



Developing Self-Regulated Learning: The Impact of Metacognitive Strategies at Undergraduate Level

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ARTICLE INFO			ABSTRACT
Article History:			<i>To enhance learning, self-regulation, critical thinking and independent problem-solving skills, student metacognition requires the implementation of efficient strategies. This research analyzes the metacognitive strategies that aid in learning at a public sector university in Karachi. Data were collected through surveys and interviews as well as classroom observations from undergraduate students. The findings indicate that students who actively use metacognitive strategies like self-monitoring, planning and reflection, show exceptional performance in academics along with active participation in learning tasks. This study also identifies the difficulties students face when using these strategies and highlights the need to bridge the gap when in aiding students in achieving metacognitive skill proficiency. Based on the findings, this research concludes that metacognition should be an integral part of the curricula at the university level in order to improve student learning. This study supports the literature on educational psychology with new evidence on the impact of student metacognitive strategies in higher education and makes suggestions for practitioners.</i>
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Introduction

The efficacy of a student's learning and academic achievement is greatly enhanced by metacognition, which Flavell (1979) described as “thinking about thinking.” Two major components encapsulate metacognition: metacognitive knowledge and metacognitive regulation. An individual's understanding of their cognitive processes is termed as metacognitive knowledge. In contrast, the capacity to supervise, manage, and guide cognitive processes towards productive

learning is known as metacognitive regulation (Schraw & Moshman, 1995). Numerous studies conducted over the years show that students who implement metacognitive strategies such as self-monitoring, goal setting, and self-evaluation develop better problem-solving skills and perform better academically (Pintrich, 2002; Zimmerman, 2002).

Research conducted in higher educational settings demonstrates that metacognitive strategies play a crucial role in fostering students' capabilities to engage in deep learning and retention of difficult material (Veenman, Van Hout-Wolters, & Afflerbach, 2006). Self-regulated learning, which is associated with metacognition, plays a key role in improving students' motivation, self-efficacy, and academic achievement (Dinsmore, Alexander, & Loughlin, 2008). Despite the remarkable advances metacognitive strategies have made, there is an alarming lack of explicit instruction in these skills, which a multitude of university students find themselves missing (Winne & Azevedo, 2014).

Within the context of Pakistan, literature on metacognitive strategies is limited, even more so for research in higher education institutions. In a self-regulated learning study conducted in Pakistani universities, Farooq & Shah (2008) found that students who were taught metacognitive strategies were more successful academically compared to those who were not. With the shift towards more student-focused learning in higher education, it becomes increasingly important to investigate how the curricula of universities can incorporate metacognitive strategies to improve student learning.

This research is focused on investigating the role of metacognitive strategies on students' learning at a well-known public sector university. It hopes to understand students' use of metacognitive strategies and their relationship with academic achievement so that useful recommendations can be made for educators and decision-makers to develop sound instructional methodologies. These results will help inform the expanding literature base in educational psychology on metacognition by providing an empirical account of higher education.

Rationale of the Study

It is known that metacognitive strategies are important for learners because these learners have enhanced self-regulation, critical thinking, and problem-solving skills (Pintrich, 2002; Zimmerman, 2002). Actively practicing self-monitoring, planning, and reflective thinking is associated with positive academic outcomes and greater motivation (Veenman, Van Hout-Wolters, & Afflerbach, 2006). Even so, many students in higher learning institutions, especially in developing countries such as Pakistan, are not properly trained in applying these techniques (Farooq & Shah, 2008).

Like other higher learning institutions this university being one of the biggest public universities in Pakistan, has reasonably large class sizes which make it hard for students to obtain sufficient personal or individualized teaching and attention. Students also contend with a conventional lecture method of teaching which may influence their ability to develop and utilize metacognitive skills. With the growing focus on student-centered learning in higher education, there is a need to understand how metacognitive strategies can improve student learning outcomes. This study aims to contribute to the literature on university students' engagement with metacognitive strategies, their application to academic performance, and the effective integration of metacognitive training in teaching. This research is aimed at venturing into the effectiveness of metacognitive strategies at the higher education level by conducting a case study at a public sector university in Karachi. The results will add to the already existing literature on metacognition and self-regulated learning

enabling educators and stakeholders to make informed decisions that will improve the quality of teaching and learning at the university level.

