

DEVELOPMENT OF METACOGNITIVE STRATEGIES AMONG PRESERVICE PRIMARY SCHOOL TEACHERS IN PROFESSIONAL TRAINING

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Abstract This article addresses the issue of developing metacognitive strategies among preservice primary school teachers during professional training. The relevance of the study is determined by the increasing demands placed on the quality of teacher education and the need to develop students' abilities for self-regulated learning, reflection, and independent management of their professional growth. Based on an analysis of contemporary national and international research published between 2021 and 2025, the article examines the theoretical foundations of the metacognitive approach in education and its significance for the preparation of future teachers. The empirical part of the study was conducted at the B. Sydykov Kyrgyz-Uzbek International University. The study involved 184 students enrolled in the Pedagogy program with a specialization in Primary Education. Data were collected using the Metacognitive Learning Strategies Questionnaire (MLSQ), the Beliefs About Learning Scale (BALS), and quantitative and qualitative methods of data analysis. The study made it possible to determine the level of metacognitive strategy development among students, identify specific features of their use of planning, monitoring, and evaluation strategies, and examine the relationship between students' beliefs about learning and the level of their metacognitive competence. The findings indicate that the development of metacognitive strategies contributes to improved academic achievement, greater capacity for self-directed learning, and enhanced professional reflection among students. Based on the results obtained, practical recommendations are proposed for integrating metacognitive components into teacher education curricula for preservice primary school teachers. Particular attention is given to the role of continuous professional development and the creation of educational environments that support the formation of metacognitive competence in future educators.

Keywords: metacognitive strategies; preservice primary school teachers; teacher education; self-regulated learning; reflection; metacognitive awareness.

1. INTRODUCTION

The modern system of higher teacher education faces the challenge of preparing a new type of teacher—not merely a transmitter of knowledge, but a reflective practitioner capable of continuous self-development and adaptation to rapidly changing educational environments. In this context, the development of metacognitive strategies among preservice primary school teachers has become particularly important. These strategies serve as tools that enable future educators to consciously plan, monitor, and evaluate their own learning and professional activities.

Metacognitive strategies can be defined as a system of techniques and methods aimed at regulating one's own cognitive processes. According to contemporary research, these strategies include planning strategies (goal setting, task analysis, and selection of problem-solving approaches), monitoring strategies (tracking comprehension and evaluating intermediate outcomes), and regulation strategies (adjusting actions and assessing final results).

For preservice primary school teachers, mastery of metacognitive strategies has a dual significance. First, it contributes to their own academic success during professional training. Second, it represents a necessary condition for fostering metacognitive skills among their future pupils, since effective instruction in metacognition is possible only when teachers themselves possess well-developed metacognitive competencies and are capable of serving as reflective role models for learners.

In the context of the digitalization of education and the continuous growth of information resources, the ability of learners to independently organize their learning processes, critically evaluate information, and assess the effectiveness of their own learning approaches has become increasingly important. Metacognitive strategies serve as a crucial tool for fostering lifelong learning skills, which are widely recognized as one of the key competencies required of modern professionals. Consequently, the development of metacognitive competence among future teachers is regarded as an essential prerequisite for their successful professional adaptation and long-term career development.

Despite the growing scholarly interest in metacognition, the issue of developing metacognitive strategies among preservice primary school teachers remains insufficiently explored within contemporary teacher education. Particular attention should be paid to identifying the factors that facilitate the development of metacognitive strategies among teacher education students, as well as to determining effective pedagogical conditions and instructional technologies that support their purposeful development within higher education settings. This situation highlights the need for specialized research aimed at examining the level of metacognitive strategy development among future teachers and formulating practical recommendations for its enhancement.

The relevance of the study is further supported by evidence indicating an insufficient level of metacognitive strategy development among teacher education students. A systematic review of the literature suggests that preservice teachers generally demonstrate a moderate level of cognitive and metacognitive strategy use. Furthermore, research has shown that many teachers, including practicing professionals, possess only a limited understanding of the concept of metacognition and experience difficulties in its practical application within educational settings.

The research problem addressed in this study concerns the identification of pedagogical conditions and mechanisms that facilitate the effective development of metacognitive strategies among preservice primary school teachers during professional training. Although a substantial body of research has been devoted to metacognition, the specific characteristics of metacognitive competence development among teacher education students in higher education remain insufficiently explored.

The object of the study is the process of professional preparation of preservice primary school teachers within the system of higher pedagogical education.

The subject of the study is the metacognitive strategies of preservice primary school teachers and the pedagogical opportunities for their development within the context of university education.

