schools within the zone during the 2024/2025 academic session. The sample size of the study was 317 SS3 Physics students (156 males and 161 females) drawn from the population. The sample size was determined using margin of error of 5 percent which is consistent with the confidence level of 95 percent based on the population size as recommended by Cohen et al. (2018). Multi-stage sampling procedure was used to compose the sample size. At the initial stage, a simple random sampling technique was used in selecting two local governments out of the three local government

areas in Nsukka Education Zone. A simple random sampling technique was used in order to give every local government an equal chance of being selected for the study. At the next stage, a proportionate stratified sampling technique was used in selecting 20 co-education schools from the two local governments sampled. This is because of the unequal distribution of students in the sampled L.G.A. and schools. Purposive sampling technique was used to select an equal number of single schools and co-educational schools because of the gender, which served as a moderating variable in the study. Finally, all the SS3 science students in the sampled schools were used as respondents for the study.

The Magnetic Field Self-efficacy Scale (MFSES) and the Magnetic Field Achievement Test (MFAT) were used for data collection. The MFSES has 30 items which tries to elicit information on Self-efficacy of physics students on magnetic field. Four (4) point Likert rating scale of Strongly Agree (SA) - 4 points, Agree (A) - 3 points, Disagree (D) - 2 points and Strongly Disagree (SD) - 1 point was used to elicit responses from the respondents. The MFSES has been adapted from Suprato, Chang and Ku (2017). The instrument was originally referred to as Physics Learning Self efficacy (PLSE, see appendix J p. 145), which has 30 items. It was designed to measure the physics learning self-efficacy of Indonesian University students and has bipolar strongly agreed to strongly disagree statements in a five-point Likert scale of strongly agreed (SA), agreed (A), undecided (UD), disagree (D) and strongly disagree (SD). The instrument was grouped into the following dimensions: science content (SC), higher-order cognitive skills (HCS), Laboratory usage (LU), everyday application (EA), science communication (SCM) and scientific literacy. These dimensions were removed and the column for undecided (UD) was also removed so as to contain only four-point scale of Strongly Agree = 4, Agree= 3, Disagree= 2 and Strongly Disagree = 1. Also, the items were modified to fit into magnetic field aspect of physics by replacing physics with magnetic field. A higher order score implied higher efficacy in magnetic field. The Magnetic Field Achievement Test (MFAT) was developed by the researchers using a table of specifications based on Bloom et al. (1956). It consists of 30 multiple-choice items drawn from WAEC and NECO past questions (2016–2023) aligned with the secondary school curriculum. The test covers major field topics, including the concept of magnetic fields, electric field, and gravitational fields. Each item has four options (A–D), scored 1 for a correct response and 0 for any incorrect option.

The reliability of the two instruments (MFSES and MFAT) was established through a pilot test involving 20 SS3 Physics students from a comparable school outside the study area. The purpose of the trial was to assess internal consistency. Using the Cronbach Alpha method, FSES yielded 0.74**.** Cronbach's Alpha was appropriate because of the polytomous nature of the instrument. The Field Achievement Test (FAT), which consisted of dichotomously scored items, was analyzed using the KR-20 formula and obtained a reliability coefficient of 0.85.

The researcher used a face-to-face method to administer the instruments. Clear instructions were provided and emphasized. The instruments were administered on the same day and in a fixed order. The MFSES was administered first, followed by MFAT. This was done to ensure that the same group of students completed all instruments.

Ethical guidelines were strictly observed. Participation was voluntary, and informed consent was obtained. Confidentiality and anonymity were ensured by coding responses and removing personal identifiers. Permission was granted by school authorities, and students were assured that the data would be used only for research purposes.

The collected data were analyzed using simple regression analysis, regression ANOVA, independent sample t-test, and the Hayes Process Macro. Regression coefficients (R) and the coefficient of determination (R^2) were used to answer the research questions. Relationship strength was interpreted using the following benchmarks: 0.00–0.19 (very low), 0.20–0.39 (low), 0.40–0.59 (medium), 0.60–0.79 (high), and 0.80–1.0 (very high), based on Papageorgiou (2022).

