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Research Article

The Role of Metacognition and Cognitive Ability in Enhancing Academic Achievement among Prospective Teachers

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ABSTRACT

Purpose: This study will examine the association among metacognition, cognitive ability, and academic achievement in prospective teachers to better understand how they affect educational outcomes.

Design/Methodology/Approach: A normative survey was utilised to study 191 B.Ed. students from a college of education. Three tests were used to gather data: the Achievement Test, the Cognitive Ability Test, and the Meta-cognitive Awareness Inventory. Regression analysis and Pearson's Product-Moment correlation were used to examine metacognition and cognitive ability's predictive value for academic accomplishment.

Findings: Academic success, cognitive capacity, and metacognition were positively, linearly correlated. An increase in metacognitive awareness and cognitive abilities was linked to better academic outcomes. Both metacognition and cognitive capacity are major indicators of academic accomplishment, with metacognitive skills having a somewhat larger predictive potential, according to regression research.

Conclusion: This study highlights the significance of incorporating the development of metacognitive and cognitive skills into teacher education programs. By cultivating these abilities, educational programs can augment academic achievement and boost the readiness of aspiring educators for their future careers. The findings support the need for curriculum modifications that prioritise the development of metacognitive and cognitive skills in order to enhance educational outcomes and better prepare future educators.

Keywords: Academic achievement, cognitive ability, Meta-cognition, prospective teachers

INTRODUCTION

The importance of cognitive reasoning skills in determining academic performance, especially in the preparation of future educators, is well acknowledged. In response to the changing needs of the modern era, the education industry has placed greater emphasis on developing advanced abilities in learners. Metacognition and cognitive capacities have been identified as important factors that can predict academic achievement. This has substantial consequences for both students and educators, as highlighted by Sternberg and Sternberg (2009) and Woolfolk (2014). This study investigates the correlation between cognitive processes and academic achievement in aspiring teachers. It highlights that educators who possess robust metacognitive and cognitive abilities are more capable of creating conducive learning environments (Flavell, 1979; Schraw & Moshman, 1995).

Cognitive aptitude, encompassing crucial abilities like attention, memory, and reasoning, plays a vital role in the brain's capacity to receive, store, and recall information (Stadler et al., 2016). These cognitive talents are not just psychological factors; they are also dependable indicators of scholastic achievement (Deary et al., 2006). Cognitive abilities and academic performance have been linked in many school settings (Rohde & Thompson, 2007; Duckworth et al., 2011). Xu and Li (2015) found that selective attention, short-term memory, and reasoning skills predicted junior high school language and math achievement. This shows these cognitive skills are valuable in many educational settings.

Learning and academic success depend on metacognition, or cognitive awareness and control of one's mental processes. Metacognitive skills empower individuals to effectively organise, supervise, and assess their learning processes, thereby enhancing their capacity to comprehend material and resolve difficulties (Zimmerman, 2002). Within the realm of teacher education, these skills hold significant value, as they enable aspiring teachers to contemplate their teaching methods and adjust to various classroom settings (Veenman, Van Hout-Wolters, & Afflerbach, 2006; Livingston, 2003).

It is important to further investigate these connections specifically in the field of teacher education (Shulman, 1987; Kramarski & Michalsky, 2009). The future efficacy of prospective teachers in the classroom is strongly influenced by their capacity to utilise metacognitive methods and cognitive skills (Pintrich, 2002; Boekaerts, 1999). This study examines cognitive and metacognitive characteristics that predict academic achievement in 191 B.Ed. students at a College of Education to address this imbalance.

Significance of the Study

This research holds great significance for various reasons. Initially, this study fills an important void in the existing body of research by specifically examining the cognitive and metacognitive capacities of aspiring educators. This group's academic achievement is of utmost importance as it directly impacts their ability to mould the minds of young individuals in the future (Darling-Hammond, 2000; Bandura, 1997). The study's results could potentially guide the structure of teacher education programs, highlighting the importance of cultivating these crucial abilities to effectively equip educators for the challenges of the modern day (Darling-Hammond & Bransford, 2005; Shulman, 1986). This study enhances our understanding of how to improve educational outcomes and professional preparation in the teaching profession by focussing on the cognitive factors that predict academic performance (Biggs, 1987; Entwistle & Ramsden, 2015).

