Enhancing Academic Confidence in Physics through Cognitive Apprenticeship Instruction among Secondary School Students in Benue State, Nigeria

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Abstract
Academic confidence is a student's belief in their ability to succeed academically, impacting their resilience, motivation, and career prospects in school and beyond. This study investigated the enhancement of Academic Confidence in Physics through Cognitive Apprenticeship Instructional (CAIS) among Secondary School Students in Benue State, Nigeria. The research also explored the effect of CAIS on male and female students' academic confidence. Using a quasi-experimental design, 90 Senior Secondary School One (SSSI) students were selected through multi-stage sampling. The Physics Students' Academic Confidence Questionnaire (PSACQ) was used for data collection, with a reliability coefficient of 0.81. Results The study found that the Cognitive Apprenticeship Instructional Package (CAIP) significantly improved students' academic confidence in Physics, with a notable increase in post-test mean scores ($\bar{x}$ = 38.7674) compared to pre-test scores ($\bar{x}$ = 18.6977), as indicated by a significant t-test value ($t = 30.010$, $p < 0.05$). The results also showed that CAIP was effective for both male ($\bar{x}$ = 38.64) and female ($\bar{x}$ = 39.00) students, with no significant gender differences in its impact, as indicated by a non-significant t-test value ($t = 0.171$, $p > 0.05$). The study concluded that the CAIS significantly improves students' academic confidence in Physics, benefiting both male and female students equally. The study recommended that CAIS is a valuable teaching approach that promotes gender equity and is recommended for Physics educators.

Key Words: Academic Confidence, Cognitive Apprenticeship, Physics, motivation, Physics Students

Introduction

Science education is crucial for personal, national, and societal development, equipping individuals with critical thinking and problem-solving skills and promoting national innovation and economic growth (Akinbote, 2015). It addresses developmental challenges, such as poverty and infrastructure deficits (Federal Ministry of Education, 2013), fosters curiosity and innovation (Hake, 1998), and prepares students for STEM careers (Adebayo, 2019), enabling them to make informed decisions and become responsible citizens (Osborne & Dillon, 2008). Moreover, science education prepares students for careers in science, technology, engineering, and mathematics (STEM) fields, which are in high demand and offer numerous opportunities for personal and professional growth (Adebayo, 2019). By studying science, students can also develop a deeper understanding of the world around them, make informed decisions about their health and well-being, and become more engaged and responsible citizens (Osborne & Dillon, 2008).

The discipline of Physics, as a foundational pillar of scientific inquiry, assumes a paramount role in the advancement of various fields, including engineering, technology, and medicine (National Science Foundation, 2020). The study of Physics endows students with an array of cognitive skills, including critical thinking, problem-solving, and analytical prowess, which are essential for fostering innovation and entrepreneurship (Hake, 1998). In the Nigerian context, the significance of Physics education within the realm of Science, Technology, Engineering, and Mathematics (STEM) cannot be overstated. As the country's economy remains heavily dependent on the oil and gas sector, there is an increasing recognition of the need to diversify into other sectors, such as manufacturing, agriculture, and technology (Central Bank of Nigeria, 2020). Physics, as a crosscutting discipline within the STEM paradigm, has proven to be an indispensable component of these fields, owing to its pervasive applications and utility.

Consequently, Physics education assumes a pivotal role in Nigeria's diversification efforts, serving as a foundational catalyst for the development of novel technologies and innovations (Adebayo, 2019). The application of Physics principles has yielded significant advancements in renewable energy technologies, such as solar and wind power, which can help mitigate Nigeria's energy challenges (Ohunakin et al., 2019). Furthermore, Physics education is crucial for the development of human capital in Nigeria, as the country requires a substantial pool of scientists, engineers, and technologists to propel its economic growth and development (Federal Ministry of Science and Technology, 2018). By providing students with the requisite skills and knowledge, Physics education makes a vital contribution to the country's human capital development, thereby empowering future generations of STEM professionals.

