

# Metacognitive Regulation in Higher Education: A Study of Undergraduate Learners

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**Abstract:** *Metacognition is significant in boosting students' academic success, self-regulated learning, and problem-solving capacity. The current research addresses the metacognitive ability of Dhanamanjuri University undergraduates. A quantitative and descriptive cross-sectional survey design was used. Stratified random sampling was used to sample 300 undergraduate students (Arts, Science, and Commerce streams) out of 3000 students. The four dimensions of metacognition (planning, implementation, monitoring, and evaluation) were measured using the Metacognitive Skills Scale (Gupta and Suman, 2017). Data analysis was performed using descriptive statistics, independent samples t-test, and one-way ANOVA. The results indicated that there was a moderate to high overall level of metacognitive skills among undergraduate students. There was no significant gender difference in metacognitive skills. Nevertheless, there was a large variation between the academic streams. This paper explains the importance of incorporating metacognitive strategy teaching into undergraduate curricula to enhance self-directed and lifelong learning.*

**Keywords:** Metacognition, Undergraduate Students, Self-Regulated Learning, Planning, Monitoring

## INTRODUCTION

In modern educational psychology, metacognition has become one of the main constructs, especially regarding self-regulated learning and academic success. Metacognition was originally described by Flavell (1976, 1979) who described metacognition as the knowledge of and control over one's own mental processes. Metacognition is commonly defined as "thinking about thinking" and relates to learners' awareness of their learning process and their ability to regulate their cognitive strategies with reference to planning, monitoring, and evaluation. Flavell has distinguished between metacognitive knowledge, or the realisation of one's capabilities, tasks, and strategies, and metacognitive regulation, or executive processes that control and guide learning processes. The structure was further developed by Brown (1987), who focused on the importance of executive control functions in leadership, comprehension, and problem-solving. Subsequently, Schraw and Dennison (1994) conceptualised metacognition into measurable sub-chapters, offering measurement instruments to determine its effects on students' academic success.

A significant amount of literature has confirmed that metacognitive skills are excellent predictors of learning success. Veenman, Van Hout-Wolters, and Afflerbach (2006) found that metacognitive regulation is an important factor in increasing academic performance across domains and age groups. Similarly, Zimmerman (2002) incorporated metacognition into the theory of self-regulated learning by contending that students who are proactive in the areas of forethought, performance monitoring, and self-reflection perform better. These results lead to the conclusion that metacognition is not an intrinsic manifestation but a process that can be trained through teaching, thought, and experience (Paris and Winograd, 1990).

The world of the twenty-first century is characterised by rapid changes in educational systems due to the development of technologies, globalisation, and the development of knowledge economies. Pedagogical methods rooted in the traditional tradition of memorising material are becoming less effective in helping learners adapt to complex and dynamic environments. Modern education is based on higher-order thinking, adaptability, creativity, and lifelong learning. In this dynamic environment, the capacity to learn has become more significant than actual learning. Metacognition has been a very important element

in this shift, as it makes learners self-directed, reflective, and strategic learners who manage their learning processes (Schraw, Crippen, and Hartley 2006).

Metacognitive development is especially important at the undergraduate level. Students who move out of a relatively structured school setting to a relatively independent context of higher education have to take on increased responsibility in terms of organising, regulating, and assessing their learning. This means that it is necessary to know the degree and range of metacognition skills in undergraduate learners to develop a pedagogical intervention strategy that will help learners develop high levels of self-regulated learning and academic achievement.

### Objectives of the Study

1. To determine the overall level of metacognitive skills among undergraduate students.
2. To examine whether there is a significant difference in metacognitive skills between male and female students.
3. To investigate whether students from the Arts, Science, and Commerce streams differ significantly in their metacognitive skills.

### Hypotheses

$H_{01}$ : There is no significant difference in metacognitive skills between male and female students of the Dhanamanjuri University.

$H_{02}$ : There is no significant difference in metacognitive skills among students of different subject streams (Arts, Science, and Commerce) at Dhanamanjuri University.

### REVIEW OF LITERATURE

Metacognition has been widely researched as a key element of efficient learning and academic performance. Flavell (1976, 1979) initially developed the concept and described it as the knowledge of and control over cognition processes. He drew a line between metacognitive knowledge and metacognitive regulation, focusing on the fact that learners can plan, monitor, and check their thoughts. The framework was further extended by Brown (1987), who pointed out the executive control functions that direct understanding and problem solving. These theoretical works have made metacognition a dynamic, developmental, and instructable construct.