Research Questions

The study is guided by the following research questions:

1. How do metacognitive skills correlate with academic achievement in prospective teachers?
2. To what extent does cognitive ability predict academic success in this population?
3. What are the specific cognitive and metacognitive strategies that contribute most significantly to academic performance?

LITERATURE REVIEW

2.1 Cognitive Abilities and Academic Achievement

Cognitive talents refer to the cognitive processes that enable humans to engage in tasks such as thinking, reasoning, problem-solving, and learning. These talents are essential for achieving academic achievement, as they dictate the efficiency with which pupils can comprehend and utilise information. Sternberg & Sternberg (2009) emphasise that cognitive aptitude, encompassing attention, memory, and reasoning abilities, plays a crucial role in the processes of encoding, storing, and retrieving information, which directly influences academic success.

Recent research consistently emphasizes the significance of cognitive talents in forecasting academic achievement. According to Stadler et al. (2016), cognitive capacity is a highly dependable predictor of academic performance, showing a strong association between cognitive skills and achievement in disciplines like mathematics and language.

Recent research has examined how cognitive capacity affects academic performance. Cognitive abilities directly affect academic success and help improve critical thinking and problem-solving skills, according to Chen et al. (2020). These data confirm Zhang and Zhang (2021) that larger cognitive capacity improves information processing speed and accuracy, improving academic achievement.

In a study conducted by Zhang (2008), it was discovered that there was a moderate link between logical reasoning ability (LRA) and academic achievement in topics like Chinese language and mathematics. However, other cognitive talents such as thinking transformation capacity (TCA) had a lesser correlation. These findings indicate that academic achievement can be influenced by different cognitive abilities to different extents, depending on the specific subject and situation.

Li (2015) proposed the information processing hypothesis as a more detailed examination of cognitive abilities. According to this theory, students with higher cognitive abilities have superior skills in processing, storing, and retrieving information. Recent empirical research, such as those conducted by Miriam et al. (2011) and Chen et al. (2020), have provided support for this idea. These studies indicated that students with higher cognitive capacities tend to obtain better academic achievements because they have an improved capacity for processing information.

In addition, Plomin et al. (2021) examined the genetics of cognitive capacity and academic success. Their research shows that cognitive talents are hereditary and genetic variables strongly influence academic success. This supports Rohde and Thompson (2007)'s findings that cognitive capacity and academic accomplishment are linked. Cognitive ability explained much of academic achievement difference, the study revealed.

These findings do not settle the debate over cognitive ability and academic success. According to Formazin et al. (2011), motivation, socio-economic position, and instructional quality also affect academic accomplishment. David (2022) stressed the importance of studying cognitive skills and contextual factors in academic accomplishment.

2.2 Metacognitive Awareness and Academic Achievement

Academic success requires metacognition, or cognitive awareness and control of mental processes. Metacognitive awareness includes metacognitive knowledge, which is awareness of one's cognitive techniques, and metacognitive regulation, which involves planning, monitoring, and evaluating one's learning (Memnun & Akkaya, 2009). Multiple studies show that pupils with significant metacognitive awareness can better control their learning process, improving academic performance.

Recently, there has been an increasing amount of literature investigating the significance of metacognitive awareness in the field of education. According to Abdelrahman's (2020) research, pupils with robust metacognitive abilities demonstrate superior academic performance due to their enhanced capacity to manage their cognitive processes. Hames and Baker (2015) found that metacognitive awareness is a strong indicator of academic achievement, especially in subjects that involve intricate problem-solving, such as mathematics.

In addition, the study conducted by zcakmak, Korolu, and Bolat (2021) showed that metacognitive awareness has a favourable influence on academic performance as it allows students to better regulate and oversee their learning processes. These results align with the research conducted by Nongtodu (2017), which demonstrated that students who possess a strong understanding of metacognition are more proficient at adjusting their learning methods to various academic obstacles, resulting in improved outcomes.

Joseph (2022) did a study examining the efficacy of metacognitive training programs in enhancing students' academic performance. The findings demonstrated a considerable improvement in exam performance among students who underwent metacognitive training, underscoring the crucial role of cultivating metacognitive skills in the field of education.