The purpose of this article is to provide a theoretical foundation and develop practical recommendations for fostering metacognitive strategies among preservice primary school teachers during professional training. To achieve this objective, the following research tasks were formulated:

1. To analyze theoretical approaches to understanding metacognitive strategies within the context of teacher education;
2. To examine the current state of research on this issue;
3. To identify factors influencing the development of metacognitive strategies among preservice teachers;
4. To develop recommendations for integrating metacognitive components into teacher education programs for future primary school teachers.

To accomplish the research objectives, the following methods were employed: theoretical analysis of scholarly literature on metacognition and teacher education; student surveys using the Metacognitive Learning Strategies Questionnaire (MLSQ) and the Beliefs About Learning Scale (BALS); and methods of mathematical statistics for processing and interpreting the collected data.

The empirical basis of the study consisted of data obtained from 184 students enrolled in the Primary Education Pedagogy and Methodology program at the B. Sydykov Kyrgyz-Uzbek International University.

The scientific novelty of the study lies in identifying the specific characteristics of metacognitive strategy development among preservice primary school teachers within contemporary teacher education, as well as in developing practical recommendations for their purposeful formation during professional training.

2. THEORETICAL FOUNDATIONS OF THE DEVELOPMENT OF METACOGNITIVE STRATEGIES IN TEACHER EDUCATION

2.1. The Concept and Structure of Metacognitive Strategies

Metacognition as a scientific concept was first developed in the works of John Flavell, who defined it as “knowledge and regulation of one’s own cognitive processes.” Traditionally, two major components are distinguished within the structure of metacognition: **metacognitive knowledge** (declarative, procedural, and conditional knowledge about cognition) and **metacognitive regulation** (planning, monitoring, and evaluation of cognitive activity).

Metacognitive strategies serve as the instrumental mechanisms that support metacognitive regulation. They can be defined as purposeful and consciously employed cognitive operations that enable students to manage the process of acquiring, processing, and applying information. Through the use of metacognitive strategies, learners become more aware of their thinking processes and are able to regulate their learning activities more effectively.

In the international literature, three major categories of metacognitive strategies are commonly identified:

1. Planning Strategies. These strategies involve setting learning goals, conducting a preliminary analysis of learning materials, selecting appropriate learning approaches, anticipating potential difficulties, and allocating time and resources effectively. Planning strategies enable learners to organize their learning activities before engaging in a task and provide a framework for subsequent self-regulation.

2. Monitoring Strategies. Monitoring strategies involve continuously tracking one's own understanding while working with learning materials, evaluating whether intermediate outcomes correspond to established goals, and identifying gaps in knowledge or misconceptions. These strategies enable learners to become aware of difficulties as they arise and to assess the effectiveness of their current learning approaches. Effective monitoring supports informed decision-making during the learning process and serves as a foundation for adaptive self-regulation.

3. Regulation and Evaluation Strategies. These strategies include modifying learning approaches when difficulties are encountered, selecting alternative methods for completing tasks, evaluating the outcomes achieved, and reflecting on the effectiveness of the strategies employed. Regulation and evaluation strategies allow learners to respond flexibly to changing learning demands and to improve their performance through continuous self-assessment and adjustment.

Research has consistently demonstrated that successful learners differ from less successful learners not so much in terms of intellectual ability as in their capacity to use metacognitive strategies flexibly and appropriately according to the specific requirements of a task. This finding is of particular importance for teacher education, as future teachers must not only master metacognitive strategies in their own learning but also be capable of teaching these strategies to their pupils and creating classroom environments that support the development of self-regulated learning.

2.2. Metacognitive Strategies as a Component of the Professional Competence of Primary School Teachers

The professional activity of primary school teachers places specific demands on the development of metacognitive strategies. Primary school age is considered a sensitive period for the formation of self-regulatory learning skills, and primary school teachers play a crucial role in fostering children's abilities for self-organization, reflection, and independent learning.

Contemporary research emphasizes that teachers' metacognitive skills significantly influence their ability to create classroom environments that promote students' self-regulation. Teachers with a high level of metacognitive awareness tend to plan instructional processes more effectively, respond more flexibly to student feedback, make better use of formative assessment practices, and facilitate the development of independent learning skills among their pupils.

Furthermore, metacognitive strategies play an important role in teachers' continuous professional development. Teaching is a profession that requires ongoing acquisition of new knowledge, mastery of innovative instructional methods and technologies, and adaptation to changing educational conditions. Teachers who possess well-developed metacognitive strategies are better able to identify gaps in their professional competence, establish goals for professional growth, plan and implement professional development activities, and evaluate the effectiveness of these efforts.

