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A Psychological Study: Use of Metacognitive Strategies in Minimising Problems Related to Classroom Teaching

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Abstract

Metacognition is a vital element in enhancing teaching efficiency. This study explores how metacognitive strategies can be employed in addressing problems in conventional classroom teaching. Metacognition is an individual's awareness of his/her cognitive processes and the outcomes of those processes. For teachers, this encompasses mindfulness before, during and after teaching sessions. The research aimed to evaluate effectiveness of metacognitive techniques in minimising the classroom conflicts. Sixty students and teachers from Monaragala Royal College were randomly selected for data collection. The study examined challenges in managing human and physical resources, implementing teaching methods and evaluating students' performance. Data were gathered from primary and secondary sources and analysed using a combination of quantitative and qualitative methods. The findings suggest that metacognitive strategies could significantly enhance students' metacognitive knowledge and cognitive abilities compared to traditional learning methods. Participants reinforced the notion that these strategies are more effective than traditional approaches. The study concludes that metacognitive strategies play an important role in mitigating classroom problems. The recommendations include planning student activities for enhancing achievement, incorporating metacognitive tactics into subject curriculum and offering training to the teachers for boosting metacognitive skills for an effective classroom application. This study contributes to the understanding of how the metacognitive strategies will be integrated for improving learning-teaching process and address common classroom challenges. It accentuates the importance of teacher awareness and adaptability in the creation of a more effective educational environment.

Keywords: Classroom problems, Hypercognitive strategies, Learning and teaching processes, Metacognitive strategies, Teachers

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INTRODUCTION

In the domain of education, the term 'Cognition' frequently features. Cognition is a process through which an individual perceives something; interprets something; remembers something, it is the way that a person learns something, which has been defined as the total of many minor processes (Garofalo & Lester, 1985). Thus, Cognition can be interpreted as a process that carries one's direct experiences, including his or her vision, smell, sensations, and all physical and psychological activities, controlled by the brain. Moreover, Barsalou (2008) states that the representations that comprise the imagination and the conceptualization too belong to Cognition.

According to Schraw & Dennision (1994), Metacognition can be categorised into two dimensions: Knowledge of Cognition' and 'Regulation of Cognition'. Cognitive Knowledge consists of 'Declarative Knowledge', 'Procedural Knowledge' and 'Conditional Knowledge'. Further, Cognitive Regulation encapsulates five limbs, namely 'Planning', Information Management Strategies', 'Comprehension Monitoring', 'Debugging Strategies' and 'Evaluation'.

Initially, Metacognition was introduced as the knowledge of one's own cognition and regulation of one's educational activities, specifically the awareness of how effectively one learns (Flavell, 1979).

According to Flavell (1979), Metacognition can be categorised as follows:

1. Knowing what one knows - knowledge of what others know?
2. Knowledge about the ideology – perception of the activity of perception and the knowledge to bring it to the perfection.
3. Knowledge of ideological strategies – perceiving the ways of direct learning, answering questions and solving problems which enables students in thinking unambiguously, setting of goals, organizing opinions that manifesting the ideological activity which highlights the metacognition in educational activity (Darling-Hammond et al., n.d.).

Metacognition consists of two subsidiary divisions: knowledge of perception and regulation of perception (Schraw & Moshman, 1995). Knowledge of perception entails the knowledge of individuals, knowledge of activities and the knowledge of strategies (Flavell, 1979). Individual Knowledge refers to the knowledge about oneself and others as objects of perception. Knowledge of activities implies the knowledge of the goal and characteristics thereof. The knowledge of strategies refers to the strategies he or she knows which are being used in a certain undertaking and in defining those strategies, knowing how and why of the strategies to be used.

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Educational psychologists emphasise the effectiveness of metacognitive strategies in regulating students' education and in assisting students to learn. The Sutton Trust - EEF Teaching and Learning Toolkit, an experimental project of teaching inaugurated by the British government. The results of this experiment as proved by the data highlight that metacognitive educational strategies give better results, while assisting decision making and information for policy makers and professionals (Higgins et al., 2013). Additionally, Schneider (1998) underscores the importance of metacognitive awareness in predicting performance, particularly how students' metacognitive skills influence their approach to tasks and decision-making.