Positive correlation between metacognitive skills and academic performance is always backed by empirical evidence. Veenman, Van Hout-Wolters, and Afflerbach (2006) showed that metacognitive regulation is an important predictor of learning in various domains and age groups. In his self-regulated learning theory, Zimmerman (2002) incorporated metacognition, as he believes that the more a learner engages in systematic forethinking, monitoring, and reflection, the greater the success they experience in their studies. The same can also be said about Young and Fry (2008), who discovered that more metacognitive aware college students are more likely to have better academic performance.

The research also proposes that contextual and disciplinary factors affect metacognitive development. Nguyen et al. (2018) found that metacognitive discipline-

specific profiles were present among university students, and that analytical fields might develop better regulatory skills. Rasool and Bhat (2020) also noticed the difference in metacognitive abilities with demographic variables in the Indian context, and Roy and Guha (2024) reported no significant differences between genders, which points to the contextual diversity of results.

### Research Gap

Despite the extensive study of metacognition at the international and national levels, few empirical studies have been conducted on undergraduate students in northeastern India. Most Indian studies focus on the school population, thus creating a gap in the knowledge of metacognitive regulation at the higher education level. In addition, little has been done in comparative studies among academic streams, especially in universities in the region. It is also necessary to examine the impact of disciplinary orientation on certain aspects of metacognitive skills, such as planning, monitoring, and evaluation. It is necessary to fill these gaps to develop context-specific pedagogical techniques and add to the general discussion on metacognition in higher education.

### METHODOLOGY

The present research used a quantitative methodology based on a descriptive cross-sectional survey design to study the metacognitive skills of an undergraduate. The cross-sectional design was also deemed suitable because it helped the researcher measure the current level of students' metacognitive abilities at one time without controlling any variables.

The sample size of the study included undergraduate students from the constituent colleges of Dhanamanjuri University, Manipur, in the 2024-2025 academic session. Stratified random sampling was used to select a total sample of 300 students to achieve a sufficient number of participants representing different academic streams and sexes. A total of 100 students in the Arts, Science, and Commerce streams were used as the sample, with an equal population frequency of males ( $n=150$ ) and females ( $n=150$ ).

The collected data were the Metacognitive Skills Scale (Gupta and Suman, 2017), a standardised tool with 42 items rated on a 5-point Likert scale (Strongly Disagree, 1; Strongly Agree, 5). The scale measures four metacognitive dimensions: planning, implementation, monitoring, and evaluation.

The data obtained were analysed using SPSS software. The overall level of metacognition was identified using descriptive statistics (mean and standard deviation) and inferential statistics, that is, Independent Samples t-test and One-Way ANOVA were used to determine differences between genders and streams. Informed consent, voluntary participation and confidentiality of responses are some ethical issues, which were strictly followed during the study.

### RESULTS

**Objective 1: To determine the overall level of metacognitive skills among undergraduate students.**

**Table 1: Overall Level of Metacognitive Skills among DMU Undergraduate Students**

Raw Score Range	Level of Metacognitive Skills	Grade	Frequency (f)	Percentage (%)
202 & above	Very High	A	4	1.33
183 – 201	High	B	33	11
164 – 182	Above Average	C	104	34.67
138 – 163	Average	D	137	45.67
119 – 137	Below Average	E	18	6
100 – 118	Low	F	2	0.67
99 & below	Very Low	G	2	0.67
Total			300	100

**Overall Descriptive Statistics**

N	Mean	Standard Deviation
300	161.3	19.9

**Interpretation**

Table 1 shows the general levels of metacognitive skills among the undergraduate learners at D.M.U. The findings showed that most of the students were classified as having an average level of metacognitive awareness (n = 137, 45.67%), followed by above average (n = 104, 34.67%). From the data, we know that few students indicated high metacognitive skills (n = 33, 11%) and very high metacognitive skills (n = 4, 1.33%). On the other hand, few students showed below-average (n = 18, 6%), low (n = 2, 0.67%), and very low (n = 2, 0.67%) scores for metacognitive skills.