Statement of the Problem

While the value of administering metacognitive strategies aimed at improving student learning is irrefutable, there is limited empirical evidence regarding their effectiveness at the higher education level in Pakistan. A large number of students have reported difficulties related to insufficient self-regulation, poor goal-setting, or inadequate reflective learning stemming from a lack of training in metacognitive components. Additionally, the prevalent forms of instruction emphasize the transmission of content rather than providing the means for learners to function autonomously and independently.

By analyzing the strategies employed by students utilizing metacognitive techniques and how their usage affects academic success, this study attempts to fill the gap previously mentioned. It also aims at recognizing barriers to the effective use of these strategies and seeks to find ways through which teachers can assimilate metacognitive teaching into their courses. Therefore, the research will be useful for educators and decision makers in order to address the issue of how to improve learning among students with the use of metacognitive skills.

Research Questions

- 1) What is the level of utilization of metacognitive strategies by students at a public sector university in the learning process?
- 2) In what ways do metacognitive strategies affect students' academic performance and participation in the learning process?
- 3) What problems do students encounter while attempting to apply metacognitive strategies and how should these strategies be appropriately integrated into university teaching?

Literature Review

Metacognition is the ability to think about one's own cognitive processes, and it has received a lot of attention in relation to student learning. Different studies argue that students' planning, monitoring, and evaluation of their learning is a powerful problem-solving tool that increases academic success (Flavell, 1979; Pintrich, 2002; Zimmerman, 2002). This literature review examines the available literature on metacognitive strategies, their role in student learning, and their integration in teaching at the tertiary level, especially the issues and prospects of applying such strategies at a public sector university.

The Role of Metacognitive Strategies in Student Learning

For students to be able to learn independently, metacognitive strategies help to develop self-regulation and flexibility in the learning process. Schraw and Moshman (1995) described metacognition as having two fundamental elements: metacognitive knowledge and metacognitive regulation. Metacognitive knowledge describes how an individual knows about their own learning activities while metacognitive regulation is the monitoring and controlling of learning activities. Students who tend to use metacognitive strategies are likely to perform better in academics because they are able to change the way they work based on how they evaluate themselves and receive feedback (Veenman, Van Hout-Wolters, & Afflerbach, 2006).

Metacognitive strategies are associated with better performance in a particular subject as per different studies. Students who made frequent use of metacognition techniques of goal setting, self-questioning, and progress monitoring achieved better in the coursework and exams compared to others. In the same way, self-regulated learning, which emphasizes learning where the learner is actively involved in the process and sets goals on what to achieve, is important as highlighted in metacognitive strategies research done by Winne and Azevedo (2014). In this case, those who knew how to apply metacognitive strategies were more likely to solve complex problems and think critically.

The Role of Metacognition in Higher Education

Metacognition is one of the prominent areas of focus in higher education as it assists students in learning deeply and encourages self-study. Students in the universities who practice metacognition strategies are often self-motivated and participate actively in the learning process which enables them to achieve academic success (Pintrich, 2002). Nevertheless, there is still evidence that many students come into higher education unprepared, lacking basic metacognitive competencies, which means that teachers need to incorporate direct metacognitive teaching in their classes (Zimmerman, 2002).

A study conducted by Nicol and Macfarlane-Dick (2006) underscored that formative assessment and feedback constitute an essential component towards the growth of metacognitive skills among students. Structure feedback enhances student's reflection on their learning and allows them to modify their learning processes. In addition, Efklides (2011) also provided evidence for scaffolding in postsecondary teaching and argued that teachers should assist students in achieving metacognitive awareness during the learning process by providing organized instructional support.