Cardiello (1998) emphasises the importance of questioning oneself as an essential perceptual strategy for self-knowledge. Self-questioning allows students to evaluate their strategies, gather important information, and assess the relevance of their personal experiences to the study.

It has been revealed that questioning a study from different points of view allows the students to sustain their metacognition. Questioning by the teacher, followed by questioning by the student, enables both parties to engage in successful learning. Accordingly, in solving classroom problems, the experiment was carried out to impart self-questioning strategies to those who were involved in it.

The teachers should encourage students with metacognitive abilities by explaining their role, for they are good problem solvers (Costa, 1984). As pointed out by Killer, when solving problems, there is a tendency to lose sight of the existing knowledge while striving to acquire new knowledge and in solving problems (Costa, 1984). This can have a positive or negative impact on cognition and metacognition. In going further into solving problems, Schoenfeld asserts that when the whole classroom is involved in solving a problem, the teacher instead of asking to give the answer should question the students whether they have understood the question and what, as they deem, initially done to solve it. Thus, the teacher should establish a rapport with the students (Suriyon et al., 2013). Furthermore, after some time, the teacher ought to check with the students to assess whether the problem-solving strategy goes swiftly and to find alternative solutions. The teacher should also contribute by participating along with the students in the problem-solving process. In solving problems, the teacher should adopt an evolving role directing his/her attention to students' decisions, he/she should encourage their self-regulatory approach to the problem. By dividing the class into small groups, the teacher should present several approaches to solve the same problem and to use these approaches productively. Metacognition is a productive strategy to solve problems. Before tackling a problem, what ought the teacher do to

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clarify the ideological backdrop of the problem? How should this be solved? What are the ingredients of the rational approach to the problem? Similarly, students' activity should concentrate on the problem. The experience created by the teacher in this context should help students develop metacognitive skills, enabling them to address their day-to-day problems more effectively. This claim was strongly supported in the study carried out.

LITERATURE REVIEW

There is plenty of evidence in foreign literature to support that the teaching-learning process can be enhanced using metacognitive strategies (Sahin & Kinder, 2013). An experiment conducted to examine the effect of metacognitive strategies on learning geometry revealed that the group taught using metacognitive strategies subsequently developed greater interest in and an appreciation for compared to the other group. It was revealed that through metacognitive strategies, the students learnt the importance of solving geometric problems. They were expected to plan how to approach questions and develop an overall strategy for arriving at solutions. It became clear that the students had significantly improved their skills through metacognition.

When metacognitive strategies were used in solving mathematical problems, including planning and observing the riddle, the students not only succeeded in solving the problem but also gained the ability to solve other problems they had not encountered before (Garofalo & Lester, 1985).

Hiebert et al. (1996) point out that by allowing students to solve problems using metacognitive strategies helps them discover multiple ways to solve the same problem and the difference between gaining knowledge and applying it to problem-solving. By encouraging students to explore different approaches to the same problem, they arrived at the same answer through metacognitive strategies.

Ulgen (1997) found that integrating metacognitive strategies into the learning process not only enhances the quality of education but also provides students with their own philosophy of education, positively influencing their mathematical skills. Metacognitive strategies are a rich resource in teaching students of manifold ideological systems which affect the nature of mathematics and its manifold ways of solving problems. It was discovered that elucidating metacognition positively enriches the student's skills and flexibility. Additionally, Risk et al. (2017) have found that proper guidance in metacognition could lead to the development of students' innovativeness.

To date, no studies have explored how metacognition can help address the challenges faced by Sri Lankan

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students, particularly in secondary education, a gap that remains unacknowledged. Therefore, the main objective of this study was to assess how metacognitive strategies could overcome learning obstacles and evaluate students' knowledge.

METHODOLOGY

To investigate how metacognitive strategies could help minimise classroom education, a random sample was selected from the students and teachers at Royal College, Monaragala. It consisted of 50 randomly chosen students and 10 teachers, totaling 60 participants (see Figure 1).

Pretest

In the beginning, the teachers and students who had no knowledge of metacognitive strategies were given a questionnaire and asked to complete it.

Post – Test

Secondly, the teachers and students were given a briefing about the metacognitive strategies and the participants were given the same questionnaire.