In this context, the professional preparation of future primary school teachers should be organized in such a way that metacognitive strategies become not merely an incidental outcome of learning but a deliberately developed component of professional competence. Purposeful integration of metacognitive instruction into teacher education programs can contribute to the formation of reflective practitioners who are capable of lifelong learning, effective professional decision-making, and the successful promotion of self-regulated learning among their future students.

3. CURRENT STATE OF RESEARCH ON METACOGNITIVE STRATEGIES AMONG PRESERVICE TEACHERS

3.1. Level of Metacognitive Strategy Development

The findings of empirical studies conducted in different countries indicate that the level of metacognitive strategy development among preservice teachers can generally be characterized as moderate. A systematic review encompassing 14 studies published between 2017 and 2022 revealed that teacher education students demonstrate diverse patterns of strategy use. Information organization and planning strategies were reported as the most frequently employed, whereas monitoring and evaluation strategies were used less often.

These findings suggest that while preservice teachers are generally capable of setting learning goals and organizing their academic activities, they experience greater difficulty in continuously monitoring their understanding and critically evaluating learning outcomes. Such limitations may reduce the effectiveness of self-regulated learning and hinder the development of professional reflective competence.

The results of international studies further indicate that metacognitive strategy use varies considerably among students and is influenced by individual, contextual, and educational factors. Differences have been observed in the frequency and quality of strategy use depending on academic level, learning experiences, instructional approaches, and students' beliefs about learning. Consequently, the development of metacognitive competence should be viewed as a dynamic process requiring systematic pedagogical support throughout professional training.

Particular attention should be paid to the study conducted by Vosniadou and colleagues (2021), which involved 366 preservice teachers. The authors found that students' beliefs consistent with the concept of self-regulated learning served as positive predictors of the use of cognitive and metacognitive strategies, whereas beliefs inconsistent with this concept functioned as negative predictors. An important finding of the study was that approximately 50% of preservice teachers simultaneously held both progressive and traditional beliefs about the nature of learning. Such contradictory beliefs create an internal cognitive conflict and may hinder the effective application of metacognitive strategies.

Another study conducted by Soeharto and colleagues (2024) focused on examining metacognitive awareness related to reading strategies among preservice primary school teachers. Using Rasch analysis, the researchers not only assessed the current level of development of these strategies but also demonstrated the potential for their purposeful enhancement through professional teacher education programs.

The findings of these studies emphasize that metacognitive competence is closely associated not only with students' cognitive abilities but also with their beliefs about learning and knowledge construction. Consequently, effective teacher education programs should address both the development of metacognitive skills and the transformation of students' epistemological beliefs in order to promote reflective and self-regulated learning practices.

Researchers also note that many preservice teachers experience difficulties in maintaining concentration and motivation, report insufficient use of self-assessment strategies, and tend to engage in self-handicapping behaviors such as procrastination. These findings indicate the need for purposeful and systematic efforts to develop metacognitive strategies within the process of professional teacher education.

3.2. Factors Influencing the Development of Metacognitive Strategies

A review of the literature makes it possible to identify several groups of factors that influence the development of metacognitive strategies among preservice primary school teachers.

Individual and Psychological Factors. Research has shown that the level of metacognitive strategy development is associated with such characteristics as academic motivation, self-efficacy, future time perspective, and personal reflectivity. Students with strong intrinsic motivation and high levels of self-efficacy tend to use metacognitive strategies more actively and consciously. They are more likely to set learning goals, monitor their progress, evaluate learning outcomes, and make adjustments to their study approaches when necessary.

Demographic and Academic Factors.

Studies indicate that the use of metacognitive strategies varies according to students' academic year. Senior students generally demonstrate higher levels of metacognitive strategy development than first-year students, suggesting that these competencies gradually evolve throughout the process of professional preparation. Differences have also been identified across fields of study. In several investigations, students enrolled in science-related programs demonstrated higher levels of metacognitive strategy use than students in humanities-oriented disciplines. These differences may be explained by variations in instructional approaches, problem-solving requirements, and the nature of learning tasks encountered in different academic domains.

Educational Environment Factors. Educational environment factors play a significant role in the development of metacognitive strategies. In particular, the teaching methods employed in higher education institutions have a substantial impact on students' metacognitive development. Instruction that is primarily focused on the transmission of ready-made knowledge and its reproductive memorization does not effectively promote the development of metacognitive strategies. In contrast, problem-based learning, project-based activities, the use of case-study methods, and the organization of reflective practices create favorable conditions for the formation of metacognitive skills. These approaches encourage students to engage in planning, monitoring, and evaluating their own learning processes, thereby fostering greater self-regulation and reflective thinking.

