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Metacognitive Awareness among Student Teachers: A Narrative Review

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ABSTRACT

Metacognition, which involves the monitoring, regulation and control of cognitive processes, is a critical component of learning and achievement. It has become a key component of student teachers' professional development and classroom practices. This narrative review has analysed empirical evidence from national and international studies between 2010 and 2024 on the metacognitive awareness of pre-service teachers. The researcher relied exclusively on secondary data. The findings demonstrated that student teachers generally display intermediate levels of metacognitive competencies, with significant differences observed across gender, field of study, teaching experience and teaching context. Moreover, higher metacognitive awareness is positively related to academic performance, classroom management and self-efficacy, suggesting its impact on improving instruction and learning outcomes. Although pre-service and in-service teachers possess certain metacognitive knowledge, they lack the metacognitive regulation and application of this knowledge in the classroom. The review highlights the importance of intentionally incorporating metacognitive elements into teacher education programs and more longitudinal and cross-cultural studies to understand developmental patterns and contextual variables that affect the growth of metacognitive awareness of the student teachers.

Keywords: Metacognitive awareness, pre-service teachers, Teacher Education, Metacognitive strategies, Reflective thinking, Teaching practices

One of the major concerns of 21st century education is to prepare metacognitively aware learners. Metacognition is an umbrella term that encompasses related constructs such as self-regulated learning, higher order thinking, and the ability to learn how to learn. This perspective advocates for learners who are independent thinkers capable of creating knowledge that addresses the various needs of contexts, tasks and disciplines through the critical analysis of multiple sources and the appreciation of credible evidence (Ozturk, 2017). Empirical research has shown repeatedly that students who actively use metacognitive strategies tend to perform better academically (Dignath & Büttner, 2018; Young & Worrell, 2019). Equally, teachers must cultivate their own metacognitive awareness so that they can design more effective teaching practices. In essence, teachers need to think metacognitively themselves in order to guide students in developing these skills. Pritula (2012) argues that teacher's metacognitive ability should be strong enough to enable them to identify and nurture metacognitive thinking among their students. Similarly, (Beziat *et al.* 2017) stress that educators should actively engage in metacognitive practices. Theoretically, an effective teacher demonstrates consistent use of metacognitive skills, which helps create opportunities for self-directed learning and promotes a learner-centered classroom environment.

The term "knowledge and cognition about cognitive phenomena" was first used by metacognition pioneer Flavell (1979). Metacognitive knowledge

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and metacognitive regulation are the two main parts of MA (Schraw & Dennison, 1994). While metacognitive regulation entails monitoring, controlling, and assessing one's cognitive processes in order to accomplish particular objectives, metacognitive knowledge entails awareness of one's cognitive tasks, methods, and processes. MA has been acknowledged as a crucial element of effective teaching and learning in educational settings. It helps students to assess their comprehension, choose suitable strategies, and modify their methods to overcome obstacles (Pintrich, 2002). According to Luke, Ford, Vaughn, and Fulchini-Scruggs (2021), teachers can improve student learning outcomes by reflecting on their instructional methods, evaluating the effects of their teaching strategies, and making improvements. MA is crucial to the professional development of pre-service teachers (PSTs), especially when it comes to lesson planning and practicum experiences where they must use theoretical knowledge in actual classroom situations (Yildiz & Akdag, 2017; Wei, Hutagalung, & Peng, 2022). According to Adadan and Oner (2018) and Mbato and Triprihatmini (2022), MA provides a fundamental framework that strengthens their ability to critically evaluate their teaching methods, consider the efficacy of their instruction, and adjust to a variety of classroom challenges. This understanding enables PSTs to plan courses better, adapt to changing classroom conditions and pursue lifelong professional development.

However, even though its importance is recognised, research on teachers' own metacognition and ways to evaluate it remains limited. The gap indicates that teachers' metacognitive abilities deserve more attention as they are important in improving student achievement. Despite the extensive research on students' metacognitive awareness, there is a lack of synthesis from a narrative review perspective on the development of the metacognitive awareness of pre-service and in-service teachers in different educational settings. Therefore, a narrative synthesis of existing research is necessary to understand trends, interventions, and gaps in metacognitive awareness research within teacher education.