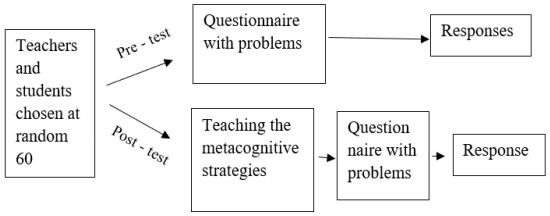

Figure 1: *Pre and post tests*

Source: Data obtained from the pre - and post - tests were analyzed using IBM SPSS Statistic (Version 28, IBM Crop., 2023).

RESULTS AND DISCUSSION

From the data gathered from informants, several key findings were discovered.

Metacognitive Knowledge

Metacognitive knowledge was analysed under three divisions of declarative knowledge, procedural knowledge and conditional knowledge (Figure 2).

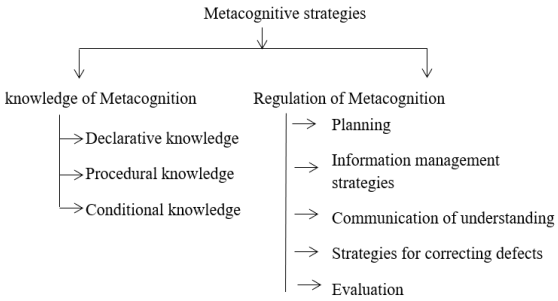

Figure 2. *How students reacted to metacognitive strategies*

Declarative Knowledge

Declarative knowledge is knowledge of facts that need to be memorised and retrieved to pass exams. According to the results of the questionnaire, 88.7% of students indicated good retention of declarative knowledge, which indicates a good response to remembering and using information. The percentage can also be further detailed by considering

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individual survey items as presented in Table 1.

For instance, 22.5% of the respondents agreed that they learn more when they have an interest in a subject, indicating that personal interest plays an important part in maintaining declarative knowledge. Individuals with an interest in a topic dedicate time and effort to learning it, directly increasing their declarative knowledge.

Further, 17.4% of the students described themselves as competent at information planning, an indicator of awareness of the need to plan and coordinate the knowledge for memorisation before exams. Also, 17.1% of the students indicated they have identified intellectual strengths and weaknesses, an indication of introspection that develops improved learning approaches.

But nothing was deemed absolutely positive. 16.2% of students reported that they were good at remembering, and 15.5% stated that information helped the most in the learning process, which means that even though the majority of the students self-reported being 'good remembrancers', there is still room for improvement in their metacognitive knowledge and skills to enhance memory.

Thus, while a majority of students reported retaining sufficient declarative knowledge, the responses also reflect where more emphasis could be placed such as on refining students' ability to discern primary information and increase their retention skills.

Table 1. *Response on the retention of declarative knowledge*

Question	Agree	Neutral
I am competent at retaining information	16.2%	2.2%
I know what information is important for learning	15.5%	1.3%
I am competent at planning regarding information	17.4%	3.2%
When I am interested in the subject I tend to learn more	22.5%	2.2%
I have discerned my intellectual abilities and deficiencies	17.1%	2.4%
Total Frequency of Declarative Knowledge	88.7%	11.3%

Source: Field Survey, 2023

Procedural Knowledge

Procedural knowledge is the knowledge application needed to undertake a specific activity or task. It provides answers to the questions, "How do I utilise my knowledge?" and "When do I apply specific strategies?" 88.1% of the participants showed satisfactory proficiency in their procedural knowledge. This indicates that the majority of students possess the ability to apply proper procedures and strategies when solving problems.

To find out when and how students apply their knowledge and procedures, some questions from the questionnaire were asked and their responses are listed in Table 2. One of the most important findings was that most of the

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students reported reusing successful earlier procedures. Specifically, 25.5% of students strongly agreed with the statement: "I tend to use the procedure that gave results in the past." It shows that students realise the effectiveness of the previous procedures and apply them to subsequent problems. This shows that students do not hold procedural knowledge hypothetically but apply the knowledge in a practical sense in terms of their past experiences.

Additionally, 20.3% of respondents agreed that they have a clear purpose for each strategy they implement; in other words, learners intentionally think about the purposes of the strategies they use in order to make their procedural knowledge goal-driven and purposeful. This is an indication of learners' ability to identify when and how to implement some strategies to achieve specific outcomes.