Furthermore, there has been a growing focus on the significance of metacognition in the field of teacher education. According to Memnun et al. (2023), metacognitive awareness is crucial for prospective teachers since it allows them to contemplate their teaching methods and make well-informed choices to improve student learning. Xu and Li (2023) argue that teacher education programs should include metacognitive training to adequately equip future educators for the demands of the classroom.

Incorporating metacognitive methods into the curriculum has been demonstrated to have a beneficial effect on academic achievement. In a study conducted by Zhang and Zhang (2021), it was found that students who received instruction in metacognitive methods as part of their coursework showed notable enhancements in their academic performance, particularly in areas that demanded critical thinking and problem-solving abilities. The literature emphasises the significance of both cognitive talents and metacognitive awareness in academic success. Cognitive talents serve as the basis for digesting and utilising information, whereas metacognitive awareness empowers students to control their learning processes and adjust to various academic obstacles. These elements collectively have a significant impact on academic achievement, especially for aspiring instructors who are getting ready to establish productive learning settings for their future pupils.

Objectives of the study

1. To assess the relationship between Cognitive ability, Meta-cognition and Academic achievement of prospective teachers
2. To determine whether the Cognitive ability and Meta-cognition of prospective teachers can predict their academic achievement

Hypotheses of the study

1. There is no relationship between Cognitive ability, Meta-cognition and Academic achievement of prospective teachers
2. There is no significant influence of cognitive ability and Meta-cognition on academic achievement of prospective teachers.

MATERIAL AND METHODS

Research Design

This study employed a normative survey methodology to investigate the correlation between metacognition, cognitive capacity, and academic accomplishment among aspiring teachers. The normative survey approach was selected due to its ability to gather data from a specific population at a certain moment, enabling the examination of connections between variables within the realm of teacher education.

Research Population

The study was carried out using a sample of 191 B.Ed. students from [Name of College/University]. This particular institution was selected because it has a diverse student population, making it a suitable and representative sample for the research. The participants were chosen by stratified random sampling to ensure adequate representation of several demographic characteristics, including gender, age, and academic background.

Instruments

Three key instruments were used to gather data:

1. **Meta-cognitive Awareness Inventory (Schraw & Dennison, 1994):** This tool was used to evaluate the participants' metacognitive abilities. The measure offers a thorough assessment of metacognitive awareness, encompassing elements such as cognitive process planning, monitoring, and evaluation.

2. **Cognitive Ability Test (Maheswari & Indu, 2020):** The purpose of this exam was to assess the participants' cognitive processes, including memory, reasoning, and problem-solving ability. The test is a commonly utilised standardised assessment in educational research to gauge cognitive aptitude.

3. **Academic Achievement Test (Maheswari & Indu, 2020):** The assessment of academic accomplishment was conducted using this test, which evaluated the students' comprehension and mastery of their material. The test was customised to align with the curriculum of the B.Ed. program at [Name of College/University].

Validity and Reliability Tests

Prior to the complete implementation of the study, a preliminary test was carried out with a small sample of the population to verify the dependability and accuracy of the instruments. The internal consistency of the Meta-cognitive Awareness Inventory and the Cognitive Ability Test was assessed using Cronbach's alpha. The results, with $\alpha > 0.7$, indicated a good level of dependability. The Achievement Test underwent content validity study, in which subject matter experts evaluated the test components to ensure they accurately represented the B.Ed. curriculum.

Data Collection

The 2023-2024 academic year yielded data. To ensure data consistency, the study team led classroom surveys and assessments. Participants were thoroughly told of the study's purpose and requested to sign consent forms before the examinations. Participants knew their replies were anonymous and could leave the study at any time.

Data Analysis

SPSS software was used to organise and evaluate the data using statistical methods. Data features were summarised using descriptive statistics including means, standard deviations, and frequencies. The relationship between metacognition, cognitive capacity, and academic success was assessed using Pearson's product-moment correlation. Regression analysis was used to determine whether metacognition and cognitive capacity predict academic success. This study considered gender, age, and academic performance as potential influences.

