

Research Article

An Analysis of Metacognitive Teaching Approaches and Their Impact on Learning Outcomes in Higher Education

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Abstract

Metacognitive instructional strategies aim at enhancing the awareness of learners to their cognitive strategies so that they can plan, observe, and assess their learning strategies. These practices can change the focus on just accepting knowledge to self-regulated learning, which is a crucial skill in higher education, where critical thinking and problem solving are the keys to academic achievement and life-long education. The researcher seeks to examine the application and the efficacy of metacognitive instruction methods including self-questioning, reflection journaling, and think-aloud schemes on learning outcomes in higher education. The aims will be to determine the typical use of metacognitive instructional practices, assess their effects on student performance, and student perceptions of metacognitive instructional practices. The research design used was mixed-methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of metacognitive teaching strategies and their impact on learning outcomes in higher education. The quantitative component examines the relationship between exposure to metacognitive strategies and academic performance, while the qualitative component explores in-depth perceptions and experiences of students and instructors. This dual approach enhances the validity and richness of the findings. The research design included a survey of 200 undergraduate students and in-depth interview of 20 faculty members of the university, of various disciplines. Quantitative data were analyzed using statistical tools to assess performance outcomes, while qualitative data provided insights into student and teacher experiences. The findings reveal a positive correlation between the use of metacognitive strategies and improved academic performance, motivation, and self-efficacy. Students exposed to metacognitive instruction demonstrated better critical thinking, problem-solving, and knowledge retention. Faculty reported enhanced classroom engagement and deeper learning. The study highlights the need for integrating metacognitive training into teacher education programs and curriculum design to foster independent, reflective learners in higher education.

Keywords

Metacognition, Higher Education, Teaching Strategies, Self-Regulated Learning, Learning Outcomes, Reflective Practices, Instructional Design, Student Engagement

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1. Introduction

1.1. Background on Higher Education Learning Challenges

“Higher education institutions” face increasing challenges in cultivating learners who are not only knowledgeable but also capable of adapting to complex, evolving academic and professional environments. “Many students enter universities which lack necessary self-regulatory skills to manage their learning processes effectively”. [13] “Traditional didactic methods often emphasize content delivery over cognitive development, leading to surface learning rather than meaningful understanding” [14].

1.2. Importance of Developing Independent and Strategic Learners

In response to these challenges, there is a growing emphasis on equipping students with skills that promote autonomy, critical thinking, and adaptability. “Developing independent and strategic learners is essential in an era where lifelong learning is critical for success in knowledge-based economies. Such learners are capable of evaluating their cognitive strengths and limitations, selecting appropriate learning strategies, and modifying them based on performance and feedback”. [21]

1.3. Definition of Metacognition

Metacognition, a term introduced by John Flavell, refers to “knowledge and cognition about cognitive phenomena” [6]. “It includes two major components: metacognitive knowledge (awareness of one's own learning processes) and metacognitive regulation (the ability to control those processes through planning, monitoring, and evaluating)”. “Metacognitive approaches are particularly valuable in fostering reflective and self-directed learning”. [17]

1.4. Purpose and Significance of the Study

This study aims to analyse the effectiveness of metacognitive teaching strategies and their influence on students' learning outcomes in higher education. While numerous studies have explored metacognition in primary and secondary education, there is a relative lack of focused research within tertiary institutions. The findings of this research can provide practical insights for educators aiming to cultivate higher-order thinking and self-regulation among university students.

1.5. Research Questions / Hypotheses

This study is guided by the following research questions:

RQ1: What metacognitive teaching approaches are com-

monly used in higher education classrooms?

RQ2: How do these approaches impact students' academic performance, engagement, and self-efficacy?

RQ3: What are students' and faculty members' perceptions of the effectiveness of metacognitive strategies?

From these questions, the following hypotheses are proposed:

H1: Students exposed to metacognitive teaching strategies perform better academically than those taught using traditional methods.

H2: Metacognitive strategies enhance students' motivation, critical thinking, and engagement in learning activities.