Further, 21.2% of students demonstrated an understanding of which strategies to use in learning, illustrating that they have a clear idea of the strategies required in different learning environments. Their ability to choose the right strategy also testifies to the fact that students are making effective uses of their procedural knowledge.

Finally, the statement "I learn to use strategies that worked best in the past" received an agreement of 21.1%. This also shows that students are making informed decisions about which strategies to apply, acting on their previous knowledge and experience to achieve maximum learning.

Table 2. *Response on the retention of Procedural knowledge*

Question	Agree	Neutral
I tend to use the procedure that gave results in the past	25.5%	2.3%
I have a special aim with every strategy I use	20.3%	3.3%
I understand what strategy to use when I am learning	21.2%	3.1%
I learn to use strategies that worked best in the past	21.1%	3.2%
Total Frequency of Procedural knowledge	88.1%	11.9%

Source: Field Survey, 2023

Conditional Knowledge

Conditional knowledge refers to the awareness of when and how acquired knowledge has to be applied, and it is usually gained through experience and example. Students showed high proficiency in conditional knowledge, particularly in applying different strategies across various circumstances and contexts (see Table 3).

Table 3. *Response on the retention of Conditional knowledge*

Question	Agree	Neutral
To evade my defects, I use my intellectual skills	17.2%	2.2%
I know when the various strategies I use give optimum results	16.4%	1.3 %
When I know something about a subject, I tend to	16.4%	1.3%

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learn about it with great interest		
I use diverse strategies according to the situation confronted by me	18.3%	1.2%
I shall use various strategies in accordance with the situation	24.6%	1.1%
Total Frequency of Conditional knowledge	92.9%	7.1%

Source: Field Survey, 2023

The highest level of agreement was given to the statement, "I shall use various strategies in accordance with the situation," at 24.6% agreement. This result clearly indicates that students use their conditional knowledge judiciously, adapting their strategies based on the opportunity or situation. This type of response indicates an awareness that strategies need to be adjusted for different environments to achieve optimal outcomes.

Additionally, 18.3% of the students agreed with the statement, "I use diverse strategies according to the situation confronted by me. This indicates that students are favourable to process flexibility and can change strategies based upon the requirements of the task. Flexibility is one of the underlying attributes of conditional knowledge since it reflects the capacity of students to assess the situation and select the most appropriate strategy.

The students also discussed the utilisation of intellectual abilities to compensate for their weaknesses because 17.2% of the respondents agreed with the statement, "To evade my defects, I use my intellectual skills." This suggests that the students are not only aware of their strengths and weaknesses but also engage their cognitive abilities to compensate for their weaknesses and improve their problem-solving abilities.

Additionally, the responses to "I know when the various strategies I use give optimal results" and "When I know something about a subject, I tend to learn about it with great interest" received 16.4% agreement, indicating that students have a growing awareness of the effectiveness of the strategies they employ and a strong motivation to delve deeper into subjects of interest.

Metacognitive Regulation

This includes how one plans their studies, strategies they use, observational understanding, mindfulness to correct the defects, and evaluation. Metacognitive regulation was analysed under five headings, "students reaction planning", "information management strategies", "comprehension monitoring", "strategies to correct defects" and "evaluation".

Planning

Planning refers to the coordination of studies, setting particular goals, and attainment of resources required to achieve such goals. For the research,

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responses under planning were considered 88.4% acceptable because most students are capable of planning their study activities.

Among the most astonishing outcomes was the students' agreement with the statement, "While thinking of many strategies for solving a problem, I select the best." 24.2% of students agreed with it, as evidenced in Table 4. It shows that students can compare several strategies and determine the most effective one for problem-solving. According to planning theory, this demonstrates that the students not only remember the strategies but are also able to choose the most suitable method for a given task.

The second important aspect of planning is the ability to make precise targets for actions. The statement "Before starting some activity, I select a specific goal for it" received 22.1% of agreement , as shown in Table 4. This testifies that the students can plan by setting precise goals prior to the activities, demonstrating their ability to plan and control their learning processes.