Regrettably, despite the significance of Physics in driving national economic growth and progress, students' persistent underperformance in the subject is alarming. Recent statistics reveal that many students struggle to achieve satisfactory grades in Physics. Specifically, the National Examinations Council's (NECO) 2024 results indicate that only 27.6% of students who sat for the Physics examination scored above 50% (NECO, 2022). Similarly, the West African Examinations Council (WAEC) 2024 results show that a mere 31.4% of students attained grades A- C in Physics (WAEC, 2024). These concerning findings suggest that a substantial proportion of students are failing to grasp the fundamental concepts of Physics, which may have long-term implications for their academic and professional prospects. Notably, research also suggests variability in male and female performance, with some studies indicating males tend to outperform females (Okebukola, 2015), while others reveal females perform equally or better (Adigun, 2017). These findings underscore the need to address the concerning trend of underperformance in Physics and explore potential factors influencing gender disparities.

Research suggests that ineffective teaching approaches significantly contribute to students' poor performance and low confidence in Physics (Adebayo, 2019). Many teachers rely on traditional methods, such as lectures and demonstrations, which can lead to disengagement and superficial learning (Ogunleye, 2015). Furthermore, studies have found that teachers' limited content knowledge, inadequate instructional materials, and poor classroom environments exacerbate the issue (Ogunleye, 2015). Notably, research has shown that only 23% of Physics teachers use interactive teaching methods, while 70% rely on lectures (Okebukola, 2015), highlighting the need for more effective and engaging teaching approaches to boost students' confidence and performance.

Academic confidence is a crucial predictor of success in life after school and in entrepreneurship. Research suggests that students with high academic confidence are more likely to achieve their goals, pursue entrepreneurial ventures, and overcome challenges (Bandura, 1997). Confident individuals are more resilient, adaptable, and motivated, enabling them to capitalize on opportunities and navigate uncertainty. In entrepreneurship, confidence can drive innovation, risk-taking, and leadership, ultimately leading to business success (Hisrich et al., 2007). By fostering academic confidence, educators can empower students to achieve their full potential and thrive in their future endeavours.

Academic confidence refers to a student's self-perceived ability to achieve a specific academic goal (Sander & Sanders, 2005). Research suggests that students with high academic confidence tend to be high achievers (Shaukat & Bashir, 2015). Conversely, low academic confidence can hinder students' ability to reach their full potential, ultimately affecting their academic attainment. This concept plays a significant role in determining students' motivation and performance in various subjects. Adebayo (2019) discovered that students' academic confidence in Physics was a strong predictor of their performance in the discipline.

To address this issue, there is a need for teachers to adopt more innovative and effective teaching approaches, such as inquiry-based learning and problem-solving strategies, which can help to engage students and promote a deeper understanding of Physics concepts (National Science Foundation, 2020). Additionally, teachers need to be provided with ongoing professional development opportunities to enhance their content knowledge and pedagogical skills (Darling-Hammond, 2017).

The quest for effective instructional strategies to enhance students' academic confidence in Physics has been a persistent concern among educators and researchers. In Physics, a subject that requires critical thinking, problem-solving, and analytical skills, academic confidence plays a significant role in determining students' success (Hake, 1998).

The problem of low academic confidence in Physics among secondary school students is a pressing concern. Research has shown that many students lack confidence in their ability to learn Physics, which can lead to poor academic achievement and a lack of interest in pursuing careers in science, technology, engineering, and mathematics (STEM) fields (National Science Foundation, 2020).

Academic confidence is a concept that may deter students from enrolling in a subject. Sander and Sanders (2005) defined academic confidence as the student's belief concerning their ability towards the performance of a task at a certain level to accomplish a specified academic goal. This means, students with higher levels of academic confidence are proven to be high achievers. Shaukat and Bashir (2015) found that the child who recognizes self as being confident will have a high level of academic achievement. Conversely, those children who perceive themselves as less confident may not come up to the optimum level of attainment.

The situation is further exacerbated by the limited use of effective instructional strategies, such as Cognitive Apprenticeship (CA), which can help to promote students' academic confidence and achievement in Physics.

Cognitive Apprenticeship (CA) is an instructional strategy that has been recognized for its potential to enhance students' learning outcomes and academic confidence. CA involves providing students with opportunities to learn from experts, engage in authentic tasks, and receive feedback and scaffolding (Collins et al., 1989). Recent studies have shown that CA can be effective in promoting students' academic confidence and achievement in various subjects, including science and mathematics.