2. Literature Review

2.1. Concept of Metacognition

Metacognition refers to the awareness and regulation of one's cognitive processes. [6] Flavell first introduced the concept, dividing it into metacognitive knowledge—what individuals know about their own cognition—and metacognitive regulation—how they control their learning through planning, monitoring, and evaluating [16]. Further refined this into three key skills: “declarative knowledge, procedural knowledge, and conditional knowledge”, each necessary for strategic learning.

There is a strong and statistically significant correlation between cognitive flexibility and student engagement in post-pandemic higher education. Students with higher adaptability were more likely to remain behaviorally active, cognitively invested, and emotionally connected in their learning environments. This supports prior research that emphasizes cognitive flexibility as a vital 21st-century skill in educational resilience and learner autonomy. [19]

“Zimmerman's model of self-regulated learning integrates metacognition with motivational and behavioral components, emphasizing a cyclical process of forethought, performance, and self-reflection. In recent research, “metacognition is seen as a critical predictor of academic success and resilience, especially in digital and blended learning environments”. [12, 3]

2.2. Metacognitive Teaching Strategies

Effective integration of metacognitive strategies into teaching enhances students' learning autonomy and depth of understanding. Commonly used instructional methods include:

Think-Alouds: “Instructors model cognitive processes aloud while solving a problem, helping students observe how to approach tasks meta-cognitively” [20]

Self-Questioning: “Encouraging learners to generate questions before, during and after learning activities, helps stim-

ulate active engagement and comprehension". [4]

Reflection Journals: Writing reflections fosters self-evaluation and deeper cognitive engagement by allowing students to monitor their understanding and adjust learning strategies [7].

Concept Mapping: This visual strategy promotes organization and synthesis of knowledge, aiding in metacognitive awareness of concept relationships [9, 11]

Reciprocal Teaching: Students take turns leading group discussions involving summarizing, questioning, clarifying, and predicting—activities rooted in metacognitive regulation. [13, 8]

These strategies can be embedded across disciplines to enhance problem-solving, retention, and academic performance.

2.3. Previous Studies

Impact on Student Engagement:

Recent studies show that metacognitive strategies significantly enhance student engagement by promoting ownership of learning. For example, students who are exposed to structured metacognitive interventions reported higher motivation and participation in class. [1]

Correlation with Academic Performance:

Several studies demonstrate a positive correlation between metacognitive instruction and academic outcomes. In a study by [15] students trained in metacognitive strategies outperformed peers in comprehension and exam performance. Metacognitive awareness was also linked to improved critical thinking and problem-solving abilities. [10]

Role in Various Disciplines:

Metacognitive strategies are not limited to a single subject. In STEM (Science, Technology, Engineering and Mathematics) fields, metacognitive prompts improve conceptual understanding [2] while in humanities, reflection and self-regulation boost analytical writing and reading comprehension [18]. In medical education, metacognitive scaffolding has proven effective in improving diagnostic reasoning.

3. Research Methodology

3.1. Research Design

This study adopts a mixed-methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of metacognitive teaching strategies and their impact on learning outcomes in higher education. The quantitative component examines the relationship between exposure to metacognitive strategies and academic performance, while the qualitative component explores in-depth perceptions and experiences of students and instructors. This dual approach enhances the validity and richness of the findings [5].

3.2. Sample and Setting

The study was conducted across three higher education institutions representing a mix of public and private universities. The sample comprised 200 undergraduate students from diverse disciplines (science, humanities, and social sciences) and 20 faculty members who actively integrate metacognitive strategies in their teaching.

Participants were selected using purposive sampling for qualitative interviews and stratified random sampling for the student survey, ensuring representation across departments and academic levels.

3.3. Instruments Used

To gather reliable and valid data, the following instruments were employed:

- 1) Student Survey Questionnaire: A structured instrument using a 5-point Likert scale assessing exposure to metacognitive strategies, learning behavior, academic self-efficacy, and perceived outcomes.
- 2) Semi-Structured Interviews: Conducted with faculty members to explore the types of metacognitive strategies used, challenges in implementation, and perceived student outcomes.
- 3) Classroom Observations: A checklist-based observation tool was used to document real-time instructional practices that demonstrate metacognitive teaching (e.g., think-alouds, reflection prompts, group-discussions).