Objectives of the Study

1. To review empirical studies on metacognitive awareness in teacher education between (2010-2024).
2. To explore major themes, trends and methodologies in studies on metacognitive awareness of pre-service and in-service teachers.
3. To investigate the influence of metacognitive interventions or instructional strategies on teacher cognitions and professional practice.
4. Identify gaps and limitations in the existing literature.

Methodology

In the present study, the studies on metacognitive awareness in teacher education from 2010 to 2024 were reviewed using a narrative review method. The Researcher relied solely on secondary empirical literature collected from number of research publications. Relevant studies were identified through databases such as Google Scholar, ERIC, and ResearchGate using keywords including 'metacognitive awareness,' 'teacher education,' 'pre-service teachers,' and 'reflective practice. Researchers have reviewed 35 works of literature, of which 14 are Indian and 21 are done abroad. The data obtained were analysed and interpreted. The inclusion criteria for the studies were: (a) peer-reviewed journal articles; (b) focused on metacognitive awareness in the context of teacher education; (c) published between 2010–2024; and (d) used empirical research methods. Excluded studies were those not involving teachers as participants, outside the specified timeframe, or non-peer-reviewed. Data from the final selection of studies were extracted and categorized based on authorship, year, sample characteristics, research design, metacognitive focus, and key findings.

RESULTS

Summary Table

Studies conducted abroad

Study & Year	Sample & Context	Method	Key Findings
Wilson & Bai (2010)	105 Graduate students	Mixed research method	Metacognitive knowledge had a significant impact on his/her pedagogical understanding of metacognition.

Kim (2011)	Prospective early childhood educators	Quantitative study with correlational and multiple regression analyses	Higher metacognitive knowledge linked to higher teacher self-efficacy;
Sendurur *et al.* (2012)	Pre-service teachers	MAI	Statistical analyses reporting mutual interaction among these variables; gender GPA, course grades, and graduated high school type
Oz (2014)	134 Turkish pre-service teachers	Metacognitive Awareness Inventory (MAI) by Schraw & Dennison (1994).	Significant positive correlations between metacognitive awareness, exam scores, and GPA.
Öztürk (2017)	Language instructors	Professional development (PD) module of teaching for metacognition.	Improved teaching of metacognition post-Professional Development modules
Oral (2017)	Teacher candidates (N=1475)	Survey	Awareness predicts self-efficacy & problem-solving
Küvaç & Koç (2018)	51 Pre-service science (Turkey)	Experimental PBL vs control	Problem Based Learning improved procedural metacognitive skills
Fauzi & Sa'diyah (2019)	39 Pre-service biology (Indonesia)	Mixed methods (MAI + rubric + open-ended)	Level of metacognitive awareness high; skills low; limited understanding about metacognition
Çakır & Güven (2019)	108 Prospective primary teachers	MA + motivation scales	Metacognitive knowledge predicted ~37 % of achievement
Cakici (2019)	218 pre-service EFL teachers (Turkey)	Correlational survey	Metacognitive awareness strongly linked with critical thinking
Duman Semerci 2019	44 prospective teachers	Survey	Metacognition-based instructional practice has positively affected the improvement of the prospective teachers
Hughes & Partida (2020)	11 Pre-service STEM (U.S.)	Professional Development experience + MAI pre/post	Increase in regulation of cognition; participants knowledge of cognition unchanged
Kandemir & Karadeniz (2021)	Pre-service math teachers (Turkey)	STEM modeling + triangulated methods	Strong use of both individual and collaborative metacognitive processes
Üstünbaş & Alagözlü (2021)	150 EFL teachers (Turkey)	MAI + interviews	In-service scored higher in Metacognitive Awareness than pre-service teachers
Dinçer & Çilek (2022)	294 Pre-service classroom teachers	Metacognitive Awareness of Reading Strategies Inventory-TR + CTS scale	MA linked to critical thinking attitudes
Tok 2022	374 pre-service preschool teachers,	Survey	Metacognitive awareness significantly predicted creative thinking domains.
Sumila *et al.* (2023)	Prospective chemistry educators	Metacognitive Awareness Inventory for Teachers18 survey	High cognitive knowledge/ regulation levels with 80% and 77%, respectively
Aquino Mendoza & Elepaño (2023)	120 Pre-service teachers (Philippines)	MAI + demographic analysis	Overall high MA; gender and year-level differences
Joshpine Albina 2023	200 preservice teachers in Karaikudi	Survey	Positive correlation between metacognitive awareness and Technological Pedagogical and Content Knowledge.
Leasa *et al.* 2024	57 Pre-service teachers	MAI	Students' metacognitive awareness in learning with PBL and PBLRQA is not significantly different.
Tak *et al.* 2025	378 Pre-service teachers	Questionnaires and mathematics reasoning assessment	Substantial correlation through all variables, and path analysis revealed that metacognitive awareness mediates the relationship between attitude and mathematics reasoning.