Additionally, the students demonstrated effective time management. 21.1% of the respondents agreed with the statement, "I control myself to get sufficient time for learning," as indicated in Table 4. This indicates that students are able to plan their study time, which is a key aspect of successful planning.

Finally, the statement "Before doing something, I read the advice that is relevant to it" received 21.0% agreement, indicating that the students are careful to gather accurate information before taking action. This shows that students are not only proactive in their preparation but also act to secure the necessary resources or advice needed to do a task.

Table 4. *Response on the retention of Planning*

Question	Agree	Neutral
I control myself to get sufficient time for learning	21.1%	3.2 %
While thinking of many strategies for solving a problem, I select the best	24.2%	2.1 %
Before getting on with some activity, I select a special aim for it.	22.1%	3.1 %
Before doing something, I read the advice that is relevant to it	21.0%	3.2%
Total Frequency of planning	88.4%	11.6%

Source: Field Survey, 2023

Information Management Strategies

The efficient use of information and application of strategies to achieve this fall under the above topic. Based on the responses of the chosen sample, the students demonstrated a satisfactory level of proficiency (89.8%) in Information Management Strategies. Moreover, the participants provided favourable responses to the statement "while learning in order to comprehend better, diagrams and pictures were drawn."

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Comprehension Monitoring

Comprehension Monitoring refers to the process of assessing one's learning and the strategies used to achieve it. According to the responses obtained, 88.1% of students demonstrated a satisfactory level. The students also responded positively to the statement, "I question myself as to how well I read when learning something new."

Debugging Strategies

This involves problem solving and correcting errors. About 91.4% of respondents provided satisfactory responses to the statement "When I do not comprehend something, I seek support from others". This proves that when students find it hard to discern a question, either they seek support from others or they themselves try to comprehend it by reading again and again. Ultimately, this leads to successful correction of errors.

Evaluation

Evaluation involves aanlysing learning activities and strategies. Most participants responded positively to the statement, "When some activity was brought to the end, I question myself whether there was an easier method of finishing it." This suggests that students assess themselves to enhance their learning skills.

To minimise learning obstacles, the use of metacognitive strategies, as provided by the sample students, is depicted in Figures 3 and 4.

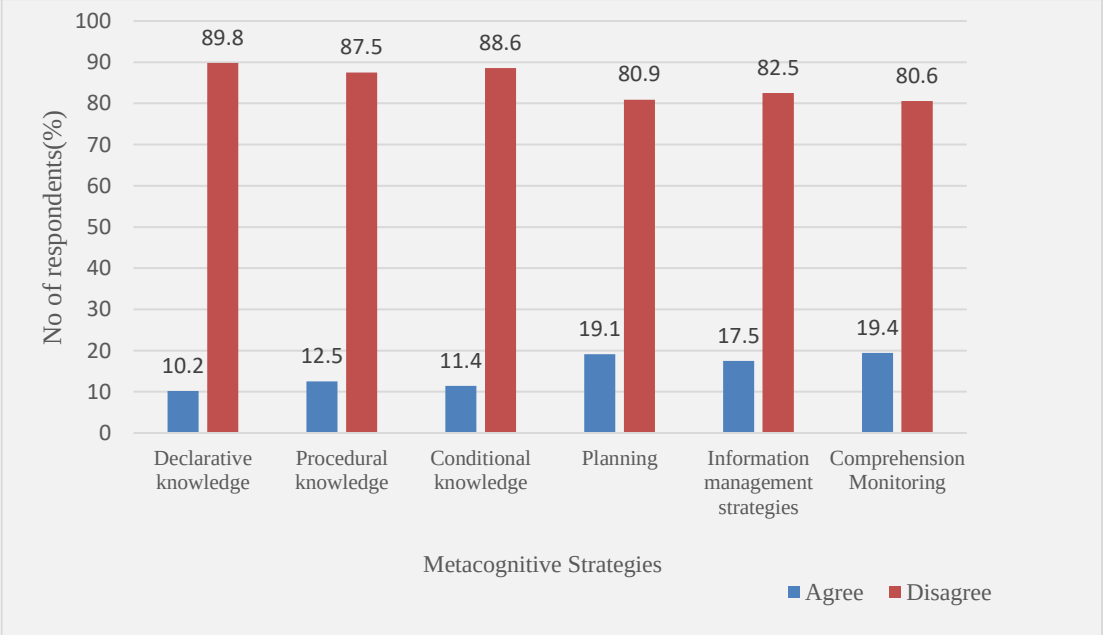

Figure 3. *Response from students and teachers before the test*
Source: Field Survey, 2023

In evaluating the data, it can be observed that relative to the traditional method of education, the use of metacognitive strategies can

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significantly augment the students' accomplishments. The obstacles faced by the students can be easily overcome through metacognitive strategies. This has been amply demonstrated by the students' performance before and after the implementation of these strategies.