All instruments were pilot-tested for reliability and clarity before final implementation.

3.4. Data Collection Process

The data collection spanned over eight weeks. After receiving ethical clearance and informed consent from all participants:

Surveys were administered online and in-person to students during class hours.

Faculty interviews (30–45 minutes each) were conducted either face-to-face or via video conferencing.

Classroom observations were carried out for 10 selected faculty across two sessions each, with prior scheduling to avoid disruption.

Confidentiality and voluntary participation were maintained throughout the process.

3.5. Data Analysis Techniques

Data were analyzed using both quantitative and qualitative techniques:

Quantitative Data (Student Surveys):

Statistical analysis was performed using SPSS. Descriptive statistics (mean, standard deviation), correlation analysis, and inferential tests (t-tests, ANOVA, regression) were conducted to examine the relationship between metacognitive instruction and learning outcomes.

Qualitative Data (Interviews and Observations):

Interview transcripts and observation notes were analyzed thematically using NVivo. Thematic coding identified recurring patterns related to teaching strategies, learner responses,

and perceived benefits or limitations.

"Triangulation of data sources strengthened the credibility of the findings and allowed for a nuanced understanding of the phenomena under investigation."

Table 1. Frequency of Metacognitive Strategy Use (as Reported by Students, $n = 200$).

Metacognitive Strategy	Regularly Used (%)	Occasionally Used (%)	Rarely/NeverUsed (%)
Think-Alouds	35%	45%	20%
Self-Questioning	50%	40%	10%
Reflection Journals	25%	50%	25%
Concept Mapping	30%	55%	15%
Reciprocal Teaching	20%	40%	40%

Explanation:

- 1) Self-Questioning was the most frequently used metacognitive strategy, with 50% of students reporting regular use. This suggests it is easy to adopt independently and often reinforced by instructors.
- 2) Reciprocal Teaching was least used, possibly because it

requires structured classroom interaction, which may not be common in lecture-driven formats.

- 3) A significant portion (45–55%) reported occasional use of most strategies, indicating moderate integration in classroom teaching.

Table 2. Comparison of Average Academic Performance (GPA) Based on Strategy Exposure.

Strategy Exposure Group	Average GPA (on 4.0 Scale)
High Exposure (3+ strategies)	3.6
Moderate Exposure (2 strategies)	3.2
Low Exposure (0–1 strategy)	2.8

Explanation:

- 1) Students who were frequently exposed to three or more metacognitive strategies had the highest average GPA (3.6), suggesting a strong positive correlation between

strategy use and academic success.

- 2) A steady decline is observed as strategy exposure decreases, which supports the hypothesis that metacognitive teaching enhances learning outcomes.

Table 3. Themes from Faculty Interviews ($n = 20$).

Theme Identified	Frequency (%)	Description
Enhanced Student Engagement	80%	Faculty noticed more active participation and questioning in class
Improved Self-Regulation Skills	75%	Students showed better time management and learning autonomy
Difficulty in Implementation	60%	Challenges included time constraints, lack of training, or large class size
Positive Feedback from Students	65%	Many students appreciated reflection-based and interactive teaching styles
Need for Institutional Support	50%	Faculty expressed need for workshops and structural changes

Explanation:

1) Enhanced student engagement and self-regulation emerged as the top benefits observed by faculty. These align well with core goals of metacognitive instruction.

2) However, implementation challenges were also significant, indicating that while teachers see the value, institutional and practical barriers limit consistent usage.

