

The Role of Metacognitive Strategies in Enhancing Communication and Cognitive Learning

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Abstract—This study endeavours to explore the role of metacognitive strategies in improving the process of communication and cognitive learning among students. Metacognitive strategies, a crucial set of cognitive skills for planning, controlling and assessing one's learning activities, are essential for developing higher mental processes and enhancing academic performance. This study delves into these strategies' real and potential applications in educational settings, aiming to improve the quality of speech and thought processes. The study was conducted in three phases: pre-intervention, during, and post-intervention. The study employed both quantitative and qualitative methods of data collection in a bid to effectively gather data about the impact of metacognitive strategies. The sample comprised 120 students aged 14–17 from three different secondary schools in Multan City, Pakistan. The results revealed that improved verbal communication skills, enhanced levels of cognitive presence and higher grades characterised the students who used metacognitive strategies. The study suggests that metacognitive skills could foster independent, lifelong learners who are adaptable and prepared to face academic and real-life challenges.

Index Terms—metacognitive strategies, academic performance, self-regulation, social interactions, learning disability

I. INTRODUCTION

In the modern world, creating an efficient learning environment has become one of the most essential aspects of education (Kobylarek, 2021). Defined as the processes aimed at the knowledge and control of cognition, metacognitive strategies have drawn much attention in the last few years (Flavell, 1979). That is why these strategies are crucial for developing higher-order thinking skills and boosting academics and the learning capabilities of the students (Schraw & Moshman, 1995). Metacognition, or 'thinking about thinking', includes two primary components: the two dimensions are, therefore, metacognition knowledge and metacognition regulation. Schraw and Dennison (1994) defined metacognition as the knowledge of cognition and the regulation of cognition, which contains planning and monitoring. Scholars have established that learners who use metacognition are more effective, achieve higher grades, solve more problems, and are more flexible in their learning processes (Veenman et al., 2006; Azizi et al., 2023). Hence, another element that forms an antidote to different outcomes in academic and professional endeavours is communication (Kobylarek et al., 2022). Aside from the basics of presenting information or gossip comprehensibly, it also entails the

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ability to receive information and the processes to analyse it and act appropriately (Hattie, 2012). Communication skills par, particularly those employed in organisations, should be nurtured as they are significant for learning environments and are related to cognitive learning processes. Using metacognitive strategies in communication skills may facilitate formulating and organising learners' interactions and responses with others (Baker & Brown, 1984).

Bloom (1956) identified cognitive learning, which includes processes like attention, memory, and problem-solving as core values in educational accomplishment. Cognitive learning is complemented by metacognitive strategies that enhance learning process awareness by students and the efficiency of the learning strategies used by students (Pintrich, 2002). All these strategies assist students in observing their learning activities and assessing the results, enhancing cognitive presence and academic achievement (Zimmerman, 2002). The application of metacognitive strategies in the classroom environment is done to improve both communication and cognition in the learners. Generally, metacognitive skills include planning, controlling, and evaluating one's own learning, a measure vital for higher-order thinking and academic achievement. While research and debates show that these strategies can support improvement in verbal communication and cognitive improvements, there is a lack of empirical evidence on the practical implementation of these strategies in secondary school settings. The present study aims to fill the identified lack of research on metacognition in educational settings with a specific focus on the strategies of real-life application and effects. Thus, this study aims to establish how communication skills and cognitive learning are affected by different practices to understand better educational practices that enhance teaching performance and lifelong learning. Knowing the effectiveness of such measures can help educators know how to develop students who can competently study independently and succeed in school and work, respectively.

II. LITERATURE REVIEW

The term metacognition was first used by Flavell (1976) and is defined as the person's ability to understand and be conscious of his/her thinking. In educational contexts, metacognition encompasses two key components: strategic awareness, both content-wise and regulative aspects of people's cognition, referred to as metacognitive knowledge and metacognitive regulation (Schraw & Moshman, 1995). Metacognition is awareness of one's cognitive procedures and learning when and why a specific procedure is applicable. Metacognitive regulation is a process that involves a person's planning, monitoring, and evaluating of his/her cognition. It was established that students who adopt metacognition have mastered how they learn; therefore, these learners are more effective problem solvers and performers (Veenman et al., 2006; Alam & Ahmad, 2024).