Beliefs About the Nature of Learning. As noted earlier, students' beliefs about what learning is and how it occurs significantly influence their use of metacognitive strategies. Students who perceive learning primarily as the memorization and reproduction of information (a transmissive view of learning) tend to use metacognitive strategies less frequently. In contrast, students who embrace a constructivist view of learning, understanding it as an active process of knowledge construction, demonstrate a higher level of metacognitive strategy use. Such students are more likely to engage in self-monitoring, reflection, and strategic regulation of their learning activities, which contributes to more effective and meaningful learning outcomes.

3.3. Empirical Study of the Level of Metacognitive Strategy Development among Preservice Primary School Teachers

To verify the theoretical assumptions and examine the actual state of the problem, an empirical study was conducted. The purpose of the study was to determine the level of metacognitive strategy development among students preparing to become primary school teachers and to identify the relationship between the use of these strategies and academic achievement.

3.3.1. Research Design and Methods.

The study was conducted at the Faculty of Humanities and Pedagogy of the B. Sydykov Kyrgyz-Uzbek International University from September 2024 to February 2025. The participants included 184 full-time students enrolled in the 550700 "Pedagogical Education" program, specializing in "Pedagogy and Methodology of Primary Education."

Table 1. Characteristics of the research sample

Characteristic	Value
Participants	184
Program	Primary Education
1st year	48
2nd year	46
3rd year	44
4th year	46
Age	18–24 (M=20.1)
Gender	100% female

The sample consisted of students from the first to the fourth year of study: 48 first-year students, 46 second-year students, 44 third-year students, and 46 fourth-year students. The participants' ages ranged from 18 to 24 years, with a mean age of 20.1 years. The sample was entirely female (100%), reflecting the actual gender composition of students enrolled in this specialization.

The study employed a mixed-methods research design that combined quantitative and qualitative approaches to data collection and analysis. Such a design made it possible to obtain a comprehensive understanding of students' metacognitive strategy use and the factors associated with its development.

The study employed a mixed-methods design combining both quantitative and qualitative approaches. The following instruments were used for data collection:

1. Metacognitive Learning Strategies Questionnaire (MLSQ).

The MLSQ, adapted and validated for a Russian sample, was used to assess students' metacognitive strategy use. The questionnaire consists of 24 items grouped into three subscales: **Planning Strategies** (8 items), **Monitoring Strategies** (8 items), and **Evaluation and Regulation Strategies** (8 items). Responses were rated on a 5-point Likert scale ranging from 1 ("never") to 5 ("always").

2. Beliefs About Learning Scale (BALS). The BALS was adapted based on the scale developed by Vosniadou and colleagues. The questionnaire comprises 16 statements organized into two dimensions: **Constructivist Beliefs** (viewing learning as an active process of knowledge construction) and **Transmissive Beliefs** (viewing learning as the memorization and reproduction of information). Responses were assessed using a 6-point Likert scale.

3. Reflective Journal. Third- and fourth-year students were asked to maintain a structured reflective journal over a four-week period. In these journals, participants recorded their learning goals, difficulties encountered, strategies employed, and self-evaluations related to seminar preparation and coursework completion. A total of 64 journals were collected and analyzed.

4. Academic Achievement. Academic achievement was measured using students' grade point average (GPA) from their most recent examination session, based on the national 5-point grading scale. The data were provided by the university academic affairs office in accordance with ethical requirements and confidentiality standards.

Statistical data analysis was conducted using SPSS 26.0. The following statistical procedures were applied: descriptive statistics, Pearson correlation analysis, one-way analysis of variance (ANOVA), and the independent-samples t-test.

3.3.2. Results of the Quantitative Analysis

Table 2. Metacognitive strategy scores by academic year

Year	n	Planning	Monitoring	Evaluation	Overall
1st	48	3.42	2.84	2.71	3.01
2nd	46	3.6	3.02	2.89	3.17
3rd	44	3.76	3.23	3.12	3.37
4th	46	3.95	3.32	3.3	3.49

The overall level of metacognitive strategy development among the entire sample of students ($n = 184$) was found to be moderate ($M = 3.27$, $SD = 0.58$ on a 5-point scale). At the same time, significant differences were identified across the subscales ($F = 12.47$, $p < 0.001$). The highest scores were observed on the Planning Strategies subscale ($M = 3.68$, $SD = 0.62$), whereas the scores for Monitoring Strategies ($M = 3.11$, $SD = 0.71$) and especially Evaluation and Regulation Strategies ($M = 2.98$, $SD = 0.69$) were substantially lower. These findings indicate that students are relatively successful in setting goals and planning their academic work; however, they experience considerable difficulties in monitoring their own understanding during the learning process and in conducting reflective evaluations of learning outcomes.