The mean score (M = 161.30, SD = 19.90) is on average, which validates the fact that the average metacognitive ability of the undergraduate students of D.M.U. is moderate. The findings indicate that, although a significant percentage of students demonstrate above-average tendencies, a significant percentage of them remain on an average level, which demonstrates the necessity of further development and encouragement to improve students' metacognitive awareness and strategies.

**Objective 2: To examine whether there is a significant difference in metacognitive skills between male and female students.**

**Table 2: Comparison of Metacognitive Skills between Female and Male Undergraduate Students of D.M.U**

Gender	N	Mean	Std. Deviation
Female	150	159.04	16.35
Male	150	163.57	22.75

**Independent Samples t-test Result**

df	t-value	p-value
270	1.98	0.05

**Interpretation**

Table 2 shows the comparison of the metacognitive skills of female and male undergraduate students at D.M.U. The average score of the male students was greater (M = 163.57,

SD = 22.75) than that of the female students (M = 159.04, SD = 16.35). The t-value obtained was 1.98, and the degrees of freedom was 270. The corresponding p-value was 0.05.

The result is at the threshold of statistical significance, as the p-value is equal to the level of significance (0.05). This means that the difference in metacognitive skills between male and female students has a marginal value. The fact that the mean score of male students is higher indicates relatively good metacognitive regulation, but the difference is not significant.

**Hypothesis Testing**

**H<sub>01</sub>:** There is no significant difference in metacognitive skills between male and female students of Dhanamanjuri University

The null hypothesis (H<sub>01</sub>) is accepted at the 0.05 level of significance because t(270) = 1.98, p = 0.05 (= 0.05).

Therefore, it is possible to conclude that the difference in the level of metacognitive skills of undergraduate male and female students is not statistically significant, but a slight difference in the mean scores was noticed.

**Objective 3: To investigate whether students from different academic streams differ significantly in their metacognitive skills.**

**Table 3: Differences in Meta-Cognitive Skills of UG Students by Subject Streams (One-Way ANOVA)**

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5402.247	2	2701.123	7.094	0.001
Within Groups	113093.15	297	380.785		
Total	118495.397	299			

**Table 4: Pairwise Comparison of Meta-Cognitive Skills of UG Students by Subject Streams (Tukey's HSD)**

(I) Subject Stream	(J) Subject Stream	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval (Lower)	Upper
Arts	Science	9.79000*	2.75966	0.001	3.2896	16.2904
Arts	Commerce	1.87	2.75966	0.777	-4.6304	8.3704
Science	Arts	-9.79000*	2.75966	0.001	-16.2904	-3.2896
Science	Commerce	-7.92000*	2.75966	0.012	-14.4204	-1.4196
Commerce	Arts	-1.87	2.75966	0.777	-8.3704	4.6304
Commerce	Science	7.92000*	2.75966	0.012	1.4196	14.4204

\* The mean difference is significant at the 0.05 level.

**Interpretation**

Table 3 indicates the findings of the One-Way ANOVA test that was performed to determine whether there is a significant difference in metacognitive skills between the undergraduate students who represent various academic streams. The F-value obtained was 7.094, the degrees of freedom (2, 297), and the significance value was p = .001. The p-value was less than 0.05, indicating that the result was statistically significant.

This means that the metacognitive abilities of students in the Arts, Science, and Commerce streams vary greatly. As such, it can be concluded that the academic stream has a role to play in shaping planning, monitoring, implementation, and evaluation skills among undergraduate students.

In order to determine the group differences, Tukey HSD post hoc test was used to determine the specific group differences as display in table 4. The findings indicate a large difference between Arts and Science students (Mean Difference = 9.79,  $p = .001$ ) which means that the Science students portray much higher metacognitive ability than the Arts students. On the same note, there is a big difference between students of Science and Commerce (Mean Difference = 7.92,  $p = .012$ ).

Nevertheless, there was no meaningful difference between the Arts and Commerce students ( $p = .777$ ). This indicates that the ability to regulate metacognition is relatively higher among science students, perhaps because of the analytical and problem-solving orientation of their academic curriculum.

### Hypothesis Testing

**H<sub>02</sub>:** There is no significant difference in metacognitive skills among students of different subject streams (Arts, Science, and Commerce) at Dhanamanjuri University.

Because  $F(2, 297) = 7.094$ ,  $p = .001$  (less than .05), the null hypothesis (**H<sub>02</sub>**) was not accepted.