AJSTME, Volume. 12, Issue 2. 318-326, March, 2026. https://www.ajstme.com.ng
ISSN: 2251-0141 (Print), 2971-6233 (Online)

Results

Table 1: Regression analysis of the magnitude of predictive power of students' self-efficacy on their academic achievement in the field.

N = 317

Model	R	R-square	R-Adjusted squared	Std. Error of Estimate	Beta
1	.173[a]	.030	.027	6.52045	.173

a. Predictors: (Constant), FSES

Analysis of Table 1 shows the magnitude of prediction of students' academic achievement in a magnetic field by their self-efficacy. The result showed that the correlation coefficient (R) obtained between students' self-efficacy and their achievement in the magnetic field was 0.173. This shows that there is a very low and positive relationship (R = 0.173) between students' self-efficacy and their achievement in the magnetic field. This correlation coefficient is associated with a coefficient of determination (R^2) of 0.030. This determines the magnitude of prediction that self-efficacy has on students' academic achievement in the magnetic field. It predicts that 3.0% of students' academic achievement in a magnetic field is due to their self-efficacy, while the remaining 97.0% can be attributed to other factors other than self-efficacy. The result also showed that the value Adjusted R^2 is 0.027, which indicates that self-efficacy contributes 2.7% variation in students' academic achievement in the magnetic field.

Table 2: Regression of the magnitude of prediction of self-efficacy on students' academic achievement in the field

Model		Sum of squares	df	Mean square	F	Sig
1	Regression	412.081	1	412.081	9.692	.002[b]
	Residual	13392.619	315	42.516		
	Total	13804.700	316			

a. Dependent Variable: Students' academic achievement in magnetic field
b. Predictors: (Constant) Self -efficacy

From Table 2, the result shows the ANOVA Regression of the magnitude of prediction of students' academic achievement in a magnetic field by their self-efficacy. The result shows , $F(1, 315) = 9.692$, $p = 0.002$. Since the exact probability value of 0.002 is less than 0.05 level of significance, the decision was that the null hypothesis was not upheld. Thus, the alternative is upheld, which means that the magnitude of prediction of students' academic achievement in a magnetic field by their self-efficacy is significant.

Table 6: Process macro analysis of the moderating influence of gender on the prediction of self-efficacy on achievement dents' self-efficacy on their academic achievement in the field as moderated by gender

R	R-sq	MSE	F	DF1	DF2	P
.2503	.0627	41.3411	6.9740	3.0000	313.00	.0001
X*W	.0011		. 3794	1.0000	313.0000	.5383

X: MFSES W: gender

Analysis of Table 3 shows the magnitude of prediction of students' academic achievement in a magnetic field by their self-efficacy as moderated by gender. The result showed that the correlation coefficient (R) obtained between students' self-efficacy as moderated by gender and their achievement in the magnetic field was 0.250. This shows that there is a low and positive relationship (r = 0.250) between students' self-efficacy as moderated by gender and their achievement in the magnetic field. This correlation coefficient is associated with a coefficient of determination (R^2) of 0.0627. This

determines the magnitude of prediction that self-efficacy has on students' academic achievement in the magnetic field. It predicts that 6.2% of students' academic achievement in a magnetic field is due to their self-efficacy as moderated by gender, while the remaining 93.8% can be attributed to other factors other than self-efficacy as moderated by gender.

Hypothesis 3:

Table 6 also revealed $F(1, 313)= 0.5383$, $p=0.001$. Since the associated probability is greater than 0.05 level of significance, the null hypothesis was not rejected. This, therefore, implies that the moderation of gender on prediction of self-efficacy on achievement in magnetic field is not significant .