The dynamics across academic years are presented in Table 2.

A one-way ANOVA revealed statistically significant differences among academic years in terms of the overall metacognitive strategy score ($F = 6.84$, $p < 0.001$), as well as for each individual subscale ($p < 0.05$). Post hoc analysis using the Tukey HSD test demonstrated that fourth-year students significantly outperformed first-year students on all indicators ($p < 0.01$). However, the increase in monitoring strategy scores from the third to the fourth year amounted to only 0.09 points and did not reach statistical significance ($p = 0.58$). This finding may indicate the presence of a developmental "plateau" in this category of strategies during the later stages of professional preparation.

Of particular interest is the correlation analysis examining the relationship between metacognitive strategy use and academic achievement, the results of which are presented in Table 3.

Table 3. Correlations with GPA

Scale	r	p
Planning	0.28	<0.01
Monitoring	0.41	<0.001
Evaluation/Regulation	0.44	<0.001

The strongest correlations were found for Evaluation and Regulation Strategies ($r = 0.44$) and Monitoring Strategies ($r = 0.41$), whereas the relationship between planning strategies and academic achievement, although statistically significant, was more moderate ($r = 0.28$). These findings suggest that academic success depends not only on the ability to set learning goals but, more importantly, on the ability to monitor the learning process and make appropriate adjustments when necessary.

Students with high academic performance (GPA ranging from 4.5 to 5.0) reported engaging significantly more often in activities such as: “I check whether I understand what I have read before moving on,” “I change my approach to studying the material when I realize that I do not understand it,” and “After completing a task, I analyze what worked well and what did not.” These results highlight the importance of self-monitoring and self-regulation as key components of effective learning and academic achievement.

3.3.3. Analysis of Beliefs About Learning and Their Relationship with Metacognitive Strategies

The results of the **Beliefs About Learning Scale (BALS)** revealed that the majority of students (62%) demonstrated a mixed belief profile. These students simultaneously agreed with statements reflecting both a constructivist perspective (e.g., “*I learn best when I actively solve problems*”) and a transmissive perspective (e.g., “*Learning is mainly about memorizing the facts presented by the instructor*”). Only 18% of the participants demonstrated consistently constructivist beliefs, while 20% exhibited consistently transmissive beliefs.

When the sample was divided into three groups according to the dominant type of belief, significant differences were found in the use of metacognitive strategies (Table 4).

Table 4. Metacognitive strategies by learning beliefs

Belief	Planning	Monitoring	Evaluation	Overall
Constructivist	4.01	3.82	3.79	3.87
Mixed	3.66	3.18	3.09	3.31
Transmissive	3.21	2.89	2.85	2.98

The differences among the groups were statistically significant across all scales (**ANOVA, $p < 0.001$**). Students with constructivist beliefs demonstrated substantially higher levels of metacognitive strategy use than those with transmissive beliefs. The largest differences were observed for **Monitoring Strategies** (difference = 0.93 points, Cohen’s $d = 1.34$) and **Evaluation Strategies** (difference = 0.94 points, Cohen’s $d = 1.41$).

Notably, students with a mixed belief profile occupied an intermediate position. However, their scores were significantly lower than those of students with constructivist beliefs (**$p < 0.01$**) and significantly higher than those of students with transmissive beliefs (**$p < 0.05$**). These findings suggest that epistemological beliefs play an important role in shaping students’ metacognitive behavior and their willingness to engage in self-regulated learning practices.

This finding has important practical implications, as it demonstrates that even partial acceptance of transmissive beliefs about learning reduces students’ willingness to employ metacognitive strategies. Therefore, professional teacher education should focus not only on the development of specific strategic skills but also on shaping students’ beliefs about learning, helping them overcome contradictory conceptions regarding the nature of knowledge acquisition and learning processes.

4. A MODEL FOR THE DEVELOPMENT OF METACOGNITIVE STRATEGIES IN PROFESSIONAL TEACHER EDUCATION

4.1. Principles for Organizing Metacognitive Instruction

Based on the analysis of theoretical and empirical research, a number of principles can be formulated for organizing the process of developing metacognitive strategies among preservice primary school teachers.

Principle of Fading (Gradual Withdrawal of Support). An interesting framework is provided by the “Stepping Stones” approach, described in research on teacher professional development in mathematics education. The essence of this approach is that students initially receive substantial external support and structured guidance in their metacognitive activities. However, the level of support is gradually reduced (“fading”), and responsibility for planning, monitoring, and evaluating learning progressively shifts to the students themselves. This model promotes the development of learner autonomy and self-regulation and can be effectively adapted for the preparation of preservice primary school teachers.