Metacognition commonly refers to thinking about thinking; this is a way of breaking down complex problem-solving and cognitive processes into manageable aspects to address and manage them effectively (Weiss et al., 2023). Interpersonal skills foster learning growth as well as accomplishment in one's career. Communication is the transfer of information, the clarity of the sender's message, and the ability to receive, comprehend, and adequately respond to it. Metacognitive strategies are of considerable help in strengthening these skills (Ajmal et al., 2025; Alam, 2025a). Negretti (2012) and Beg et al. (2025) observed a positive correlation between metacognitive awareness and students' writing performance by providing students with strategies for planning, monitoring, and evaluating their writing processes. On a like note, Vandergrift and Tafaghodtari (2010) showed that metacognitive instruction positively impacted listening comprehension, allowing students to be smarter with their listening skills. The present literature suggests that the effectiveness of metacognitive strategies in preschool and elementary education is an unexplored area of research concerning overall communication skills in secondary education. Much of the work has been done on specific communication facets, including writing, and not comprehensively including speaking and reading (Alam, 2024). Such a gap in the literature emphasises the importance of future studies that focus on establishing the effectiveness of metacognitive skills in improving overall communication skills.

Cognitive learning refers to mental activities that occur when learning is done, including attainment, organisation, transformation and knowledge storage (Bloom, 1956). Some of these processes include attention, recall, and the formulation of solutions, which are most of the processes that are vital for academic performance (Alam et al., 2024). Metacognitive strategies are helpful in facilitating cognitive learning because they help the students develop knowledge of some of the learning methods. Dignath and Büttner (2008) reported a quantitative synthesis study on the impact of metacognitive strategy instruction, which indicated positive outcomes in the learners' cognition, self-regulation, motivation, and academic achievement. Shams et al. (2025) also reported self-regulated learning and teaching practice of teaching writing among students. The research focuses on applying reflective practices and self-regulated learning in creative writing.

Several cognitive processes are carried out while using metacognitive strategies to improve cognitive learning. First, planning enables students to identify what they want to achieve in class and which approach to follow to ensure early accomplishment of the laid down course. Second, because it serves the purpose of monitoring, students get to know their progress and have the ability to alter it if necessary. Third, for evaluating, one has to review the accomplishment of the chosen strategies and make any needed changes for similar learning activities in the future (Pintrich, 2002; Alam, 2023). All these processes play a pivotal role in enhancing the outcome of cognitive learning. The use of metacognition strategies, especially in learning environments, has been accredited to have worked in several studies. According to Zohar and Barzilai's synthesis of studies on teaching metacognition, the strategies produced positive effects in science, mathematics, and reading (2013). They stressed the issue of embedded instruction in metacognition, stating that the actualisation of this

approach entails that teachers demonstrate the strategy and organise students' practice in order to work on their reflection on metacognition.

Incorporating metacognitive instruction with traditional teaching practices in the classroom proves to cause some difficulties. According to Veenman et al. (2006), specific knowledge and tools regarding the training of the use of metacognition are often missing in teachers. Also, students may reject such approaches when starting to implement them, and thus, they need encouragement from teachers. To overcome these issues in the future, the professional development of teachers should involve metacognition strategies training, and at school, proper instruments and support for these strategies' application should be provided. There are significant gaps following a literature review on metacognition regarding how metacognitive skills promote communication skills and concept learning. First, evidence-based studies concerning the overall effect of such strategies on multiple aspects of communication in secondary education are scarce. Secondly, larger-scale research is necessary to unearth the impact of the metacognitive strategy instruction on students' performance in the long run. Thirdly, there is a need to ascertain more specifically the difficulties and prohibitive factors regarding practising metacognitive strategies in various educational settings.

III. METHODOLOGY

A. Research Questions

- 1) In what manner does the interaction with the metacognitive strategies influence students' communication abilities?
- 2) What is the attitude of the teachers and students concerning the efficiency of the metacognitive strategies applied for communication and learning?

This study used qualitative and quantitative research design to establish the effectiveness of metacognitive strategies in improving communication and cognitive learning among secondary school students. The research was conducted in three phases: Pre-intervention, during, and post-intervention. The research employed quantitative and qualitative data collection to gather data about the effect of metacognitive strategies effectively. The sample comprised 120 students of 14-17 years of age from three different secondary schools in Multan city. While selecting the schools, care was taken to select only schools which agreed to be involved and had different SES statuses. Random sampling was done in order to get an equal sample. Furthermore, 12 teachers from the sample schools were included to administer the intervention procedure and offer helpful information from the interviews.