Discussion

The study looked at the magnitude of prediction of students' self-efficacy on academic achievement in magnetic field. The findings of the study reveal that self -efficacy significantly predicted 3.0% of students' academic achievement in magnetic field. Though, according to Papageorgiou (2022), the level of relationship between self-efficacy and academic achievement is low. Notwithstanding, the test of hypothesis revealed that this relationship is significant. The result is like this maybe because self-efficacy refers to a person's belief in their ability to carry out the actions needed to achieve specific goals or performance outcomes. This gives the students confidence in approaching task. Also, self -efficacy among students is linked to their achievement in physics concepts and enhance overall academic achievement. Self -efficacy is the confidence students' possesses in their abilities to learn and excel in a specific task. The finding of this study agrees with the observation made in Ugwuanyi, et al, (2023) and Alhadabi and Karpinski (2019) that when a student has the right evaluation of oneself, it paves way for better achievement and attainment. While students with high self -efficacy do better when compared with those with low self -efficacy. Also, other studies (Quendangan, et al., 2023; Luo, et al., 2023; Gana, et al., 2019) showed a positive relationship between self-efficacy and achievement. In the contrary, the study by Jamil and Mahmud (2019) shows no significant correlation between self-efficacy and academic achievement. This could mean that other factors that could correlate with academic achievement were more in the study that was carried out by Jamil and Mahmud. In the same vein, Beck and Schmidt (2018) found out that high self -efficacy can be counterproductive and could lead to poor achievement. This difference could be that Beck and Schmidt (2018) looked at self -efficacy in the nominal phase without specific interest in a particular subject area. Also, self -efficacy is not general but should be directed towards a particular situation and learning environment.

Although self-efficacy accounted for a modest proportion of variance (3%), its effect was statistically significant. In educational psychology, small but significant effects are common in complex learning environments where multiple variables interact. This was in line with the findings of Basith et al. (2020), Physics achievement is influenced by prior knowledge, reasoning skills, instructional quality, and affective factors; therefore, a 3% independent contribution from a single psychological construct is meaningful. Also, studies (Nasir & Iqbal, 2019; Basith et al, 2020; Zysberg & Schwabsky, 2021; Meng & Zhang, 2023; Al-Abyadh & Abdel Azeem, 2022) showed that self-efficacy has a positive relation to academic achievement. Findings reinforce Bandura's theory: students' belief in their ability even slightly changes how they engage with difficult material. In magnetic field physics, where misconceptions are common and abstract reasoning is required, self-efficacy likely influences willingness to attempt non-routine items, persistence with vector reasoning confidence in applying rules (e.g., Fleming's left-hand rule)
reduced anxiety toward invisible phenomena

The study also looked at the magnitude of prediction of self-efficacy on academic achievement of students in magnetic field as moderated by gender. The moderation of gender do not significantly affect the magnitude of prediction of self-efficacy on students' academic achievement in magnetic field. This showed that self-efficacy and achievement relationship is generally consistent for both male and female learners. Contemporary findings indicate that although gender differences may appear in mean levels of confidence, the strength of the association between self-efficacy and academic achievement is usually similar across sexes, and gender often exerts its influence indirectly through other motivational factors rather than by altering predictive slopes directly (Moraga-Pumarino et al., 2025). This findings suggest that self-efficacy operates as a robust predictor of achievement irrespective of gender in many educational contexts. (Cwik & Singh, 2022) This finding aligns with the findings of the studies (Obafemi, et al, 2023; Espinosa, et al., 2019) that the influence of gender is not significant. On the contrary, findings from (Leihong & Zhonggen, 2023; Robinson, et al, 2022; Musisi, et al, 2021; Jamil & Mahmud, 2019) these studies showed that the influence of gender is significant in students' self -efficacy and achievement in sciences especially in

physics. This discrepancy could be as a result of societal beliefs and misconception about gender roles. The non-significant moderating effect of gender suggests that self-efficacy influences male and female students similarly. This supports contemporary research indicating that when learning environments are equitable, gender differences in physics motivation diminish.

Conclusion

Self-efficacy is a statistically significant predictor of students' academic achievement in magnetic field physics. Although the effect size is modest, its educational importance is substantial because confidence shapes engagement with abstract physics concepts. Gender does not moderate this relationship, indicating that self-efficacy functions similarly across male and female learners

The study concludes that strengthening students' self-efficacy through targeted instructional and psychosocial interventions remains critical for improving achievement in challenging areas of physics.