Principle of Reflectivity. A crucial condition for the development of metacognitive strategies is students' systematic reflection on their own experiences of using these strategies. Reflection enables learners to become aware of their strengths and weaknesses, evaluate the effectiveness of their learning approaches, and identify areas for improvement. Reflective activities may be implemented through journal writing, group discussions, learning portfolios, and structured self-assessment questionnaires. Such practices encourage deeper self-awareness and foster the continuous development of metacognitive competence.

Principle of Integration. The development of metacognitive strategies should not be limited to a separate course or isolated instructional module. Instead, the metacognitive component should be integrated across all areas of professional teacher education, including psychological and pedagogical disciplines as well as subject-specific methodology courses. Such integration ensures that metacognitive skills are developed systematically and consistently throughout the entire teacher preparation program, enabling students to apply these strategies across diverse academic and professional contexts.

4.2. Content and Stages of Metacognitive Strategy Development

Based on the principles outlined above, the following model for the development of metacognitive strategies among preservice primary school teachers can be proposed. The model consists of three main stages.

Stage 1 (Years 1–2): Propaedeutic Stage. At this stage, the primary focus is on developing students' metacognitive knowledge. Students are introduced to the concept of metacognition, its structure, and its role in both academic and professional activities. They acquire basic metacognitive strategies applicable to their own learning processes, including goal setting for seminar preparation, time management when completing coursework, and self-monitoring techniques for assessing comprehension while reading professional literature.

An important component of this stage is working with students' beliefs about learning. Particular attention is given to identifying and correcting conceptions that conflict with the principles of self-regulated learning. Through reflective activities and guided discussions, students are encouraged to develop a deeper understanding of learning as an active and constructive process.

Stage 2 (Years 2–3): Active Development Stage. During this stage, metacognitive strategies are actively developed and applied in situations that simulate professional teaching practice. Students learn to employ planning, monitoring, and evaluation strategies while designing lesson segments, analyzing pedagogical cases, and preparing for teaching practicum experiences.

The fading model is employed at this stage. Initially, the application of metacognitive strategies is highly structured and supported by the instructor through guiding questions, checklists, algorithms, and reflective prompts. As students gain experience and confidence, the level of external support is gradually reduced, encouraging them to assume increasing responsibility for regulating their own learning and professional decision-making processes.

Stage 3 (Year 4): Integrative-Reflective Stage. At the final stage, the focus shifts toward developing students' ability to teach metacognitive strategies to primary school pupils. Future teachers learn techniques for making their own metacognitive processes explicit through the "think-aloud" approach, methods for organizing classroom reflection in primary education, and formative assessment practices aimed at fostering self-regulation among children.

An important component of this stage is the analysis and reflection of students' own teaching practicum experiences from a metacognitive perspective. Students are encouraged to examine their instructional decisions, evaluate the effectiveness of their teaching strategies, identify areas for improvement, and develop plans for further professional growth. This process contributes to the formation of reflective practitioners capable of continuous professional learning and adaptation.

4.3. Examples of Instructional Modules for Developing Metacognitive Strategies

Based on the proposed three-stage model and taking into account the results of the empirical study, which identified the most problematic areas (namely, the low levels of monitoring and evaluation/regulation strategies, as well as the presence of contradictory beliefs among the majority of students), a set of instructional modules was developed for integration into teacher education programs for preservice primary school teachers.

These modules may be incorporated into existing courses such as Psychology, Pedagogy, and Teaching Methodology, or implemented as part of a separate elective course with a workload of approximately 36–72 academic hours. The primary purpose of these modules is to provide systematic support for the development of metacognitive competence and to promote students' ability to regulate, evaluate, and improve their own learning and professional activities.

Session 2. Beliefs About Learning and Monitoring of Understanding

Students complete the adapted version of the Beliefs About Learning Scale (BALS) and participate in a group activity based on statements reflecting constructivist and transmissive views of learning (e.g., “Knowledge is transmitted by the teacher”, “Knowledge is constructed by the learner”, “Mistakes indicate failure”, “Mistakes are opportunities for growth”). Participants categorize statements into “agree” and “disagree” groups, compare their responses in small groups, and discuss conflicting viewpoints.

The session also introduces the concept of monitoring comprehension. A short lecture presents common indicators of misunderstanding, such as difficulties in paraphrasing information, logical gaps, and feelings of cognitive uncertainty. Students practice evaluating their understanding while reading texts of varying complexity using a three-level scale: “understood – unsure – did not understand.” Their self-assessments are then compared with comprehension test results to identify possible overconfidence biases.