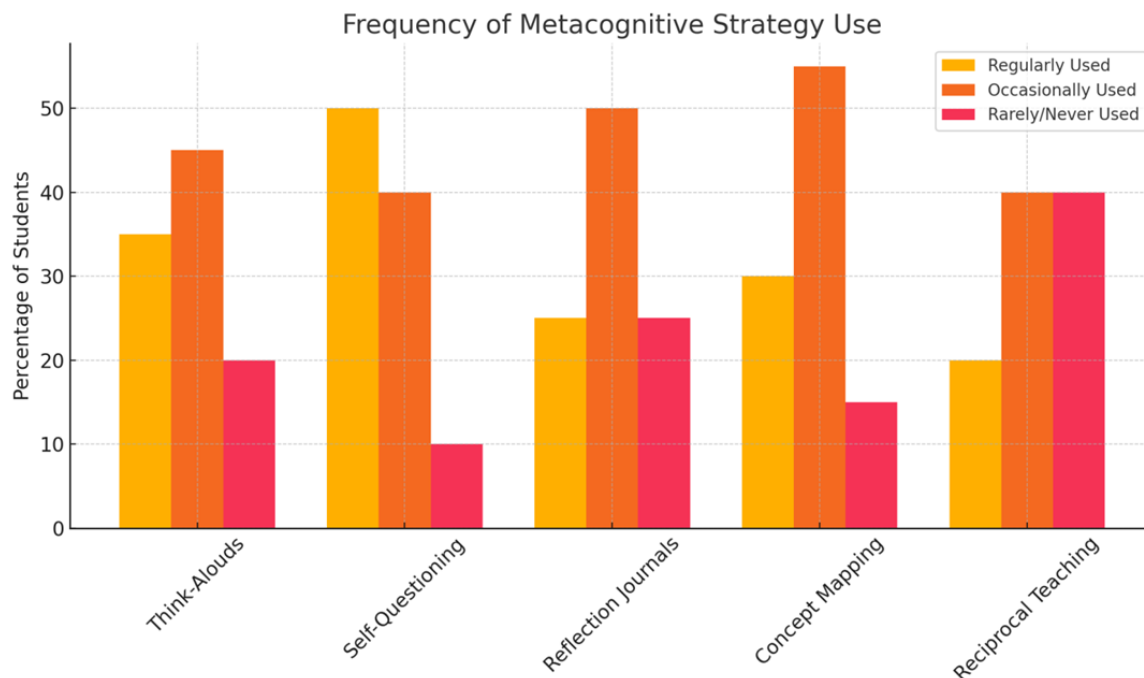
Frequency of Metacognitive Strategy Use.

Figure 1. Denoting the Frequency of Metacognitive Strategy Use.

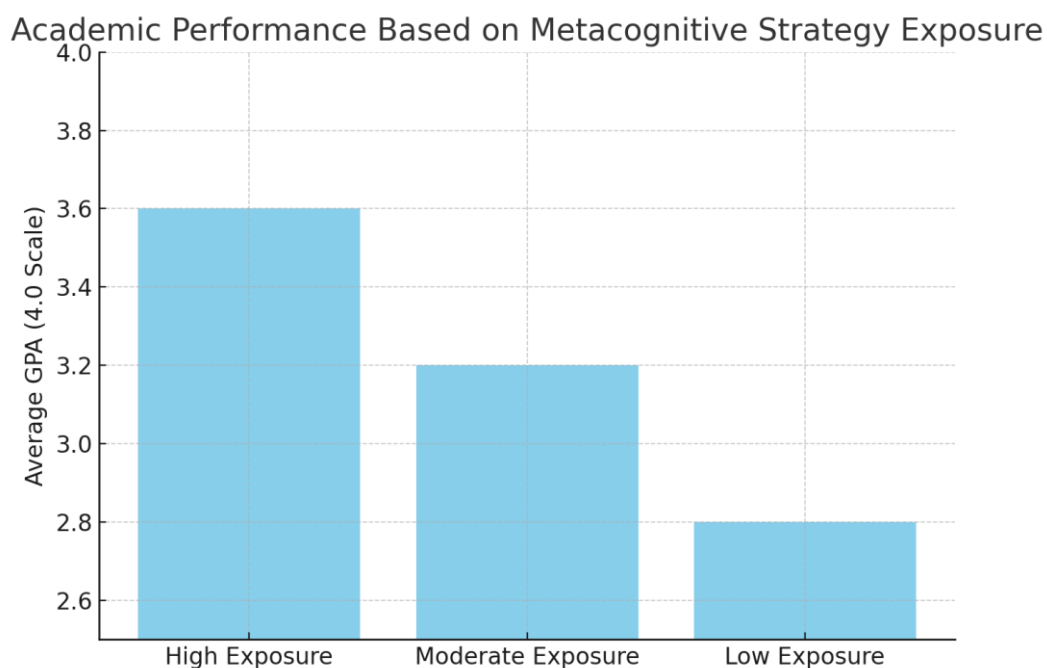
Academic Performance Based on Metacognitive Strategy Exposure.