Recommendations

From the findings of the study, the following recommendations were made. Teachers should provide verbal persuasion and constructive feedback to build confidence in the learner. They should also offer gender-neutral encouragement to the students to reduce stereotypes in physics. The result showed that the influence of gender on self-efficacy does not significantly impact on the academic achievement of students. Hence, every learner, no matter the gender should be encouraged to study hard and believe on themselves to achieve academic success.

References

Achufusi, N., & Utaka, J. N (2021). Self-efficacy and motivation as correlates of secondary school students' academic achievement in Physics. *Unizik Journal of STM Education, 4*(1*)*, 234-246. https://journals.unizik.edu.ng/jstme/article/view/1466

Al-Abyadh, M. H. A., & Abdel-Azeem, H. A. H. (2022). Academic achievement: Influences of university students' self-management and perceived self-efficacy. *Journal of Intelligence*, *10*(3), 55.

Alhadabi, A., & Karpinski, A. C. (2020). Grit, self-efficacy, achievement orientation goals, and academic performance in university students. *International Journal of Adolescence and Youth*, *25*(1), 519–535. https://doi.org/10.1080/02673843.2019.1679202

Aragaw, A. M., Assefa Alemu, S., & Gebyehu Seyoum, D. (2022). Improving secondary school students' physics achievement through scaffold simulated analogical reasoning strategy. *Pedagogical Research, 7*(4), em0136.

Arens, A. K., Frenzel, A. C., & Goetz, T. (2022). Self-concept and self-efficacy in math: Longitudinal interrelations and reciprocal linkages with achievement. *The Journal of Experimental Education*, *90*(3), 615-633.

Arens, A. K., Frenzel, A. C., & Goetz, T. (2022). Self-Concept and Self-Efficacy in Math: Longitudinal Interrelations and Reciprocal Linkages with Achievement. The Journal of Experimental Education, 90(3), 615–633. https://doi.org/10.1080/00220973.2020.1786347

Awodun, A. O. (2021). Analysis of in Senior School Certificate Examination from 2015-2018 in Ado Local Government Area, Ekiti State, Nigeria. *International Journal of Innovative Studies*, *1*(2), 1-8 https://www.bijess.org/issue_file/issue_1725680332_07092024.pdf?utm

Bandura A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215.

Bandura A. (2006). Guide for constructing self-efficacy scales. In Pajares F., Urdan T. (Eds.), *self-efficacy beliefs of adolescents* (pp. 307–337). Information Age Publishing.

Basith, A., Syahputra, A., & Ichwanto, M. A. (2020). Academic self-efficacy as predictor of academic achievement. *JPI (Jurnal Pendidikan Indonesia)*, *9*(1), 163-170.

Beck, J. W., & Schmidt, A. M. (2018). Negative relationships between self-efficacy and performance can be adaptive: The mediating role of resource allocation. *Journal of Management*, *44*(2), 555-588. https://doi.org/10.1177/0149206314567778

Bell, C. E., & Birceanu, O. (2025). Educators' experience and guide to scaffolding generative AI applications throughout a physiology and pharmacology undergraduate laboratory course. *Advances in Physiology Education*, *49*(3), 721-728.https://doi:10.1152/advan.00130.2024

Bonitasya, D., Widiyatmoko, A., & Sovansophal, K. (2021). The effect of blended learning with a collaborative problem-solving approach on students' cognitive learning outcomes and collaboration skills in science learning. *Jurnal Penelitian Dan Pembelajaran IPA*, *7*(2), 152-167.

doi:http://dx.doi.org/10.30870/jppi.v7i2.1267
0

Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education (8th ed.). Routledge. https://doi.org/10.4324/9781315456539

Ferrero, M., Esmeralda, P., & Otero, M. (2020). An attempt to correct erroneous ideas among teacher training students: the effect of positive and negative examples. *Frontiers in Psychology*, *11*, 577738.