Reflection activities include answering questions such as: “Which statement surprised me most?”, “What contradictions do I notice in my beliefs about learning?”, and “How do I recognize that I do not fully understand a topic?” Students are also introduced to the “Stop and Think” technique, which encourages them to pause periodically during study and ask themselves whether they can explain the material in their own words. As homework, students write a short reflective essay entitled “How I Learned Best: A Story of One Successful Learning Experience” and identify the learning strategies they used.

Our pilot implementation of selected module components during the 2023–2024 academic year, involving 64 third- and fourth-year students, demonstrated that even partial integration of metacognitive instruction (12 academic hours) resulted in statistically significant improvements in the subscales of Monitoring Strategies (from 3.14 to 3.46, $p < 0.05$) and Evaluation and Regulation Strategies (from 3.08 to 3.39, $p < 0.05$), while no significant changes were observed in the control group. The effect remained stable when reassessed three months later, indicating the sustainability of the acquired skills.

5. PRACTICAL RECOMMENDATIONS FOR INTEGRATING THE METACOGNITIVE COMPONENT INTO TEACHER EDUCATION PROGRAMS

5.1. Instructional Techniques and Technologies for Developing Metacognitive Strategies

An analysis of successful educational practices makes it possible to propose a number of specific instructional techniques that can be employed by university instructors to foster the development of metacognitive strategies among preservice primary school teachers. These techniques are designed to enhance students’ ability to plan, monitor, evaluate, and regulate their own learning processes, thereby promoting greater academic autonomy and professional competence.

The “Three-Part Questionnaire” Technique. Before engaging with learning materials (e.g., reading a chapter, attending a lecture, or preparing for a seminar), students answer three questions: **“What do I already know about this topic?”**, **“What do I need to learn?”**, and **“How will I determine whether I have mastered the material?”** After completing the learning activity, students revisit the same questions as part of a reflective exercise. This technique promotes the activation of prior knowledge, goal setting, and the development of self-assessment criteria.

The “Metacognitive Portfolio” Technique. Students maintain a metacognitive portfolio that documents not only the outcomes of their learning activities but also the processes involved in organizing and regulating their learning. The portfolio includes learning goals for each module, action plans with timelines and resources, reflective notes on challenges encountered and strategies used to overcome them, as well as self-evaluations of learning outcomes. Portfolios are periodically reviewed and discussed in small-group sessions or individual consultations with instructors, fostering reflection and continuous self-improvement.

5.2. The Role of Teaching Practicum in the Development of Metacognitive Strategies

Teaching practicum represents a critical stage of professional teacher preparation, during which theoretical knowledge is integrated with practical skills. It is within authentic teaching contexts that preservice teachers experience the greatest need for reflection, planning, and self-regulation, creating favorable conditions for the development of metacognitive strategies.

To maximize the potential of teaching practicum for fostering metacognitive competence, the following measures are recommended:

1. **Structured Reflective Practice.** Student teachers should maintain a reflective practicum journal that includes not only descriptions of lessons and activities but also analyses of challenges encountered,

identification of factors contributing to successes and failures, and the formulation of goals for subsequent teaching activities.

2. **Reflective Discussion Sessions.** Regular reflection meetings involving supervisors and student teachers should be organized to discuss not only methodological aspects of teaching but also the planning, monitoring, and evaluation strategies employed during instructional practice.
3. **Observation of Mentor Teachers' Metacognitive Practices.** Student teachers should be encouraged to observe how experienced teachers plan lessons, adapt instruction based on students' responses, and facilitate classroom reflection. These observations can then be analyzed and discussed to enhance metacognitive awareness.
4. **Video-Based Lesson Analysis.** Recording and reviewing teaching episodes enables student teachers to analyze their instructional decisions from a metacognitive perspective, evaluate their effectiveness, and identify alternative approaches for future improvement. This practice serves as a powerful tool for developing professional reflection and self-regulated teaching.

6. DISCUSSION OF EMPIRICAL FINDINGS IN THE CONTEXT OF INTERNATIONAL RESEARCH

The findings of the present empirical study not only provide insight into the current state of metacognitive strategy development among preservice primary school teachers but also allow for meaningful comparison with results reported in international research. Such comparisons are important for identifying both universal and context-specific patterns in the development of metacognitive strategies within teacher education programs.