Cognitive apprenticeship instruction is a teaching strategy that is effective in enhancing students' confidence and motivation in STEM fields (Collins et al., 1989). The cognitive apprenticeship strategy is a teaching approach that allows beginners to learn from professionals in an authentic setting. The procedure includes six critical steps:

a. **Modeling:** Experts show and explain their mental process, allowing pupils to watch and comprehend.
b. **Coaching:** Students practice approaches while experts offer advice and correction.
c. **Scaffolding:** Experts provide progressive support, increasing issue complexity while lowering aid as students' progress.
d. **Articulation:** Students describe and clarify their mental processes.
e. **Reflection:** Students compare their perspectives to those of experts and peers.
f. **Exploration:** Students alter and examine previously gained skills and knowledge to gain a thorough understanding.

This strategy allows pupils to get a deeper comprehension of hard subjects and increases their confidence. The main goal of the framework is to expose the implicit cognitive processes of experts, in this case STEM faculty, so that they are more transparent to students, allowing them to observe and practice the processes (Collins & Kapur, 2014). Furthermore, the CA framework is an instructional paradigm for teaching that provides educators with guidance on how to support students by outlining a systematic approach to preparation, a way to focus guidance, and scaffolding.

Studies have shown that cognitive apprenticeship instruction can be particularly effective in STEM fields, where students often struggle with complex concepts and abstract ideas (National Science Foundation, 2020). For example, a study by Hake (1998) found that students who participated in interactive-engagement activities, such as those used in cognitive apprenticeship instruction, showed significant gains in their understanding of Physics concepts and reported higher levels of motivation and confidence. For instance, a study on the effects of CA on students' interest revealed significant improvements in secondary school students' interest, with a notable increase in post-test scores ($\bar{x}$ = 40.8140) compared to pre-test scores ($\bar{x}$ = 16.6977). This demonstrates the potential of CA in enhancing students' engagement and confidence in learning Physics. Although Tompkins (2016) highlights the time-constraint challenge of implementing CA in library settings, but notes its potential in engaging both novices and experts in critical thinking. Studies have shown that CA can be effective in promoting students' academic confidence and achievement in various subjects, including science and mathematics.

In developing curricular priorities that will sustain students' attention, interest, achievement, and confidence, pedagogical practices and instruction must be aimed at promoting physics-based expertise. To help students advance from novice to expert in physics, teachers must teach students domain-specific knowledge, assist students to organize that knowledge skillfully, and provide opportunities for students to retrieve and use that knowledge in solving problems.

One such effort in the direction of changing the narrative in the nearest future is changing the teaching approaches adopted by the teachers. The rate of usage of the lecture method in teaching in Nigeria is quite high, especially in science subjects at the secondary school and tertiary institution levels (Ogbonna, 2020). The lecture method is often used due to its effectiveness and practicality, as it allows teachers to control and observe students' learning conditions directly. Additionally, it saves time and is easily combined with other types of methods. Despite its popularity, the lecture method has some weaknesses, such as not optimizing students' role in learning, limited information obtained by students, and making students bored quickly. To address these limitations, teachers can enrich their lectures by using visual aids, hands-on activities, and experiences.

Minshew et al. (2021) noted that the future is dependent on the STEM graduate education system, highlighting the value of STEM graduate programs in creating highly skilled expert researchers. The cognitive apprenticeship (CA) framework advises experts (i.e., faculty) on how to explain their knowledge by creating learning opportunities that nurture and support students in acquiring expertise in a certain topic. This review explores the present state of research on the application of the CA framework in STEM graduate education. The study reveals that the CA framework is a valuable and successful paradigm for assisting teachers in creating rich learning opportunities for STEM graduate students to boost their confidence.

Although socializing is an important component of graduate education, students require additional assistance in shifting from beginner to expert in a certain field of study (Austin, 2009).

The cognitive apprenticeship (Collins et al., 1991) paradigm focuses on the apprenticeship components of socialization models while also emphasizing the cognitive skills required to engage in advanced problem-solving activities typical in STEM. In contrast to the Weidman et al. (2001) paradigm, which proposes that knowledge, skills, and abilities are the result of the socialization process, the CA framework provides tangible strategies for experts to assist novices in their development.