Ethical Considerations

Throughout the study, ethical guidelines were strictly followed. Informed consent was obtained from all participants, ensuring they were aware of the study's purpose, procedures, and their rights. Confidentiality of participant data was maintained at all stages, and participants were given the freedom to withdraw from the study at any point without any consequences. The study was approved by the Institutional Human Ethical Committee of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore No. AUW/IHEC/EDU-20-21/XPD-04 dated 07-12-2021.

Results and Discussion

The interdependence of cognitive ability, meta-cognition, and academic accomplishment among future teachers highlights their interconnected roles in educational outcomes. Cognitive capacity, which includes memory, reasoning, and problem-solving skills, is essential for successful learning and academic achievement. Simultaneously, meta-cognition, which involves being aware of and controlling one's cognitive processes, improves learning strategies and self-directed learning, therefore impacting academic achievement. This study reveals a direct link between greater levels of cognitive ability and meta-cognitive skills and enhanced academic performance among aspiring teachers. These findings support the inclusion of focused interventions in teacher education programs to develop both cognitive skills and meta-cognitive competences. This will help educators become more skilled at improving student learning and achievement.

The relationship between future teachers' cognitive aptitude, meta-cognition, and academic success was examined using Pearson's product-moment correlation. The analysis results are in Table 1.

Table-1

Relation between Meta-cognition, Cognitive Ability and Academic Achievement of Student Teachers

Variables	Meta-cognition	Cognitive Ability	Academic Achievement
Meta-cognition	*1*		
Cognitive Ability	*0.757***	*1*	
Academic Achievement	*0.777***	*0.843***	*1*

Note. ** denotes the value is significant at 0.01 level.

At a significance level of 0.01 the correlation coefficient between student teachers' cognitive ability and meta-cognition is 0.757, statistically significant. With a score of 0.757, the correlation coefficient shows a significant positive relationship between student teachers' cognitive competency and meta-cognition.

At a significance level of 0.01 and with a correlation value of 0.777, student teachers' academic achievement and meta-cognition are statistically significant. With a correlation coefficient of 0.777, student teachers' academic achievement and meta-cognition are strongly positively correlated.

The correlation coefficient between academic achievement and cognitive ability of student teachers is 0.843, which is significant at a 0.01 level of significance. The correlation coefficient value r = 0.843 shows a positive and high correlation between the academic achievement and cognitive ability of student teachers.

The analysis of the nature of relation between meta-cognition, cognitive ability and academic achievement of student’s teachers reveals that there exists a linear, positive, strong correlation between these three selected variables at .01 level of confidence.

The relation of Meta-cognition, cognitive ability and academic achievement is depicted in Figure 1, Figure 1 and Figure 3.

Figure 1

Graphical Representation of Correlation between Meta-cognition and Cognitive Ability of Student Teachers

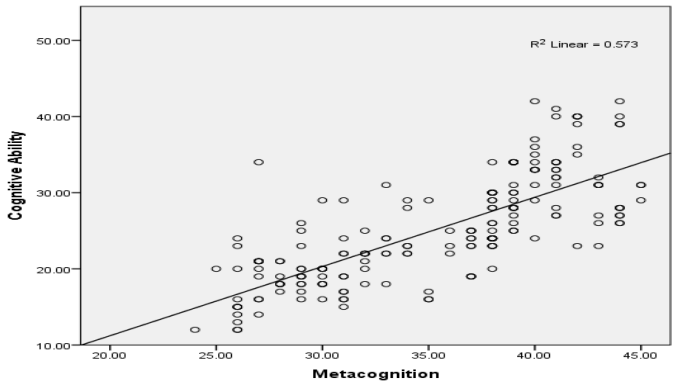


Figure 2

Graphical Representation of Correlation between Meta-cognition and Cognitive Ability of Student Teachers