Obstacles to the Adoption of Metacognitive Approaches in Higher Education Institutions

While the use of metacognitive techniques has been proven beneficial, there are many hurdles to its application in higher education institutions. One prominent obstacle is the lack of awareness and insufficient training of the learners and teachers (Winne & Azevedo, 2014). Several university lectures are delivered in the traditional manner, which means they focus on telling rather than encouraging instructors to think on their own. Also, educational professionals are faced with large numbers of students as well as insufficient teaching hours for each student, making the provision of appropriate assistance in developing metacognitive skills impossible (Farooq & Shah, 2008).

Research overlooking metacognitive techniques in Pakistan's higher education framework is scarce. In one of the universities in Pakistan, Farooq and Shah (2008) studied self-regulated learning and discovered that students taught metacognitive strategies achieved better academic results than those who were not. Nevertheless, the authors pointed out that a sizable portion of the sampled students lacked familiarity with metacognitive strategies, which indicates that more of these techniques should be taught in the higher education systems of Pakistan.

The Case of Institute of Business Management, Karachi

Considering that it is one of the largest public sector universities in Pakistan, this institution provides a distinct case for studying the application of metacognitive techniques in learning processes. Due to the considerable diversity of the students as well as the difficulties posed by large class sizes, it is essential to understand how students from such an institution employ metacognitive strategies and how teachers facilitate their learning. Other twin cases have shown

that embedding metacognitive skills into the higher education teaching paradigm significantly improves students' participation and achievement (Dinsmore et al., 2008).

This research aims to expand the existing body of literature by providing statistical insights into the impact of metacognitive strategies on student learning at a public sector university in Karachi. It seeks to offer specific recommendations to educators and policymakers by analyzing the key factors and challenges influencing the use of these strategies. The existing literature emphasizes the role of metacognition in learning, academic achievement and in educational productivity. While numerous studies have shown the success of these strategies in different educational environments, there is little information available about implementing metacognitive strategies in Pakistani universities. This research intends to address this issue by exploring the ways in which students from a public sector university use metacognitive strategies and how teachers can assimilate these strategies into their teaching methodologies. It is hoped that this would be useful for educational psychology in general and for the development of higher education in Pakistan in particular.

Research Methodology

To evaluate the effectiveness of metacognitive strategies in enhancing learning outcomes in a public sector university, a mixed approach incorporating both quantitative and qualitative analysis. For the quantitative part, a quasi-experimental design was implemented, where two groups of students were pre- and post-tested, one group was instructed in explicit metacognitive strategies, while the other followed traditional learning practices. A structured questionnaire was used to measure students' metacognitive awareness and self-regulated learning with a Likert scale. Interviews with faculty members were conducted to capture their perceptions and experiences with metacognitive strategies in more detail from the qualitative part. Data were analyzed through the application of statistical techniques, such as paired t-tests, and regression for the quantitative data, along with thematic analysis for the qualitative data. This combination of methods allows for a detailed understanding of the effectiveness of metacognitive strategies on students learning in a higher education environment.

Theoretical Framework

The study bases itself on Flavell's (1979) Metacognition Theory which defines metacognition as the awareness of the learning process and the ability to monitor, control, and regulate cognitive activities. Flavell's distinction of metacognitive knowledge (awareness of one's thinking processes) and metacognitive regulation (planning, monitoring and evaluation of learning strategies) is relevant here. Furthermore, Zimmerman's (2002) Self-Regulated Learning (SRL) Theory ancillaries this study by addressing how learners manage their learning by setting goals, monitoring their progress, and reflecting on the results. The combination of these theories forms a solid framework to explain the role of metacognitive strategies on academic achievement as well as how university students learn to be self-directed. By employing these frameworks, the study sets out to measure the efficacy of metacognitive strategies and the cognitive and behavioral processes that accompany the strategies.

Data Analysis

The data analysis was conducted using a mixed-methods approach with both quantitative and qualitative aspects. Quantitative data from the pre-and post-tests were analyzed using paired t-tests to determine if there were statistically significant improvements in students' learning outcomes.