Studies conducted in India

Study & Year	Sample & Context	Methods	Key Findings
Gopinath (2014)	Student teachers	Survey	Metacognitive Awareness in Teaching of the student teachers is at an average level.
Shetty (2014)	172 student teachers	Descriptive survey method	The most common personality type among student teachers was ESFJ (Extraversion, Sensing, Feeling, Judging).
Sawhney & Bansal (2015)	100 undergraduate students from various colleges of Chandigarh.	Metacognitive Awareness Inventory (MAI) by Schraw & Dennison (1994)	Significant difference found in academic achievement between students with high and low metacognitive awareness.
Jain et al (2017)	522 students at undergraduate and postgraduate levels.	**Metacognitive Awareness Inventory** (Schraw & Dennison, 1994) - **Academic Adjustment Scale** (Anderson *et al.* 2016)	Components of metacognition showed **positive correlation** with: • Academic achievement • Overall academic adjustment • Academic outcome
Hossain (2019)	Under Graduate college students	**Survey**	Students have average metacognitive awareness; no significant difference between boys and girls on MA
Fathima & Vimala (2020)	Graduate teacher trainees at Alagappa University	Metacognitive intervention + competency measures	Planning, monitoring & evaluation improved teaching competence via metacognitive support
Gomathi & Sugirtha (2020)	321 Pre service teachers	Metacognition inventory	Female teachers exhibit better awareness than male teachers. pre-service teachers in urban were found to be higher than those in rural.
Nath (2021)	ESL learners (future teachers), Gauhati University, Assam	Pre/post quasi-experiment in reading strategies	Planned instruction increased metacognitive awareness, especially among initially less aware learners
Sahoo *et al.* (2021)	100 secondary prospective teachers, Odisha	MAIT + teaching competence scale, correlational design	Males scored higher than females in metacognitive awareness; strong positive correlation with teaching competence
Mishra (2022)	Pre-service science teachers, GD Goenka University, Gurugram	Qualitative analysis via interviews and reflections	Teachers showed conceptual understanding of metacognition but struggled with planned instructional use; need stronger pedagogical support
Sumitha & Mandal (2022)	300 B.Ed. trainees from Chennai colleges	MAI + Grit scale survey	Significant gender differences in metacognitive awareness; no variation by college type or income
Geetha & Fathima (2023)	150 Pre-service teachers	Descriptive survey method	Metacognitive awareness of pre-service teachers does not differ based on their age, gender, locality, and type of institution.
Devisri & Veeraragha-van (2024)	791 prospective teachers, Chennai district	Descriptive survey, examined gender/ residence differences	Moderate overall metacognitive skills; no significant differences by gender or residence
Sharma (2024)	549 secondary school teachers across India	Large-scale survey using Teachers' Metacognitive Awareness Scale	Explored demographic variables (e.g., gender, school type, experience) in relation to awareness levels

Interpretation

Objective 1: *To review empirical studies on metacognitive awareness in teacher education between (2010-2024).*

The empirical work on metacognitive awareness in teacher education, conducted from 2010 to 2024, shows a steady increase in the number of studies conducted in both pre-service and in-service settings. International research has shown that metacognitive awareness is related to self-efficacy, critical thinking and problem-solving skills, teaching competence and creative thinking (Oral, 2017; Cakici, 2019; Dinçer & Çilek, 2022; Tok, 2022).