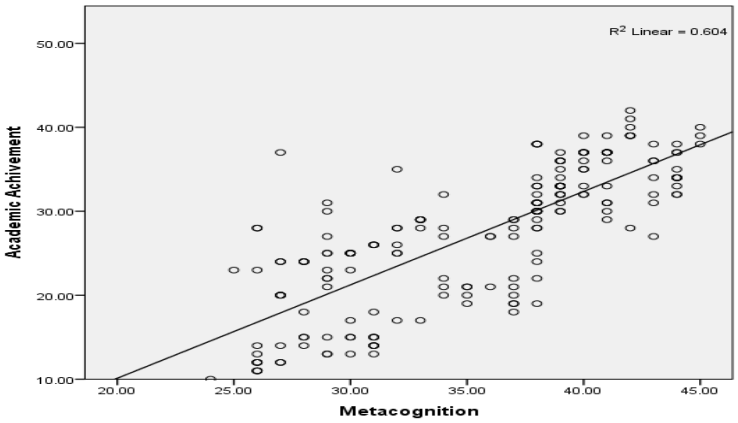
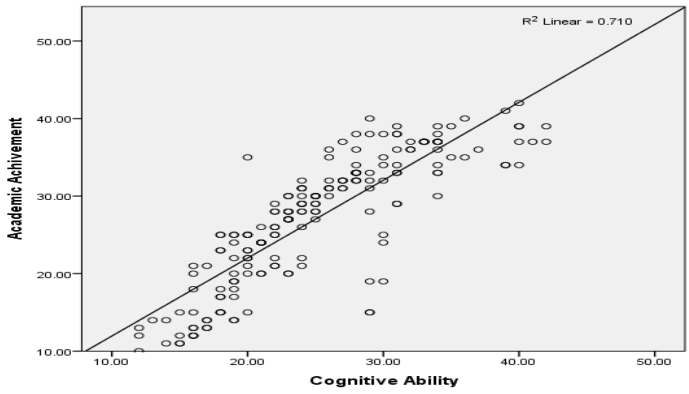


Figure 3

Graphical Representation of Correlation between Meta-cognition and Cognitive Ability of Student Teachers



Predictability of Academic Achievement of Prospective Teachers in terms of Cognitive Ability and Meta-cognition

The researcher sought to determine the predictive capacity of both meta-cognition and cognitive ability in forecasting academic accomplishment. This researcher utilised linear regression. The regression model summary is presented in Table-2.

Table-2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.869[a]	.756	.753	4.08003

a. Predictors: (Constant), Cognitive Ability, Meta-cognition

Table-2 clearly indicates R value of .869, indicating a significant connection between the predictor variable and outcome variable. The value of R2 is calculated to be 0.756. These findings indicate that both meta-cognition and cognitive capacity contribute to 75.6 percent of the academic accomplishment of student teachers. Consequently, numerous additional factors are exerting an influence on the academic achievement of the sample. Out of them, 75.6% is attributed to meta-cognition and cognitive capacity.

Table-3

ANOVA

Model	Sum of Squares	Df	Mean Square	F[a]	Sig.
Regression	9689.748	2	4844.874	291.042	p <.0001[b]
Residual	3129.571	188	16.647		
Total	12819.319	190			

a. Dependent Variable: Academic Achievement

b. Predictors: (Constant), Cognitive Ability, Meta-cognition

Table-3 show that the F value obtained is 291.042 which is significant at .01 level of significance. The *F* value obtained shows that the regression model can significantly do better prediction of academic achievement of the student teachers in terms of Meta-cognition and cognitive ability.

Table-4 *Coefficients*

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-7.190	1.903		-3.778	.000
Meta-cognition	.467	.079	.326	5.918	.000
Cognitive Ability	.710	.066	.596	10.798	.000

a. Dependent Variable: Academic Achievement (Pre-Test)

The regression analysis carried out shows that that the Meta-cognition and cognitive ability of the student teachers can make a significant contribution to the prediction of their academic achievement with a *p* value less than .0001.

The prediction of the academic achievement of the student teachers with the values of Meta-cognition and cognitive ability can be done using the equation,

Academic achievement = -7.190 + 0.467 Meta-cognition + 0.710 Cognitive Ability

DISCUSSION

The results of this study are consistent with an increasing amount of research that emphasises the crucial importance of metacognition and cognitive ability in academic success. The strong positive link between these characteristics and academic achievement reported in this study aligns with other research. For example, Schraw and Dennison (1994) highlighted the importance of metacognitive awareness in enhancing learning outcomes. This knowledge allows students to better organise, monitor, and manage their cognitive processes. In a similar vein, the study conducted by Maheswari and Indu (2020) demonstrated that cognitive aptitude, which includes memory, reasoning, and problem-solving skills, is a strong indicator of academic achievement.