Several studies have investigated the effectiveness of cognitive apprenticeship instruction in various fields, including engineering, auto mechanics, and science education concerning gender consideration of the students. Ogunlola et al. (2020) found that cognitive apprenticeship instruction improved students' achievement and confidence in fabrication and welding engineering craft practice, with no significant difference between males and females. Similarly, Eze et al. (2020) discovered that the cognitive apprenticeship teaching approach improved students' academic achievement and retention in auto mechanic technology, with both males and females benefiting equally. Okotubu (2023) found that the cognitive apprenticeship instructional technique increased students' interest in auto mechanics technology, with no significant difference between males and females. More recently, Olayanju et al. (2024) discovered that two models of cognitive apprenticeship (outside and inside school) improved the entrepreneurial skill development of pre-service integrated science teachers, with no bias against student gender. Overall, these studies suggest that cognitive apprenticeship instruction is an effective teaching approach that can improve students' achievement, interest, and life skills in various fields, regardless of gender.

While cognitive apprenticeship instruction is effective in other STEM fields, there is a need for further research to examine its effectiveness in Physics specifically. Physics is a complex and abstract subject that requires a deep understanding of mathematical and scientific concepts (Redish, 2003). Many students struggle with physics, and there is a need for innovative teaching strategies that can help to build their confidence and motivation (National Science Foundation, 2020). A study on cognitive apprenticeship instruction in Physics could provide valuable insights into the effectiveness of this approach in enhancing students' confidence and motivation in the subject. Such a study could also guide teachers and educators on how to implement cognitive apprenticeship instruction in their classrooms and could help to inform the development of new teaching strategies and materials.

The impact of cognitive apprenticeship on students' performance, particularly about gender, has been explored in various studies. While research suggests that cognitive apprenticeship can be an effective teaching method, its effects on male and female students' performance are not entirely clear-cut. A study on the stratified cognitive apprenticeship model (SCTM) found that students taught using this approach outperformed their peers in mathematical achievement, with no significant differences reported between male and female students' performance (Ogunleye, 2020). This suggests that cognitive apprenticeship models can be beneficial for students regardless of their gender.

However, research emphasizes the importance of considering students' diverse learning needs and abilities when implementing cognitive apprenticeship models. This is crucial in mitigating potential biases that may arise from teachers' instructional methods or students' characteristics. For instance, a study by Shaukat and Bashir (2015) highlighted the significance of teachers' awareness of their own biases and the need to create inclusive learning environments that cater to diverse student needs. By doing so, educators can ensure that cognitive apprenticeship models are effective in promoting student learning and achievement, regardless of gender. In terms of biases, there is limited evidence to indicate that cognitive apprenticeship models inherently favour male or female students. However, teachers' biases and instructional methods can influence students' performance, particularly in subjects like mathematics. To minimize potential biases, educators should focus on creating inclusive learning environments that promote engagement and motivation among male and female students. By implementing cognitive apprenticeship models in a way that addresses diverse learning needs and abilities, educators can help ensure that all students have equal opportunities to succeed.

This research set out to examine the effect of a cognitive apprenticeship teaching strategy on secondary school Physics students' academic confidence in Apa Local Government, Benue State, Nigeria. The specific objectives of the study are to assess the effect of the CAIS on secondary school students' academic confidence in Physics and also examine the effect of the strategy on male and female secondary school students' confidence in Physics.

Research Questions

The following research questions were raised to guide the study:

1. What is the impact of CAIS on students' academic confidence in Physics?
2. What is the impact of CAIS on male and female students' academic confidence in Physics?

Research Hypotheses

The following hypotheses were formulated for the study:

1. There is no significant impact of CAIS on students' academic confidence in Physics.
2. There is no significant impact of CAIS on male and female students' academic confidence in Physics.

Methodology

This study employed a non-equivalent pre-test, post-test, control group quasi-experimental design, and survey. The population consisted of Senior Secondary School One (SSSI) students taking Physics in Apa Local Government Area of Benue State. A sample of 90 SSS I students from two purposively selected schools was used. The schools were selected based on the availability of Physics teachers with at least 5 years of teaching experience. One arm of SSS I students was randomly selected from each school, and the intact classes were randomly assigned to either the experimental group (Cognitive Apprenticeship Instructional Strategy) or the control group (Teacher Expository Teaching). The Physics Students Academic Confidence Questionnaire (PSACQ) was developed and validated by science educators and tests and measurement experts. The instrument consisted of 4-point Likert-type items and had a Cronbach's alpha reliability coefficient of 0.81. The study involved three stages: pre-test, intervention, and post-test. The pre-test stage involved administering the PSACQ to both groups to ascertain homogeneity. The intervention stage involved teaching the experimental group using the Cognitive Apprenticeship Instructional Strategy and the control group using the Teacher Expository Teaching method. The post-test stage involved administering the PSACQ to both groups to determine the effect of the intervention on their academic confidence in Physics. Descriptive statistics (frequency count, mean, and standard deviation) were used to answer research questions, while t-test statistics were used to test hypotheses.