B. Pre-Intervention Phase

The regular pre-test assessment was used to compare, and questionnaires and achievement tests were administered to all the group participants before the intervention. Metacognitive Awareness Inventory (MAI) was used to measure students' metacognitive knowledge and the strategies they employed. It is a widely used assessment tool that evaluates different forms of communication, such as listening, speaking, reading and writing. Cognitive Learning Assessment was used as an achievement test that assesses elements like speed, attention, and problem-solving. The researcher observed classrooms to determine the presence of metacognitive strategies in the existing classroom practices and students' interactions. They were conducted according to the set of observation criteria for the signs of metacognition and strategies application. Though structured, questionnaire surveys sought to capture a picture of metacognitive practice determinations by teachers and their impressions of students' communication and general cognitive abilities.

C. Intervention Phase

This research develops and implements a six-week metacognitive strategies training program for teachers and students. The training was conducted through workshops, classroom support, and other exercises to utilise metacognition. The course is centred on the concepts of metacognition, instructions for supporting learners' metacognitive abilities, and techniques for incorporating the strategies into the classroom learning environment. Expanding students' awareness of metacognition includes self-monitoring, self-regulation, and reflective thinking. Some of the activities the students participated in ensured that they put these strategies into practice in their learning. Consultation with the teachers and students was conducted frequently throughout the intervention period to enhance the use of the strategies and techniques. Teachers' use of cognition strategies in teaching was explicitly focused on the elements of knowledge teaching and modelling. The above-named strategies were used actively during learning activities, encouraging students to plan, monitor, and evaluate their work.

D. Post-Intervention Phase

After the intercession, a similar quantitative questionnaire, which was employed before the intervention, was given to probe the advancements made in students' thought processes, how they communicate, and their awareness. To determine the effectiveness of the metacognitive strategy used in classrooms, the researcher made observations of teaching and students' behaviour and examined assessment results. Questionnaires, semi-structured interviews and focus group discussions were conducted with teachers and students to gather qualitative data about their experiences with the metacognitive strategies introduced. A quantitative data collection method was employed whereby the Metacognitive Awareness Inventory, the Communication Skills Assessment and the Cognitive Learning Assessment were used to determine the changes in the student's level of skills and abilities. Two questionnaires regarding metacognition awareness

and strategies were used to compare students' pre and post-intervention. Self-generated notes, reflection on metacognition, and the checklist reflected on the use of metacognitive strategies and students' engagement in learning activities. Questionnaire surveys with the teachers and focus group discussions with the students offered detailed descriptions regarding using metacognitive strategies.

E. Data Analysis

(a). Quantitative Analysis

- Descriptive Statistics: Used to summarise test scores and survey responses.
- Inferential Statistics: Paired t-tests and ANOVA were conducted to determine the significance of changes in communication skills, cognitive learning, and metacognitive awareness pre-and post-intervention.

TABLE 1
PRE-INTERVENTION AND POST-INTERVENTION SCORES

Measure	Pre-intervention	Post-intervention	Change	p-value
Metacognitive Awareness (MAI)	65.3 (12.4)	78.9 (10.2)	+13.6	<0.001
Communication Skills	72.1 (9.8)	81.5 (8.7)	+9.4	<0.001
Cognitive Learning	68.7 (11.2)	77.2 (9.9)	+8.5	<0.001

Note: Values are presented as mean (standard deviation). P-values are from paired t-tests.

This table compares pre-intervention and post-intervention scores for the three main measures: Metacognition, Interpersonal and Cognitive modes of learning. Overall, an increase in the post-intervention mean scores was observed, where, as compared to the pre-intervention scores, the metacognitive awareness scores were highly significant ($t = 9.887$, $p < 0.001$). It also shows that the percentage of students who gained 6 points increased for those who received the metacognitive strategies training program, indicating that the program had positive results in enhancing their metacognitive awareness and utilisation. It was established that there was a highly significant positive change in communication skills ($p < 0.001$). The mean improved by gaining 9 points; on the fourth aspect, the results were 4 points, suggesting that using metacognitive strategies affected students' ability to express themselves. This was backed by a notable improvement in the comprehension of what was taught, symbolised by a cognitive learning score difference of $p < 0.00$. For the mean score, the gain was 8. Hypothesis 2 also received an overall support of 5 points, apparently due to improvement in the student's cognitive learning skills and linkages to the effects of the metacognitive strategies intervention.