The robust correlation between metacognition, cognitive aptitude, and academic performance supports previous research findings. The present study aligns with existing findings, illustrating that both cognitive talents hold comparable significance for the academic accomplishment of potential teachers.

Furthermore, the regression analysis conducted in this study demonstrated that metacognition and cognitive ability are substantial indicators of academic accomplishment, with metacognitive skills exhibiting slightly greater predictive capacity. Abdelrahman (2020) provided evidence to support the notion that metacognitive awareness improves students' capacity to adjust their learning strategies according to various tasks, resulting in enhanced academic achievements. Memnun and Akkaya (2009) emphasised the importance of metacognitive skills in educational settings, stating that these skills are crucial for promoting creativity, critical thinking, and self-confidence in students.

The regression equation obtained from this study, Academic achievement = -7.190 + 0.467 Metacognition + 0.710 Cognitive Ability, demonstrates that both variables are significant factors in determining academic success. Rohde and Thompson (2007) discovered a strong link between cognitive capacity and academic accomplishment. The study found that cognitive skills explain much academic achievement difference.

This result was supported by Deary et al. (2006), who found a substantial link between cognitive capacity at age 11 and academic success at age 16. This supports the idea that cognitive skills predict long-term academic achievement. Plomin (2011) discovered that cognitive capacity correlates with language and math achievement.

The impact of metacognition on improving academic achievement is well supported by research. Ozcakmak, Koroglu, and Bolat (2021) conducted a study which revealed that metacognitive awareness has a beneficial influence on academic accomplishment. This implies that students who possess a greater understanding of their cognitive processes likely to excel academically. These findings are consistent with those of Nongtodu (2017), who emphasised that metacognitive abilities are crucial for academic achievement because they allow students to effectively organise, monitor, and assess their learning techniques.

Chen (2016) studied how cognitive talents affect academic performance. Higher cognitive skill youngsters are more likely to attend conventional high school, which improves academic performance. The current study and these data suggest that cognitive capacity is vital to aspiring teachers' academic success.

The results of this study have important consequences for programs that train teachers. Incorporating techniques that strengthen metacognitive and cognitive abilities into these programs has the potential to significantly enhance individual academic achievements and the capacity to teach and engage future students more effectively. This approach aligns with the suggestions of Hames and Baker (2015), who highlighted the significance of cognitive abilities in forecasting academic achievement in several disciplines, such as mathematics.

To summarise, this study strengthens the significance of metacognition and cognitive capacity as primary indicators of academic success. The findings align with several research, indicating that educational approaches that prioritise the improvement of these abilities can significantly influence students' academic achievements. Subsequent studies could delve deeper into the enduring impact of these cognitive and metacognitive abilities on career achievements in the teaching profession and other associated domains.

Highlights of the study

The study found a robust link between cognitive capacity, meta-cognition, and academic success among aspiring teachers. It stresses the importance of cognitive skills like memory, logic, and problem-solving in educational outcomes. Furthermore, the results highlight the crucial role of meta-cognitive awareness and regulation in

students' capacity to successfully control their learning, thereby improving their academic achievement. These observations emphasise the significance of including comprehensive methodologies into teacher education programs that develop both cognitive ability and meta-cognitive capabilities. By doing this, educators can enhance their readiness to cultivate ideal learning environments and assist students in reaching their academic capabilities.

CONCLUSION

This study examined the complex connections between cognitive ability, metacognition, and academic accomplishment in aspiring teachers, resulting in several noteworthy discoveries. The investigation uncovered a strong positive link between cognitive ability and metacognitive skills, as well as between these qualities and academic accomplishment. More precisely, there was a robust correlation between higher levels of cognitive capacity and metacognitive awareness and enhanced academic achievement. Regression research revealed that both cognitive ability and metacognition significantly predict academic performance, with metacognitive skills demonstrating a somewhat stronger predictive capacity.

The findings emphasise the significance of including focused interventions into teacher education programs to improve both cognitive and metacognitive abilities. The findings support the implementation of creative educational approaches, aligned with design thinking ideas, to cultivate these abilities in future educators. Teacher education programs can enhance academic achievements and better equip future educators to successfully support their students' learning by focussing on the cultivation of metacognitive awareness and cognitive ability.