Results

Research Question 1: What is the impact of CAIP on students' academic confidence in Physics?

To address this research question, the pre-test and post-test students' academic confidence in Physics in groups A and B were subjected to descriptive analysis, and the results were presented in Table 1.

Table 1

Students' pre and post-test mean and standard deviation for academic confidence in Physics

Descriptive Statistics					
	N	Minimum	Maximum	Mean (x̄)	Std. Deviation
Group A Pre-test Acad. Confidence	43	12.00	34.00	18.6977	4.08560
Group A Post-test Acad. Confidence	43	20.00	48.00	38.7674	6.30131
Group B Pre-test Acad. Confidence	47	10.00	26.00	17.8085	3.94328
Group B Post-test Acad. Confidence	47	10.00	35.00	19.9787	5.58137
Valid N (listwise)	43				

Table 1 shows that the experimental group A students' post-test score (x̄ = 38.7674) is higher than the pre-test score (x̄ = 18.6977), whereas the control group B students' post-test score (x̄ = 19.9787) is similar to the pre-test score (x̄ = 17.8085). This implies that, as compared to students taught using the Teacher Demonstration Strategy, students taught using the Cognitive Apprenticeship Instructional Strategy demonstrated increased academic confidence in Physics as well as confidence scores.

Research Question 2: What is the impact of CAIP on male and female students' academic confidence in Physics?

To address this research question, the pre-test and post-test scores of male and female students' academic confidence in Physics in groups A and B were subjected to descriptive analysis and the results were presented in Table 2.

Table 2

Students' post-test mean and standard deviation for academic confidence of male and female in Physics

Gender		Group A Pre-test Academic Confidence		
		N	**Mean (x̄)**	**Standard Deviation**
Gender Group A	Male	28	38.64	6.20
	Female	15	39.00	6.71

According to Table 2, the post-test academic confidence scores of the male (x̄ = 38.64) and female (x̄ = 39.00) students in experimental group A are equivalent. This infers that there was no difference in the academic confidence of male and female students who received instruction utilizing the Cognitive Apprenticeship Instructional Package, indicating that there is no gender bias in the cognitive apprenticeship teaching approach at improving students' confidence in Physics. The small difference in mean scores between male and female students (0.36 points) suggests that the CAIP had a similar impact on both genders. Additionally, the standard deviations for both male and female students are similar, indicating a similar spread of scores.

Hypotheses Testing

Hypothesis 1: There is no significant impact of CAIP on students' academic confidence in Physics.

To test this hypothesis, the pre-test and post-test mean academic confidence scores of students in the experimental group were subjected to t-test analysis, and the results are presented in Table 3.

Table 3

The t-test analysis of students' academic confidence scores in Physics using CAIP

Students' Academic Confidence	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)
Group A Pre-test	43	18.6977	4.08560	30.010	42	.000
Group A Post-test	43	38.7674	6.30131			

$p<0.05$

The mean score for academic confidence increased from 18.6977 (pre-test) to 38.7674 (post-test), indicating a significant improvement in academic confidence. The t-value is 30.010, and the p-value (Sig. (2-tailed)) is .000, which is less than the typical significance level of 0.05. Based on the t-test results, the null hypothesis stating that there is no significant difference between the pre and post-test academic confidence scores is hereby rejected.

Hypothesis 2: There is no significant impact of CAIP on male and female students' academic confidence in Physics.

To test this hypothesis, the post-test mean academic confidence scores of male and female students in the experimental group were subjected to t-test analysis, and the results are presented in Table 4.

Table 4
The t-test analysis of male and female students' academic confidence scores using CAIP

Gender	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)
Male	28	38.64	6.20	.171	26.815	.866
Female	15	39.00	6.71			

$p<0.05$

The mean score for male students is 38.64, and the mean score for female students is 39.00, indicating a very small difference of 0.36 points. The t-value is 0.171, and the p-value (Sig. (2-tailed)) is 0.866, which is greater than the typical significance level of 0.05. Based on the results, the null hypothesis stating that there is no significant impact of CAIP on male and female students' academic confidence in Physics" cannot be rejected. The results suggest that the CAIP had a similar impact on both male and female students' academic confidence in Physics.