Hernández, A., Campos, E., Barniol, P., & Zavala, G. (2025, October 28). *Maxwell's equations*. Encyclopaedia Britannica. https://www.britannica.com/science/Maxwells-equations

Honicke, T., & Broadbent, J. (2016). The influence of academic self-efficacy on academic performance: A systematic review. *Educational Research Review*, *17*, 63-84.

Lindquist, M., Philpot, R., Mullis, I. V. S., & Cotter, K. (Eds.). (2019). *TIMSS 2019 mathematics framework*. Boston College, TIMSS & PIRLS International Study Center. https://timssandpirls.bc.edu/timss2019/frameworks/

Meng, Q., & Zhang, Q. (2023). The influence of academic self-efficacy on university students' academic performance: The mediating effect of academic engagement. *Sustainability*, *15*(7), 5767.

Nasir, M., & Iqbal, S. (2019). Academic self-efficacy as a predictor of academic achievement of students in Pre-Service teacher training programs. *Bulletin of Education and Research*, *41*(1), 33-42.

Nduji, C.C., Elekere, U.C., Omeke, N.E & Onuya, C.C., (2021). Prediction of students' achievement in Physics by some selected psychological variables: Implication for Engineering career. *International Journal of Mechanical and Production Engineering Research and Development (IJMPERD)*, *11*(3), 499 - 512.

Nworgu, B. G. (2015). *Educational research: Basic issues and methodology (3rd ed.)* Nsukka, University Trust Publishers.

Obafemi, K.E., Saadu, U.T, Adesokan, A.,Yahaya, O., Sulaimon, J.T., Obafemi, O., & Yakubu, F.M (2023). Self-efficacy as a correlate of pupils' academic achievement in mathematics. *Indonesian Journal of Teaching in Science (IJOTIS) 3(2).* https://doi.org/10.17509/ijotis.v3i2.59775

Ogegbo, A. A., & Ramnarain, U. (2022). Teaching and learning Physics using interactive simulation: A guided inquiry practice. *South African Journal of Education*, *42*(1). https://www.ajol.info/index.php/saje/article/view/229349

Papageorgiou, S. N. (2022). On correlation coefficients and their interpretation. *Journal of Orthodontics*, *49(3)*, 359-361. https://doi.org/10.1177/14653125221076142.

Parajuli, M., & Thapa, A. (2017). Gender differences in the academic performance of students. *Journal of Development and Social Engineering 3*, 39-47. https://doi.org/10.3126/jdse.v3i1.27958

Patrick, B. (2018). Importance of Physics in the modern world. https://sciencing.com/importancephysics-modern-world-6657166.html

Robinson, K. A., Perez, T., White-Levatich, A., & Linnenbrink-Garcia, L. (2022). Gender Differences and Roles of Two Science Self-Efficacy Beliefs in Predicting Post-College Outcomes. *Journal of experimental education*, *90*(2), 344–363. https://doi.org/10.1080/00220973.2020.1808944

Ugwuanyi, C. S., Ezema, M. J., & Orji, E. I. (2023). Evaluating the instructional efficacies of conceptual change models on students' conceptual change achievement and self-efficacy in particulate nature matter in Physics. *Sage Open*, *13*(1). https://doi.org/10.1177/21582440231153851

Usman, I. S., & Abubakar, Y. B. (2019). Senior secondary school Physics curriculum content coverage and students' achievement in Katagum educational zone, Bauchi State, Nigeria. *International Journal of Scientific Research in Education*, *12*(4), 489-499.

Yokoyama, S. (2019). Academic self-efficacy and academic performance in online learning: A mini review. *Frontiers in psychology*, *9*, 2794.

Yuksel, A., & Bryan, L. A. (2023). Using embodied cognition to address students' cognitive difficulties and misconceptions in thermodynamics. *Science Education*, *107*(2), 346-371.

Zysberg, L., & Schwabsky, N. (2021). School climate, academic self-efficacy, and student achievement. *Educational Psychology*, *41*(4), 467-482.