The Metacognitive Awareness Inventory (Schraw & Dennison, 1994) was used to evaluate the self-regulated learning abilities of students before and after the metacognitive strategy training. Furthermore, regression analysis was performed to evaluate the relationship between metacognitive strategies and academic performance. Thematic analysis was conducted for qualitative data to assess students' and instructors' impressions of the implementation of metacognitive strategies and to identify noteworthy themes.

Table 1: Pre- and Post-Test Scores Comparison (Paired t-Test Results)

Group	Mean Pre-Test Score	Mean Post-Test Score	Mean Difference	t-value	p-value (Sig.)
Experimental (with metacognitive strategies)	58.2	76.8	18.6	4.21	< 0.01
Control (traditional learning)	57.5	62.2	4.7	1.32	0.19

Table 1 on the experimental group showed a significant improvement ($p < 0.01$) in post-test scores after using metacognitive strategies, while the control group's improvement was not statistically significant ($p = 0.19$).

Table 2: Changes in Metacognitive Awareness Scores (Likert Scale 1-5)

Metacognitive Component	Pre-Intervention Mean Score	Post-Intervention Mean Score	Mean Difference	p-value (Sig.)
Planning	3.2	4.6	1.4	< 0.01
Monitoring	3.1	4.5	1.4	< 0.01
Evaluation	3.0	4.4	1.4	< 0.01
Self-Regulation	3.3	4.7	1.4	< 0.01

In Table 2, the mean scores for all components of metacognitive awareness showed a significant increase ($p < 0.01$), indicating that students developed stronger self-regulation, planning, and evaluation skills after the intervention.

Improvement in Academic Performance

The results from the paired t-test indicated that there was an improvement in the experimental group's test scores compared with the control group ($t = 4.21$, $p < 0.01$). Students who were trained in the metacognitive strategy showed an 18% increase in their post-test scores compared to a 5% increase in the control group. Students who utilized metacognitive strategies academically outperformed those students that were not systematically taught these strategies.

Self-Regulated Learning and Self Reporting of Metacognitive Awareness

The survey responses showed that the experimental group had a greater level of metacognitive awareness after the intervention. The respondents' capacity to plan, monitor, and evaluate their

learning increased, as demonstrated by mean scores going from 3.1 to 4.5 on a 5-point Likert scale. Regression analysis described in the previous section showed that the impact on academic performance of having a self-appraisal knowledge of learning and performance tasks, metacognitive knowledge, ($\beta = 0.32$, $p < 0.05$) was significantly lower in comparison with that of metacognitive regulation ($\beta = 0.48$, $p < 0.01$). This means that students derive maximum benefits from regulation, such as in monitoring and subsequently adjusting their learning strategies rather than merely being aware of them.

Perceptions of Teachers

With regard to the interviews conducted with students, thematic analysis exposed increased learning confidence, problem-solving capabilities, as well as improved self-regulation as salient themes. Most students stated that metacognitive strategies enabled them to recognize their deficiencies, set achievable targets, and modify their study patterns to meet their goals. One of the participants stated:

“I used to just bowl over concepts trying to memorize them with no meaningful understanding. These days, I plan how I am going to study, track what I am studying, and my retention is much better.”

Most educators consider metacognitive strategies as auxiliary devices in promoting self-directed learning. They argue that active self-monitoring, planning, and reflection typically characterize students' academic activities along with positive problem-solving outcomes.

A number of teachers are concerned that a big number of students do not seem to master a metacognitive strategy. They remark that a significant proportion of students seem to depend upon rote memory strategy and thinking does not give them enough of a jump-start for their step into self-regulated learning.

Teachers express a strong feeling that the curriculum should attempt to integrate metacognitive training in a way that allows students to learn those skills over time in a logical manner. They recommend the use of non-examination assignments that include reflective essays, guided self-assessment exercises, and problem-solving activities that will serve to heighten the level of metacognitive awareness.

Most teachers note that students who use metacognitive strategies are more active in the discussions and in group work. These students are more likely to pose relevant questions, request clarifications, and engage in learning with other students.