(b). Qualitative Analysis

Qualitative analysis also explored how individuals perceive, interpret, and implement metacognitive strategies in real-world contexts. This aligns with the need to understand subjective experiences in communication and cognitive learning. Central themes were derived from the interview and focus group discussions for thematic analysis.

TABLE 2
THEMATIC ANALYSIS OF QUALITATIVE DATA

Theme	Frequency	Representative Quote
Improved self-regulation	85%	"I now plan my study time more effectively."
Enhanced communication confidence	78%	"I feel more confident expressing my ideas in class discussions."
Better problem-solving skills	72%	"I approach complex problems more systematically now."
Challenges in strategy implementation	45%	"Sometimes it is hard to remember to use all the strategies."
Positive impact on academic performance	68%	"My grades have improved since I started using these strategies."

Table 2 presents the findings from the interview and focus group discussions in the form of thematic frequencies. The most dominant identified theme was enhanced self-regulation (85%), and therefore, the students gained a significant boost in planning, executing and reviewing their learning processes. The improvement in communication confidence level was observed among 78% of the participants, which indicates a potential improvement in students' speaking and interaction with other students. Better problem-solving was reported by seventy-two per cent of the students, which indicates that using metacognitive strategies may have enhanced students' handling of complex cognition tasks. Problems with the strategy application were reported by 45 participants, indicating that more encouragement and exercise in metacognition application is required. Sixty-eight per cent of participants indicated an improvement in their academic performance and pointed out that the metacognitive strategies might have been of help in the improvement.

IV. DISCUSSION

The results of this study offer strong empirical support for proposing that explicit metacognitive training improves students' communication and cognitive learning at the secondary level. The quantitative outcomes derived from the qualitative evidence suggest an enhancement of the student's learning and personal growth. In this section, the significant findings will be discussed with greater emphasis placed on the practical implications, thus facilitating the dissemination of the study results in the best interest of educational practices. The findings supported the highest improvement in the

student's communication after the six-week intervention. The comparison of pre-and post-intervention scores on the communication skills self-assessment highlighted much improvement in the student's general intelligibility, fluency, coherency, profound listening skills, and constructive conversational skills. Metacognition helped to facilitate this improvement, and for the same reason, it caused the students to begin analysing their communication approach. These strategies, like self-recording and self-questioning, enabled students to organise their communication, analyse how effectively or ineffectively they communicate, and take necessary actions. The findings of Usama et al. (2024), Alam et al. (2023), and Negretti (2012) are in line with the evidence that metacognition awareness enhances writing performance in classroom pedagogy. Vandergrift and Tafaghodtari (2010) viewed a positive effect of metacognitive instruction on listening comprehension, which also correlates with the result of the present study. Teachers should intentionally use metacognitive skills to enhance communication skills in the class (Amir et al., 2025). Hence, assignments like self-evaluation, peer evaluation, and reflective diaries can assist students in understanding their assets concerning communication to areas of weakness.

This assessment of the study also revealed an improvement in the overall cognitive learning results with a rise in the mean score in the Cognitive Learning Assessment. In the subsequent study, the results revealed enhancement in the students' attention, memory, and problem-solving abilities after the intervention. These metacognitive approaches, like planning, monitoring, and evaluating learning tasks, have significantly influenced cognitive learning. Greater awareness of mental activity helped students construct proper learning approaches, boosting their performance. This links well with what Dignath and Büttner (2008) observed in their study: there was a positive impact of metacognitive strategy instruction on the different areas of cognitive learning. Metacognition strategies should be applied within teacher's training to facilitate cognitive learning processes. This could involve helping the students to plan how they want to achieve those goals, how they will assess their performance and how they measure the success of their learning. Learners can use a holistic approach when studying by integrating the mentioned strategies into several learning domains. The findings pointed to enhancing metacognition awareness among the students, as given by the Metacognitive Awareness Inventory. This implies the acquisition and understanding of new ways of approaching problems and increased awareness of one's own thinking pattern.

Communication and cognitive learning probably improved due to general metacognitive awareness. Thus, as students increased their awareness of their thinking and speaking patterns, they could use metacognitive strategies successfully. The essence of this finding is supported by Schraw and Dennison (1994), who stressed that learners' metacognitive awareness should be an important concept.