Objective 2: *To explore major themes, trends and methodologies in studies on metacognitive awareness of pre-service and in-service teachers.*

Key themes that emerge from the literature:

Relationship of Metacognition with critical thinking; problem solving; creative thinking (Oral, 2017; Dinçer & Çilek, 2022; Tok, 2022) Effects of instructional designs such as Problem-Based Learning, reflective practice, and STEM modelling on metacognitive development (Küvaç & Koç, 2018; Kandemir & Karadeniz, 2021; Nath, 2021). Demographic Differences (Gender, Place of residence, Urban-rural background) (Gomathi & Sugirtha, 2020; Sumitha & Mandal, 2022; Geetha & Fathima, 2023) Importance of professional development and teacher training in developing planning, monitoring and evaluation skills (Öztürk, 2017; Hughes & Partida, 2020; Fathima & Vimala, 2020).

Trends

Recent studies demonstrate a shift from descriptive correlational research (2014–2019) to mixed-methods and intervention-based designs (2020 onwards). There is also increasing interest in discipline-specific contexts (science, mathematics, language education) and the integration of metacognitive instruction within teacher education curricula.

Methodologies

The Metacognitive Awareness Inventory (MAI) and its adaptations remain the most widely used tools. Complementary qualitative techniques such as interviews, reflective journals, and rubrics are increasingly used to capture deeper insights (Fauzi & Sadiyah, 2019; Mishra, 2022).

Objective 3: *To analyze the effects of metacognitive interventions or instructional approaches on teacher cognition and professional practice*

Several intervention studies provide evidence that explicit instruction in metacognitive strategies positively impacts teacher cognition and professional practice: Professional development modules increased teachers' ability to integrate metacognitive strategies into instruction (Öztürk, 2017; Hughes & Partida, 2020). Problem-Based Learning significantly enhanced procedural metacognitive skills in science teacher candidates (Küvaç& Koç, 2018).STEM modeling approaches promoted collaborative regulation of cognition among pre-service mathematics teachers (Kandemir & Karadeniz, 2021). Metacognitive reading strategies instruction improved awareness among ESL learners preparing for teaching (Nath, 2021).In-service teachers tend to show higher metacognitive awareness than pre-service peers, suggesting that experience plus reflective PD strengthens awareness (Üstünbaş & Alagözlü, 2021).

Objective 4: *To identify gaps and limitations in the existing body of literature*

Heavy reliance on self-report tools such as MAI without triangulation with observed classroom practice (Fauzi & Sadiyah, 2019; Sharma, 2024). Limited experimental and longitudinal studies, with most research being cross-sectional or short-term (Sumila *et al.* 2023; Geetha & Fathima, 2023). Underrepresentation of in-service teachers in rigorous interventions; most studies focus on pre-service contexts (Üstünbaş & Alagözlü, 2021). Variability in conceptual understanding versus application: high awareness does not always translate into pedagogical implementation (Mishra, 2022).

DISCUSSION

The present review highlights the increasing role of metacognitive awareness as a fundamental component of teacher education and professional competence. The studies discussed, both in Indian and international contexts, unanimously show that metacognitive awareness has a positive effect on instructional effectiveness, reflective thinking, self-efficacy, critical thinking, academic achievement, and teaching competence of pre-service and in-service teachers. Teachers with more developed metacognitive abilities seem to be better able to plan, monitor, assess and modify their teaching

practices to respond to classroom needs and learning contexts.

The results also indicate that metacognitive awareness is significantly related to important educational and professional variables such as academic achievement, problem-solving ability, motivation, and creative thinking. Studies conducted in different educational contexts revealed positive relations between metacognitive awareness and self-efficacy, critical thinking, academic adjustment and pedagogical understanding, supporting the role of metacognitive regulation in effective teaching and learning practices (Kim, 2011; Oral, 2017; Çakır & Güven, 2019; Dinçer & Çilek, 2022; Tok, 2022).

Another important trend identified in the literature is the positive effect of intervention-based instructional approaches on metacognitive development. Problem-Based Learning, STEM modelling, professional development programs, reflective activities and strategy instruction were found to foster planning, monitoring, evaluation and regulation of cognition among teacher trainees and practicing teachers (Küvaç& Koç, 2018; Hughes & Partida, 2020; Kandemir & Karadeniz, 2021; Nath, 2021). These findings indicate that systematic pedagogical experiences and reflective engagement can be conducive to metacognitive awareness. However, many studies also showed that although teachers have theoretical knowledge of metacognition, they face problems in applying metacognitive strategies effectively in real classroom situations (Fauzi & Sadiyah, 2019; Mishra, 2022). This suggests a gap between metacognitive awareness and pedagogical implementation.