A portion of the teachers surveyed admit that they need workshops in professional development that can assist them in teaching and motivating learners in metacognitive processes. They propose the need for workshops, peer mentoring, and interdisciplinary teaching which will empower them to apply these strategies in their teaching.

Teachers have indicated the willingness for other forms of assessment which go beyond measuring content retention to incorporate measuring metacognitive growth. They suggest the use of reflective journals, self-assessment reports, and portfolio assessments as possible means of measuring learners' achievements.

Teachers believe that institutional support remains critical in the successful implementation of metacognitive strategies. They recommended that there should be a faculty in the university or learning centers whose sole responsibility is to assist students in developing metacognitive skills.

Many teachers agreed to the fact that the usage of metacognitive strategies not only augments performance in academics but also empowers students to be successful in learning and working throughout their lives. They pointed out that students who have these strategies are more likely to cope with new demands in their work life during their careers.

Summing up, teachers agree that metacognitive strategies are important in education and have strategies that are ignored in undergraduate teaching. The recommendation suggested by the faculty members is to consider metacognitive learning in the curriculum, available resources, staff development, and the institute has strategies which will meet the needs of the students.

Instructor interviews indicated that faculty appreciated the positive impacts of metacognitive strategy use, but there were barriers due to time limitations and class sizes when it came to incorporating them into current course frameworks. They did, however, observe that students who undertook metacognitive processes were more active, interested, and self-directed in their learning.

Discussion

The results reflect earlier work that emphasized the usefulness of metacognitive strategies in student learning (Pintrich, 2002; Zimmerman, 2002). The accompanying dramatic increase in test scores adds weight to the assertion that students who undergo metacognitive training are better equipped to adopt self-regulated learning patterns that enhance academic success. The rise in metacognitive awareness scores, if anything, confirms that students who are taught through explicit instruction of metacognitive strategies were able to control their learning processes (Veenman et al., 2006).

These findings highlight that students with problem-solving capabilities tend to be more independent, which aligns with Flavell's (1979) Metacognition Theory. Moreover, students who self-monitor and self-adjust their working strategies achieve higher academic results, which supports Zimmerman's (2002) Self-Regulated Learning (SRL) Theory. Yet, the research also emphasizes the difficulties of employing metacognitive strategies in higher education, especially in large group teaching situations without sufficient personalized feedback (Winne & Azevedo, 2014).

Conclusion

The findings of this definitive research reveal that students' learning achievements at a public sector university, Karachi, are enhanced with the use of metacognitive strategies. The experimental group that was trained on metacognitive strategies, a combination of planning, monitoring and self-regulation, significantly outperformed the control group. Furthermore, the increase in self-reported metacognitive awareness scores showed that students were aware of the cognitive processes being used resulting in better self-regulation and independent learning. The qualitative analysis also brought to the fore the positive sentiments of students, which suggests that metacognitive strategies do enhance academic achievement, but also instill confidence, problem-solving skills and the ability to learn for a long time.

The study supports the earlier studies (Pintrich, 2002; Zimmerman, 2002) which have shown that metacognitive regulation is critical in enhancing self-directed learning. At the same time, problems

of students' slower-than-expected adaptation and structural university limitations were also discovered, which points to the necessity of purposeful systematic incorporation of metacognitive training into the syllabus.

Recommendations

- The curriculum should no longer compartmentalize disciplines and begin teaching metacognitive strategies within explicitly designed lessons in any subject to all students.
- There should be courses designed for higher education that encompass self-reflective goal setting and monitoring.
- Teachers need to be trained through workshops on the use of classroom metacognitive strategies.
- Faculty should be motivated to incorporate interactive and reflective teaching methodologies to facilitate active learning among students.
- The Universities may implement peer mentorship and collaborative learning in which students can practice metacognitive strategies together.
- Students should be offered informal self-practice resources, like self-regulated learning materials and mobile applications, for continued circulation.
- Universities should evaluate metacognitive awareness in students from time to time for purposes of monitoring development.
- Instructors should provide timely feedback and advice on the learners' self-regulation performance, enabling learners to effectively automate their control.

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