The study underscores the crucial significance of metacognition and cognitive capacity in academic success and emphasises the necessity for educational reforms that prioritise these domains. The data suggests that it is beneficial to include skill-enhancing techniques in teacher training curriculum in order to ensure that future teachers possess the requisite competences for academic and professional achievement. This method holds the potential to generate more efficient learning settings and enhance educational results, so benefiting both educators and their prospective pupils.

Limitation

The study's findings may not be applicable to the broader community due to its small sample size, thereby limiting its generalisability. Hence, it is crucial to reproduce this work in alternative environments with more extensive samples to validate the results. Multiple constraints were observed in this study that require careful evaluation. The limited sample size of 191 potential teachers from a single College of Education may restrict the capacity to apply the findings to larger populations or diverse educational settings. Moreover, the utilisation of self-reported measures like the Meta-cognitive Awareness Inventory and Cognitive Ability Test may lead to response biases or mistakes when evaluating the genuine cognitive and metacognitive abilities of participants. This study's cross-sectional methodology makes it difficult to demonstrate causal linkages between metacognition, cognitive ability, and academic success across time. Longitudinal studies with larger and more diverse samples might improve future study. To better understand educational interactions, many evaluation methods should be used.

Recommendations and Implications

According to this study, there are several ways to improve education and help potential teachers improve their metacognition and cognitive abilities:

1. **Integrate Metacognitive Training**: Teacher education programs should include organised activities specifically designed to enhance metacognitive awareness and self-regulation. This may involve engaging in reflective practices, such as keeping metacognitive journals, and participating in goal-setting activities to enable prospective educators to effectively observe and enhance their learning processes. Prospective teachers can enhance their ability to effectively regulate themselves and engage in reflective practice in their teaching careers by incorporating metacognitive training.

2. **Enhance Cognitive Skill Development**: It is important to prioritise instructional tactics that promote critical thinking, problem-solving, and analytical reasoning. Offering prospects for aspiring educators to participate in demanding assignments that necessitate the utilisation and adjustment of cognitive abilities will equip them for the intricacies of teaching. Engaging in activities that increase cognitive engagement can assist aspiring educators in improving their problem-solving skills and boosting their overall cognitive function.

3. **Embed Assessments of Metacognition and Cognitive Ability**: Incorporating evaluations of metacognitive and cognitive abilities should be a fundamental component of teacher training programs. These assessments can assist in identifying areas that need work and provide valuable information for creating specific professional development opportunities. Periodic assessments of these abilities can inform modifications to the curriculum and offer significant input for aspiring educators.

4. **Promote Collaborative Learning**: It is essential to prioritise the establishment of collaborative learning environments in teacher education programs. It is advisable to motivate aspiring educators to participate in peer dialogues, collaborate in teams, and undertake joint endeavours. These experiences not only improve cognitive abilities by encouraging collaborative problem-solving, but also foster metacognitive reflection when individuals share and assess their learning processes with others.

5. **Provide Ongoing Professional Development**: Teachers should be provided with ongoing professional development opportunities that specifically target the improvement of their metacognitive and cognitive skills throughout their careers. Workshops, seminars, and mentoring programs can assist teachers in staying up-to-date with effective ideas and methodologies, thereby honing their vital abilities. Continuous improvement enables educators to consistently enhance their teaching methodologies and adjust to emerging educational obstacles.

6. **Support Research and Innovation**: It is crucial to support research initiatives that investigate efficient methods for cultivating metacognition and cognitive skills in educational environments. An environment that encourages innovation should be cultivated, where educators are motivated to explore new methods and exchange their most effective strategies. By providing support for research and innovation, we can uncover efficient techniques to enhance these skills and ultimately improve educational outcomes.

By incorporating these suggestions, teacher education programs can enhance the preparation of aspiring teachers by providing them with the necessary metacognitive and cognitive abilities to enhance academic performance and cultivate a lifelong love for learning in their pupils.

Conflicts of interest

No potential conflict of interest was reported by the authors.

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Authors' contributions

G. Maheswari had the idea for this study, the principal investigator of the research work, performed data collection and edited the manuscript. Dr.H. Indu, designed the study protocol, conducted the analyses and drafted the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript.

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