The review also shows differences in metacognitive awareness by demographic and contextual factors including gender, residence, teaching experience and institutional background. Some studies found that female teachers had more metacognitive awareness, but others did not find significant gender difference (Sumitha & Mandal, 2022; Devisri & Veeraraghavan, 2024). Similarly, differences were found between pre-service and in-service teachers, with teaching experience and reflective practice contributing to higher levels of metacognitive regulation in some contexts. The inconsistencies found suggest that metacognitive awareness is affected by a range of educational and contextual factors, not just demographic variables.

The Indian studies reviewed in the present paper reflect a growing recognition of the importance of metacognitive awareness in teacher education. Most studies reported moderate levels of metacognitive awareness among teacher trainees, while intervention-based approaches demonstrated improvements in teaching competence, planning, monitoring, and evaluation skills (Fathima & Vimala, 2020; Sahoo *et al.* 2021). At the same time, the findings indicate the need for stronger integration of metacognitive training within teacher education curricula so that teachers are able not only to understand metacognitive concepts theoretically but also to apply them effectively in pedagogical practice.

Overall, the reviewed literature demonstrates that metacognitive awareness functions as an essential professional competency that supports reflective practice, self-regulated learning, instructional decision-making, and professional growth. The findings collectively emphasize the importance of systematically integrating metacognitive instruction, reflective activities, and experiential learning opportunities within teacher education and professional development programs.

Recommendations

- Integrate Metacognitive Training into B.Ed. and M.Ed. Curricula: Many Indian pre-service teachers demonstrate only a conceptual understanding of metacognition without the ability to apply it (Mishra, 2022). Teacher education programs must explicitly incorporate metacognitive strategy training, including reflective journaling, think-alouds, and self-assessment exercises, as part of their pedagogical toolkit.
- Promote Reflective Practice through Structured Mentoring: Findings from studies like Nath (2021) and Sahoo *et al.* (2021) underscore the value of guided reflection. Institutions should assign trained mentors to support pre-service teachers in reflecting on their lesson plans, classroom decisions, and learning outcomes using metacognitive frameworks.
- Continuous Professional Development for In-Service Teachers: Moderate levels of metacognitive awareness among in-service teachers (Sharma, 2024) call for ongoing

professional development (PD) sessions focused on self-regulated teaching, planning-monitoring-evaluation cycles, and metacognitive feedback techniques.

- ❒ Use Culturally Contextualized Tools and Approaches: Since most metacognitive tools are adapted from Western models (e.g., MAI), Indian teacher education programs should develop or validate context-specific metacognitive assessment instruments that align with local languages, cultural settings, and classroom challenges.
- ❒ Encourage Gender-Sensitive Pedagogy: Some studies (e.g., Sumitha & Mandal, 2022) found gender-based differences in metacognitive awareness. Educators should be sensitive to such disparities and encourage equitable participation, especially in reflection and peer-learning activities.

CONCLUSION

This narrative review (2010–2024) provides strong and consistent evidence for the key role of metacognitive awareness in teacher education. The findings show that metacognition is not an ancillary skill but a core component of professional teaching practice that enhances decision-making, instructional planning and learner responsiveness. Metacognitive awareness is known to be valuable but is still underdeveloped in many teacher education programs. While pre-service and in-service teachers may possess basic metacognitive knowledge, their ability to regulate and use that knowledge in real time teaching contexts is limited. To close these gaps, teacher education needs to move beyond declarative instruction and engage learners in authentic, reflective and iterative metacognitive experiences. Future research should explore longitudinal studies to capture the sustainability of metacognitive interventions and examine how cultural, institutional and technological factors influence teachers' metacognitive development. When embedded thoughtfully into curriculum and policy, metacognitive competency can be a transformational force in the growth of reflective, adaptive, and competent educators. Metacognitive ability should therefore be viewed as both an individual cognitive skill and a core professional competency for reflective and adaptive teaching.

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