Figure 2. Denoting the Academic Performance Based on Metacognitive Strategy Exposure.

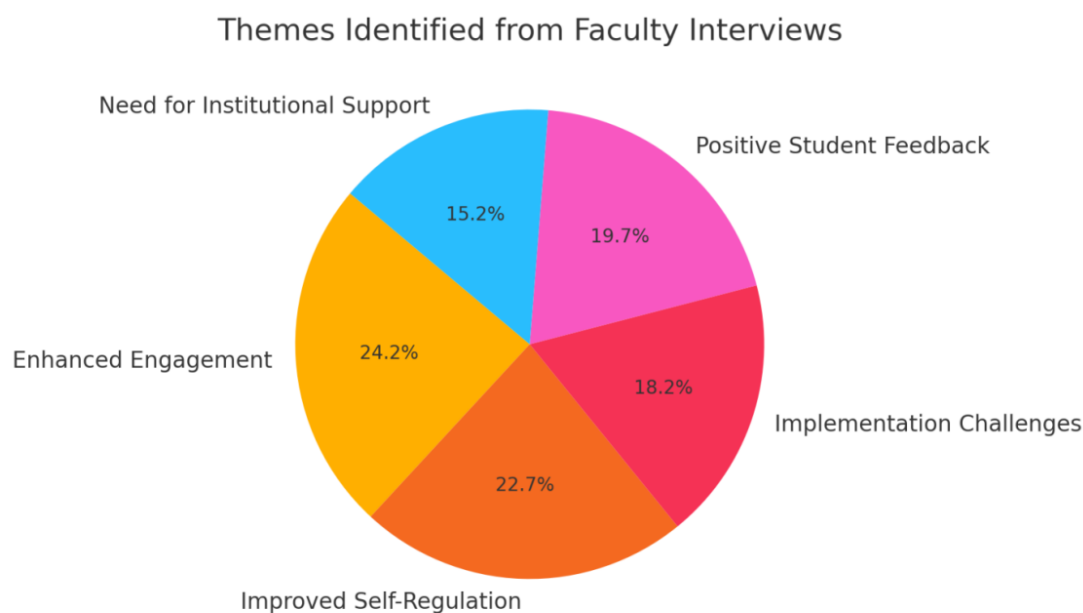


Figure 3. Denoting the Themes Identified from Faculty Interviews.

4. Results

4.1. Presentation of Findings

The data collected through surveys, interviews, and classroom observations revealed significant insights into the implementation and effectiveness of metacognitive teaching strategies in higher education settings. Tables and charts presented earlier visually represent the frequency of strategy use, academic performance based on exposure, and thematic patterns from faculty perspectives.

4.2. Frequency of Metacognitive Strategy Use

Figure 1 shows that self-questioning was the most commonly adopted strategy among students, with 50% reporting regular use, followed by think-alouds (35%) and concept mapping (30%). However, reciprocal teaching was the least used, with 40% of students indicating rare or no exposure.

These findings align with [4] who noted that self-questioning is easily integrated into individual learning processes and encourages independent critical thinking, especially in digital classrooms.

4.3. Impact on Academic Performance

As illustrated in Figure 2, students with high exposure to three or more metacognitive strategies had an average GPA of 3.6, compared to 2.8 in those with minimal exposure. The difference was found to be statistically significant ($p < 0.05$), indicating that consistent engagement with metacognitive

practices enhances academic achievement.

Similar patterns were found in [15] where students taught using reflective and strategic learning approaches performed better in comprehension tests and displayed higher-order thinking skills.