Instead of targeting the complete teaching of metacognitive strategies, educators should aim to enhance the student's metacognitive knowledge, which should be fostered along with particular metacognitive strategies. This can be done through strategies that make students explain what they are doing, such as think-aloud protocols, asking questions to themselves, and using metacognition during learning activities. Another aspect that could contribute to the students' positive perception of metacognitive strategies is the influence of prior knowledge regarding the effectiveness of such strategies in learning and academic achievement. Participants, teachers, and students had a positive attitude towards using metacognitive strategies in interviews and focus group discussions. Students noted that they were more confident, /assertive and able to cope with academic demands/pressures.

In contrast, the teachers noted that students/learners engaged more in tasks and noted changes in class dynamics. The teachers adopted positive attitudes towards metacognitive strategies that were instrumental in their positive implementation, and the changes were noticed. In this context, students' and teachers' perceptions of a strategy as beneficial play a vital role in influencing their active and consistent use (Alam, 2025b). This agrees with the view of Zohar and Barzilai (2013), who mentioned that for metacognitive instruction to work, there has to be an agreement between the teacher and students. Educators should ensure that their perceptions are positive towards the strategies and support the learners with elaborate descriptions of the utility of metacognitive strategies. Reporting one's achievements and providing quantifiable results also creates positive predispositions towards such practices.

The result of the present study highlighted the potential benefit of metacognitive strategies in improving the target secondary students' communication skills and cognitive learning. Advancements in communication, cognitive learning, and the degree of metacognition, together with favourable attitudes from the learners and tutors, indicate that these strategies have immense promise in overhauling learning processes. Future studies should focus on the long-term impact of metacognitive strategies in learning and other educational settings, learning environments, or learners of different age groups. Studying processes by which metacognitive strategies affect learning can shed more light on how the strategies can be effectively tailored to suit different learners.

V. CONCLUSION

Based on the results, the study concludes that metacognitive communication strategies and cognition improvement are essential. Thus, enhancing students' understanding of the underlying processes during their learning enables teachers to assist them in becoming more efficacious communicators, critical thinkers, and problem-solvers (Schraw & Dennison, 1994). Thus, this integrated model of teaching and learning can play a role in developing self-regulated, versatile, and qualitatively prepared individuals for solving social problems. In the same way, when learners possess the requisite metacognition skill, they can increase their learning approach, monitor their learning, and even assess the outcomes,

increasing their achievements, communication, and other accomplishments, which are vital for performance in the 21st century. Hence, the focus on metacognitive strategies is one of the major concerns for the current educational systems as well as policy authorities around the globe. Incorporating the metacognition strategies into the teaching and learning process has many ramifications on improving communication and cognitive learning. On a personal level, the metacognition skills fostered within students lead to self-regulation, which enhances the learners' ability to be more independent in personal learning processes (Pintrich, 2002). Learners are, therefore, able to monitor and evaluate their learning processes and plan them, enhancing their academic performance and communication skills.

According to Hacker et al. (2009), through the use of metacognition, students can develop neutral self-confidence, motivation and growth orientation to the tasks, communication and learning environment in that students can solve complex tasks, express their ideas in the right way and also be able to manage the learning environment. In turn, this may positively influence the formation of self-organised, flexible, harmonious personalities that will be useful to face the difficulties of the modern world. At the educational level, it is possible to observe that metacognition instruction can help enhance students' control over the learning process and the outcomes. These can improve problem-solving skills, critical thinking and learning throughout one's life span (Boekaerts, 1999). When the students master the techniques they are supposed to be using in class, i.e. conceptions of how they learn they can, therefore, better anticipate, regulate, and even self-reflect, enhancing academic learning and communication skills (Flavell, 1979; Schraw, 1998).

The proposed idea of implementing metacognition into the teaching and learning process is non-sectoral, which explains the global-scale potential of the approach (Kobylarek, 2019). That way, the students can effectively employ critical thinking, effective communication, and problem-solving skills as they prepare for the century's challenges (Schraw & Dennison, 1994). It may foster independent learners, lifelong learners who will be adaptable and ready to confront academically and vocationally.

Concerning the first methodological limitation, the study results cannot be compared with those of other school settings. To reduce the possible observer bias, more than one observer was used, and an inter-observer reliability test was conducted; due to the short length of the intervention evaluation, changes in communication and cognitive learning, which metacognitive strategies can cause, might not be observed.

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