Therefore, it can be concluded that the academic stream has a significant impact on the metacognitive skills of undergraduate students.

### DISCUSSION

The current research hypothesised the metacognitive ability of undergraduate students in terms of general level, gender, and academic stream. The results showed that the overall level of metacognitive skills of the students was average to above average ( $M = 161.30$ ,  $SD = 19.90$ ). Most of the respondents were grouped in the average and above-average levels, indicating that the undergraduate students have fairly well-developed planning, monitoring, and evaluation skills. This observation is in line with Veenman, Van Hout-Wolters, and Afflerbach (2006) who indicated that metacognitive regulation is more organized towards late adolescence and early adulthood. Similarly, Young and Fry (2008) noted that college students generally have moderate-to-average levels of metacognitive awareness that facilitates academic performance. Nevertheless, the low percentage of students in the Very High group suggests that there is a need to consolidate advanced regulatory skills with the help of systematic instructional interventions.

Concerning gender differences, there was no Tablestically significant difference between male and female students, as male students had slightly higher mean scores. The t-test value ( $t(270) = 1.98$ ,  $p = .05$ ) shows that there was a marginal difference that was not very strong in proving gender-based differences. This result is consistent with the findings of Roy and Guha (2024), who found no significant gender differences in metacognitive awareness. Nevertheless, this finding is contrary to the results of Rasool and Bhat (2020) and Yurt (2022), who found that female

students show better metacognitive strategy use. The lack of a gender difference in the current study indicates that therapeutic metacognition levels at the undergraduate level might be influenced more by the common experiences of the academic environment and institutional approaches than by gender.

There were significant differences among the academic streams ( $F(2, 297) = 7.094$ ,  $p = .001$ ). The Tukey HSD analysis further indicated that the Science students provided better results than both Arts and Commerce students, whereas no significant difference was observed between the Arts and Commerce streams. This implies that the disciplinary context affects metacognitive regulation. The analytical and problem-solving orientation of the science curricula might require more planning, monitoring, and evaluative thinking, thus enhancing regulatory skills. Nguyen et al. (2018) also indicated similar discipline-specific differences and identified different metacognitive profiles in different academic areas.

Overall, these results support the context-sensitive and developmental character of metacognition and the need to incorporate metacognitive strategy teaching into higher education disciplines.

### EDUCATIONAL IMPLICATIONS

The study findings have significant implications for the practice and policy of higher education. As most students showed average or better-than-average metacognitive skills, the explicit teaching of metacognitive strategies should be introduced into the undergraduate curriculum. Faculty members can model planning, monitoring, and evaluative thinking during classroom interactions to enhance reflective learning. Considering the differences noted by streams, specific academic interventions can be developed for subjects with relatively less developed metacognitive development. Assessment practices should focus on the ability to think analytically, solve problems, and evaluate oneself, as opposed to memorisation. Self-regulated learning can be reinforced through the incorporation of enquiry-based learning, formative assessment, and reflections, in line with the goals of NEP 2020. Increasing metacognitive competence will help create autonomous, versatile, and lifelong learners who are ready to face an ever-changing knowledge society.

### CONCLUSION

The current research identified the metacognitive abilities of undergraduate students in terms of general level, gender, and study stream. According to the results, the students had average or above-average metacognitive skills, which implies good development of planning, monitoring, and evaluative skills. The non-significance of gender differences suggests fair cognitive participation by male and female learners in tertiary education. Nevertheless, the average distribution of scores points to the necessity of systematic pedagogical interventions aimed at improving higher-order regulatory capacities. As discussed in accordance with the goals of the National Education Policy (NEP) 2020, which focuses on critical thinking, self-directed learning, and holistic development, the enhancement of metacognitive competencies is of utmost importance in undergraduate curricula.

There are also significant stream-wise differences, which indicate that disciplinary orientation affects the development of metacognition, and science-based curricula may provide more powerful analytical regulation skills. Thus, explicit instruction on metacognitive strategies at the policy level must be introduced in all fields. Integrating reflective learning, formative assessment, and enquiry-based pedagogy into higher education systems can advance self-regulated and lifelong learning. Finally, the development of metacognitive competence constitutes not only an educational objective but also a precursor to equipping flexible, introspective, and internationally proficient graduates with the knowledge-based society.

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