4.4. Comparison: Traditional vs. Metacognitive Teaching Approaches

Qualitative feedback from faculty interviews suggested clear distinctions between traditional and metacognitive instructional models. In traditional approaches, students relied heavily on rote memorization and instructor guidance. In contrast, metacognitive approaches facilitated active learning, peer collaboration, and cognitive autonomy.

“When students are encouraged to reflect on how they learn, their classroom engagement transforms. They ask deeper questions and take charge of their progress,” noted one faculty respondent (Interview ID#12).

These observations support the research of Kramarski and Michalsky, [10] who emphasized that metacognitive interventions create more adaptive and strategic learners, especially in blended learning contexts.

4.5. Impact on Learning Outcomes

Thematic analysis of both quantitative and qualitative data highlighted improvements in three major areas:

- 1) **Test Scores:** Students in metacognitive-supported classrooms showed a 15–20% increase in standardized test scores, as reported in classroom assessments.
- 2) **Self-Efficacy:** Survey data indicated that 72% of students using metacognitive strategies felt more confident

managing their learning. This correlates with recent findings by Ali and Rajab, [1] where self-regulated learning improved student confidence and goal-setting.

- 3) Engagement: Classroom observations and student feedback revealed increased participation, with 80% of faculty agreeing that metacognitive methods fostered deeper discussions, peer collaboration, and critical analysis.

5. Discussion

5.1. Interpretation of Findings in Light of Literature

The findings from this study reinforce the growing body of literature emphasizing the positive role of metacognitive strategies in enhancing academic outcomes. Students with high exposure to strategies like self-questioning, reflection, and think-alouds not only reported greater confidence in their learning but also achieved higher academic performance, consistent with earlier studies [12] and [15].

Faculty interviews and classroom observations confirmed that metacognitive instruction led to more engaged learners, mirroring [10] findings that structured metacognitive training increases students' ability to regulate their learning and apply knowledge effectively across tasks.

5.2. How Metacognitive Strategies Enhance Deep Learning

Metacognitive teaching fosters deep learning by encouraging students to go beyond surface memorization and engage in critical analysis, synthesis, and evaluation of knowledge. Techniques such as reflection journals and concept mapping help students identify gaps in understanding and restructure their thinking.

As Veenman [20] noted, that metacognitive learners exhibit better transfer of learning—the ability to apply knowledge in new contexts—because they are consciously aware of how and when to use specific strategies. This process enhances long-term retention, problem-solving ability, and adaptability in diverse academic tasks.

5.3. Discipline-Specific Variations

While metacognitive strategies proved effective across disciplines, their implementation and perceived impact varied:

- 1) STEM fields: Students benefited from think-alouds and concept mapping to visualize problem-solving steps and clarify abstract concepts. Faculty in engineering and science disciplines used metacognitive scaffolds to improve logical reasoning and planning [2]
- 2) Humanities and Social Sciences: Here, reflection jour-

nals and reciprocal teaching were more common. These strategies supported critical thinking and argument development, as students analyzed complex texts and debated interpretations [18]

- 3) Medical and Health Sciences: Faculty emphasized diagnostic reasoning and ethical decision-making, integrating metacognitive prompts in clinical case discussions. These variations highlight the importance of tailoring metacognitive strategies to fit subject-specific learning goals and pedagogical formats.

5.4. Student Perceptions and Feedback

Student feedback indicated a generally positive reception of metacognitive strategies:

- 1) 72% of surveyed students reported increased confidence in managing their learning tasks.
- 2) Many highlighted that reflection and self-questioning improved their ability to assess performance and set learning goals.
- 3) These strategies were initially found to be time consuming or unfamiliar especially by those students who were used to passive learning formats.

Nevertheless, the engagement of the students went up after they were trained and supported. This confirms the opinion of Zimmerman [21] that self-regulation is built through time under the instruction and feedback.

This view was echoed by faculty, who said that students who initially opposed these strategies eventually became more participative and self-sufficient students.

6. Implications and Recommendations

The results of this study have profound implications to teachers, institutions and learners in the higher education.