Table 5. Metacognitive strategy scores by academic year

Year	n	Planning	Monitoring	Evaluation	Overall
1st	48	3.42	2.84	2.71	3.01
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4th	46	3.95	3.32	3.3	3.49

The overall level of metacognitive strategy development identified in the present study ($M = 3.27$ on a 5-point scale) is comparable to the findings of the systematic review conducted by Franciscão and Boruchovitch (2023), who analyzed 14 studies focusing on learning strategies among preservice teachers. Their review concluded that students enrolled in teacher education programs generally demonstrate a moderate level of cognitive and metacognitive strategy use. Furthermore, information organization and planning strategies were reported as the most frequently employed, whereas comprehension-monitoring strategies were used least often.

The similarity between our findings and those reported in international studies suggests that challenges related to the development of metacognitive regulation are not limited to a particular educational system but represent a broader issue within teacher education. In particular, the relatively low use of monitoring strategies indicates that many preservice teachers experience difficulties in continuously evaluating their understanding and adjusting their learning processes accordingly.

Our findings indicating significantly lower scores on the Monitoring and Evaluation/Regulation subscales compared to the Planning subscale are also consistent with international research. A study by Vosniadou et al. (2021) demonstrated that preservice teachers tend to overestimate their self-regulation abilities and report frequent use of planning strategies, whereas their actual ability to monitor understanding during learning activities is considerably less developed. The authors attribute this discrepancy between declared intentions and actual behavior to insufficient procedural metacognitive knowledge. In other words, students generally know *what* should be done (e.g., setting goals and planning time), but often lack knowledge of *how* to effectively monitor their understanding in specific learning situations.

An interesting finding of the present study concerns the developmental trajectory of metacognitive strategies across academic years. While the overall increase from the first to the fourth year amounted to 0.48 points (from 3.01 to 3.49), a study conducted by Soeharto et al. (2024) in Indonesia using Rasch analysis reported an increase of 0.61 points in metacognitive awareness of reading strategies over a comparable period. The somewhat smaller increase observed in our sample may be explained by differences in curriculum design. In the Indonesian study, metacognitive instruction was explicitly integrated into academic writing and professional reading courses, whereas no dedicated course focusing on metacognitive strategy development is included in our teacher

education program. Consequently, the development of metacognitive strategies in our context appears to occur more implicitly, as a by-product of engagement with other academic disciplines.

This phenomenon is closely related to the concept of epistemological shift, widely discussed in teacher education research. Many students enter teacher education programs with well-established beliefs about learning that have been shaped by more than a decade of schooling, often based on a transmissive model of instruction. During their professional preparation, they are exposed to constructivist perspectives and educational discourse; however, their deeply rooted beliefs tend to change slowly and frequently remain inconsistent.

The findings of the present study suggest that mere exposure to constructivist theories is insufficient to produce meaningful changes in students' use of metacognitive strategies. Developing metacognitive competence requires deliberate pedagogical efforts aimed at making these contradictions explicit and helping students resolve them. Such efforts may include reflective practices, analysis of personal learning experiences, case-based discussions, and critical examination of beliefs about knowledge, teaching, and learning. These activities can facilitate a gradual transition from transmissive to constructivist orientations and promote more consistent engagement in metacognitive and self-regulated learning practices.

7. CONCLUSION

The development of metacognitive strategies among preservice primary school teachers represents an important challenge for contemporary teacher education. The review of the literature and the findings of the present study indicate that a considerable proportion of teacher education students demonstrate only a moderate level of metacognitive strategy use. Furthermore, many students hold contradictory beliefs about the nature of learning, which may hinder the effective application of metacognitive skills and self-regulated learning practices.

Based on the theoretical analysis and the synthesis of empirical evidence, this study proposed a three-stage model for the development of metacognitive strategies, consisting of a propaedeutic stage, an active development stage, and an integrative-reflective stage. In addition, practical recommendations were formulated for integrating metacognitive components into primary teacher education programs. The empirical findings suggest that targeted metacognitive instruction can contribute to the improvement of students' monitoring, evaluation, and self-regulation skills, thereby enhancing both academic performance and professional competence. Several directions for future research can be identified. These include: (1) the development and validation of diagnostic instruments for assessing metacognitive strategies among preservice primary school teachers; (2) experimental evaluation of the effectiveness of the proposed developmental model; (3) investigation of the relationship between teachers' metacognitive competence and the development of self-regulated learning skills among primary school pupils; and (4) the design and implementation of professional development programs aimed at strengthening metacognitive teaching practices among in-service primary school teachers.

Overall, the findings highlight the importance of systematically integrating metacognitive instruction into teacher education curricula as a means of preparing reflective, self-regulated, and professionally competent teachers capable of meeting the demands of contemporary education.

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