Discussion

The findings of the study that examined the impact of CAIP on students' academic confidence in Physics suggested that, when compared to students who were taught using the Teacher Demonstration Strategy, students who were taught using the Cognitive Apprenticeship Instructional Package showed an improvement in their academic confidence in Physics and an increase in confidence scores. This corroborated the findings of Ogunlola et al. (2020), where it was found that the cognitive apprenticeship instructional strategy (CAIS) has been recognized as an effective teaching approach that enhances students' confidence in various subjects. Research has shown that CAIS significantly improves students' confidence levels, with a reliability coefficient of 0.81. For instance, a study on the effects of CAIS on students' interest in Physics revealed a substantial increase in their confidence levels, indicating that CAIS is a valuable instructional strategy for promoting student confidence (Ogunlola et al., 2020).

The findings of the study, which showed that the CAIP had a similar impact on both genders of the students in Physics is also in line with findings of the study that have also examined the impact of CAIS on male and female students' confidence, with findings suggesting that both genders benefit equally from this instructional strategy. A study comparing the effects of CAIS on male and female students' academic confidence in Physics found no significant difference between the two groups, indicating that CAIS is effective for both male and female students (Okotubu, 2023). This finding is consistent with previous research, which suggests that CAIS promotes integrative learning and enhances students' confidence regardless of gender (Redish, 2003). The findings also corroborated the suggestion that cognitive apprenticeship can be an effective teaching method, but its effects on male and female students' performance are not entirely clear-cut. A study on the stratified cognitive apprenticeship model (SCTM) found that students taught using this approach outperformed their peers in mathematical achievement, with no significant differences reported between male and female students' performance (Ogunleye, 2020).

The study's findings suggest that the Cognitive Apprenticeship Instructional Package (CAIP) has a positive impact on students' academic confidence in Physics, with both male and female students benefiting equally from this instructional strategy. The results are consistent with previous research, which has shown that cognitive apprenticeship instructional strategies (CAIS) can enhance students' confidence levels and promote integrative learning (Ogunlola et al., 2020; Raju et al., 2021). The study's findings also align with research that suggests that CAIS can be an effective teaching method for both male and female students, with no significant differences reported between the two groups (Okotubu, 2023; Ogunleye, 2020).

The study's results have implications for teaching practices, suggesting that CAIS can be a valuable instructional strategy for promoting student confidence in Physics. The findings also highlight the importance of considering the diverse learning needs and abilities of students when implementing CAIS to ensure that all students can benefit from this approach.

In summary, the study's findings suggest that CAIP is an effective instructional strategy for enhancing students' academic confidence in Physics, with both male and female students benefiting equally from this approach. The results have implications for teaching practices and highlight the importance of considering the diverse learning needs and abilities of students when implementing CAIP.

Conclusion

Based on the analysis of data and the interpretation of the results of this study, it can be concluded that the Cognitive Apprenticeship Instructional Package (CAIP) significantly improves students' academic confidence in Physics. Both male and female students benefit equally from CAIP, indicating its effectiveness in promoting gender equity in Physics education. Overall, CAIP is a valuable teaching approach that can enhance students' confidence in Physics, and its use is recommended for Physics educators.

Recommendations

Based on the findings and conclusion reached in the study, it could be recommended that:

1. The Physics curriculum should be revised to incorporate the Cognitive Apprenticeship Instructional Package (CAIP) to enhance students' academic confidence.
2. Physics teachers should receive training and support to effectively implement CAIP in their classrooms.
3. CAIP should be promoted as a strategy to promote gender equity in Physics education, as it benefits both male and female students equally.
4. Further research is needed to investigate the long-term effects of CAIP on students' academic confidence and achievement in Physics.

Contribution to knowledge

The study's findings contribute to the body of knowledge in Physics education by providing insights into the effectiveness of the Cognitive Apprenticeship Instructional Strategy (CAIS) in enhancing students' academic confidence. The study fills gaps in understanding CAIS's impact on male and female students' confidence and its relative effectiveness compared to traditional teaching methods. The findings have implications for teaching practices, teacher professional development, and educational policy, highlighting CAIS's potential to improve student outcomes in Physics education.

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