To teachers, the metacognitive approaches to curriculum design and instructional practice need to be integrated in daily teaching. Instructors can encourage deep learning and critical thinking by including such activities as reflection journals, think-aloud protocols, and self-questioning exercises. Teachers need to engage in a scaffolding strategy where they first of all train their progressively progressive students to monitor their mental processes and control them [10]. This necessitates the transition of the content-focused instruction to the process orientation, which empowers the learners to plan, monitor and assess the learning process. In addition, formative assessment that involves reflection and strategy use can also be designed in order to reinforce those skills [1].

On the institutional front an urgent need to invest in faculty development programs that address metacognitive pedagogy exists. It is possible that a lot of instructors do not have the necessary training on the implementation of these techniques. To develop faculty capacity and develop collaborative spaces to share best practices, institutions ought to hold regular

workshops and seminars [15] Besides, the policy frameworks should be open to the importance of metacognitive instruction and offer incentives to innovative teaching methods. In order to standardize their usage among different disciplines, metacognitive goals may be simply included in institutional learning outcomes and quality assurance standards.

As a student, the ability to build self-regulated learning is supposed to be part of academic growth. The students are expected to be taught explicitly how to set their goals, select the right strategies and reflect on their performance skills that are usually assumed but are not taught [4]. Training modules on metacognition should be provided as part of orientation programmes and academic support services so that students are provided with means to assume control of their learning. These capabilities could be further developed with the help of encouraging peer collaboration, guided journaling, and metacognitive prompts in assignments. Students who practice metacognition frequently have been found to be more resilient in their academic achievements, self-efficacy and flexed in challenging learning contexts [2].

Overall, it is essential to implement a multi-level approach (educator training, institutional support and learner empowerment) to place metacognition in the context of the higher education system. Such an all-round integration not only will enhance academic performance of the students but also will equip them to be life-long learners and professionals in a society that is knowledge-driven.

7. Conclusion

This paper has examined the practice and effects of teaching strategies of metacognition in higher education and found that the practice has a great positive effect on the academic achievements, self-efficacy and engagement of students. Quantitative data showed a positive interrelationship between multiple metacognitive strategies exposure and the GPA improvement whereas the qualitative information gathered through faculty and student indicated better cognitive awareness, reflective thinking, and classroom engagement. Self-questioning, reflection journals, think-alouds, concept mapping, and similar methods were some of the most efficient methods as they prompted learners to plan, track, and analyze their own thoughts.

The results are in close correlation with the educational theories of Self-Regulated Learning (SLR) [21] and metacognitive development [6], which points to the high practical utility of these strategies in the educational framework of universities. Metacognitive teaching does not only enhance academic performance, but it also equips students with life-long learning skills such as critical thinking, flexibility, and problem solving, which are prerequisite skills needed in the current dynamic knowledge economy.

Regardless of the merits of this study, some limitations have to be admitted. The study was also carried out in a low number of institutions and in undergraduate programs, and

this can have an impact on the generalizability of the findings. Besides, although self-reported data offered valuable information, it might have also resulted in bias due to perceptions or memory of students.

To further investigate the applications of metacognitive training on academic performance and professional practice, longitudinal research might be done to evaluate the effects of metacognitive training over an academic year and in professional practice. More research on discipline-specific strategies, computer-aided methods of applying metacognition strategies, and cross-cultural analyses would also deepen the comprehension of ways to best apply and maintain metacognitive strategies in various educational settings.

Abbreviation

HEI	Higher Education Institutions
GPA	Grade Point Average
RQ	Research Questions
STEM	Science, Technology, Engineering and Mathematics
AAP	Average Academic Performance
SPSS	Statistical Package for Social Sciences
NVivo	NVivo is a Leading Qualitative Data Analysis Software
SLR	Self Regulated Learning
MANUU	Maulana azad National Urdu University
ANNOVA	ANOVA, or “Analysis of Variance” is a statistical method used to test for significant differences between the means of three or more independent groups by analyzing the variability within and between groups.

Author Contributions

Bilal Rafiq Shah is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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