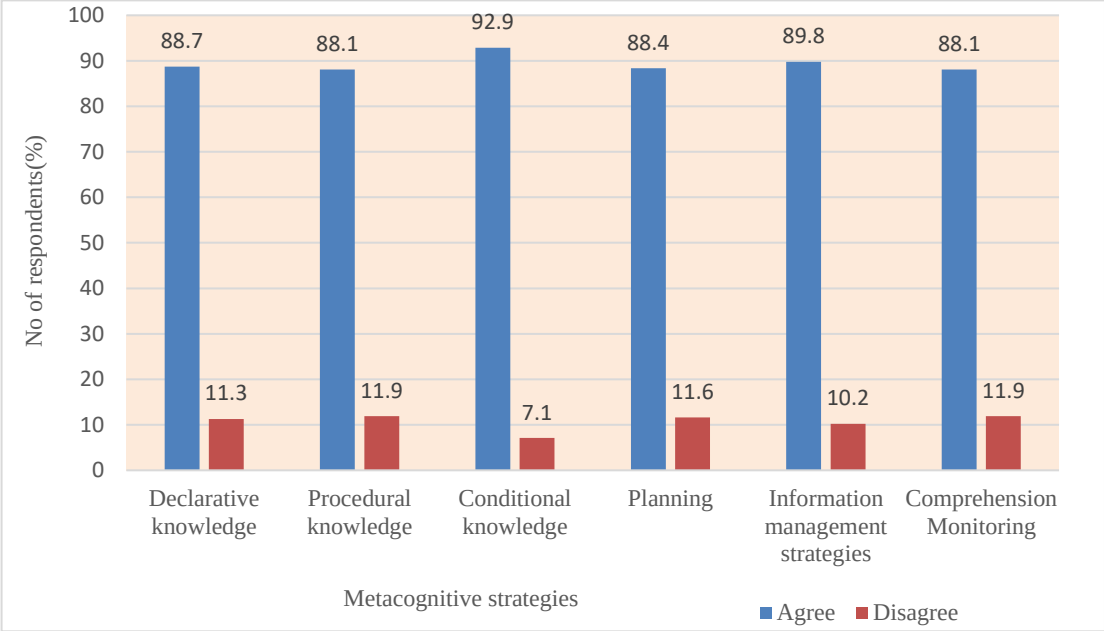

Figure 4. *Response from students and teachers after the test*
Source: Field Survey, 2023

In accordance with the responses by the metacognitive awareness inventory, through metacognition students' planning of their learning, the strategy used for problem solving, observational skills and mindfulness to correct wrong answers have improved significantly.

CONCLUSION AND SUGGESTIONS

It was concluded that the use of metacognitive strategies can effectively overcome obstacles in the learning process. Classroom learning would be augmented and enhanced significantly through the use of metacognitive methods. In the learning and teaching process, a great deal of attention should be focused on planning strategies, strategies for verbal thinking, solving problems and for obviating obstacles to finding solutions. The application of metacognition can significantly enhance students' cognitive abilities and their ability to regulate metacognitive processes. Currently, in Sri Lanka, we are unable to see the use of metacognitive methods. To develop the Sri Lankan education system, we must apply metacognitive methods.

The following recommendations are proposed to ensure the successful implementation of metacognitive strategies. Student accomplishments should be aligned with the use of metacognitive strategies. A roadmap must be included in the syllabus. Courses should be conducted in

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schools to enable teachers to familiarise themselves with metacognitive strategies. In developing professional skills of teachers, they should be made to learn metacognition and its uses. When training teachers, they should be taught to teach metacognitive skills. As more time is needed to implement metacognitive strategies, educators should take note of this fact and design the syllabi accordingly.

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