



Empowering University Learners: Metacognitive Learning Strategies Across Genders and Academic Streams

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Abstract

Metacognitive learning strategies—encompassing planning, monitoring, and evaluation—represent critical self-regulatory mechanisms that enhance academic achievement among university students. This study examines their variation by gender and academic streams (arts, sciences, commerce) using a sample of 500 undergraduates. Independent t-tests revealed no significant gender differences ($t(498) = 1.23, p = 0.219$), while two-way ANOVA showed no main effects for stream ($F(2,494) = 0.67, p = 0.513$) or gender ($F(1,494) = 0.81, p = 0.369$), nor significant interactions ($F(2,494) = 0.52, p = 0.597$). Correlation analysis confirmed moderate positive relationships between metacognitive strategies and GPA ($r = 0.42, p < 0.001$). Findings advocate universal metacognitive training programs that transcend demographic boundaries, emphasizing personalized strategy development. Educational implications include curriculum-embedded reflection tools and faculty training in self-regulation pedagogy.

Keywords: metacognitive learning strategies, self-regulated learning, gender differences, academic streams, university achievement, higher education

1. Introduction

1.1 Background and Rationale

In contemporary higher education, academic success increasingly hinges on students' ability to self-orchestrate their learning processes. Metacognitive learning strategies—defined as deliberate cognitive operations involving planning task approaches, monitoring comprehension during execution, and

evaluating outcomes post-task (Flavell, 1979)—serve as the cornerstone of self-regulated learning (SRL). Unlike surface-level memorization, these strategies enable learners to adaptively manage cognitive resources, fostering deeper understanding and sustained performance.

Despite their established efficacy, critical questions persist regarding demographic influences. Do male and female students deploy metacognitive strategies differently? Are science students more strategic than arts counterparts? Existing literature presents mixed findings: while some studies report gender invariance (Pintrich & De Groot, 1990), others suggest discipline-specific patterns (García et al., 2020). This study addresses these gaps by analyzing strategy use across genders and academic streams among North Indian university students.

1.2 Theoretical Framework

The research is grounded in Zimmerman's (1990) cyclical model of self-regulated learning, which posits three phases: forethought (planning), performance (monitoring), and self-reflection (evaluation). This triadic structure aligns with the Motivated Strategies for Learning Questionnaire (MSLQ) subscales employed here. Expectancy-value theory (Wigfield & Eccles, 2000) further contextualizes how students' competence beliefs influence strategy selection, though demographic moderators remain underexamined.

1.3 Significance of the Study

Findings hold practical implications for curriculum design, faculty training, and institutional policy. By clarifying whether metacognitive interventions require gender- or stream-specific tailoring, this research supports evidence-based pedagogical reform in diverse higher education contexts.

2. Review of Literature

2.1 Metacognitive Strategies and Academic Achievement

Pintrich and De Groot (1990) established that metacognitive self-regulation significantly predicts classroom performance ($\beta = 0.35$, $p < 0.01$), independent of aptitude. Longitudinal studies confirm this: students with high planning/monitoring scores maintain superior GPAs across semesters (Rodríguez, 2020).

2.2 Gender Differences in Metacognitive Strategy Use

Gender research yields inconsistent results. Some meta-analyses report females' advantage in monitoring ($r = 0.12$; Schunk & Pajares, 2002), while others find equivalence (Zimmerman, 1990). Cultural contexts may moderate these patterns, with collectivist societies showing attenuated differences.

2.3 Academic Stream Variations

STEM disciplines often demand explicit strategy instruction, potentially elevating science students' metacognition (Asian Social Science, 2013). Conversely, humanities foster implicit reflection through discussion-based learning (Christ University Journals, n.d.). Empirical comparisons remain scarce.

2.4 Research Gap

While individual studies exist, comprehensive analyses integrating gender, stream, and achievement correlations within single frameworks are limited—particularly from developing nation contexts.

3. Objectives

1. To investigate gender differences in metacognitive learning strategies among university students.
2. To examine academic stream effects and gender-stream interactions on strategy deployment.
3. To explore correlations between metacognitive strategies and academic achievement.

4. Method

4.1 Participants

The study comprised 500 undergraduate students (220 males, 280 females; M age = 20.4 years, $SD = 1.2$) from Panjab University affiliates across three streams: Arts (35%), Sciences (40%), Commerce (25%). Purposive sampling ensured demographic representation. Participation was voluntary with informed consent.

4.2 Instruments

Metacognitive Self-Regulation Scale (MSLQ): 12 items across planning (4 items, $\alpha = 0.85$), monitoring (4 items, $\alpha = 0.82$), and evaluation (4 items, $\alpha = 0.87$). Likert scale: 1 (*not at all true*) to 7 (*very true*). Composite reliability: $\alpha = 0.89$.

Academic Achievement: Semester GPA (0-10 scale) obtained from registrar records.

Demographics: Gender, stream, year of study.

4.3 Procedure

Data collection occurred during regular classes (Fall 2024) over four weeks. Questionnaires administered in English/Hindi (back-translated). Response rate: 92%.

4.4 Data Analysis

SPSS 27.0 facilitated analyses:

- Independent t-tests (gender)
- Two-way ANOVA (stream $\times$ gender)
- Pearson correlations (strategies-achievement)
- Effect sizes (Cohen's d , η^2)

$\alpha = 0.05$; assumptions verified (normality, homogeneity).

5. Results

5.1 Descriptive Statistics

Table

1

Descriptive Statistics for Metacognitive Learning Strategies by Gender and Stream

Group	<i>N</i>	Planning (<i>M</i> ± <i>SD</i>)	Monitoring (<i>M</i> ± <i>SD</i>)	Evaluation (<i>M</i> ± <i>SD</i>)	Composite (<i>M</i> ± <i>SD</i>)
Gender					
Male	220	3.78±1.42	3.69±1.48	3.68±1.44	3.72±1.45
Female	280	3.65±1.49	3.58±1.55	3.60±1.51	3.61±1.52
Stream					

Arts	175	3.64±1.47	3.55±1.53	3.58±1.50	3.59±1.50
Sciences	200	3.74±1.46	3.67±1.50	3.69±1.47	3.70±1.48
Commerce	125	3.68±1.48	3.62±1.52	3.62±1.49	3.64±1.50
Total	500	3.70±1.47	3.62±1.52	3.64±1.49	3.66±1.49

5.2 Inferential Statistics

5.2.1 t-Test Results: Gender Differences

Table

2

Independent t-Test for Metacognitive Composite Scores by Gender

Gender	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Male	220	3.72	1.45	498	1.23	0.219	0.08
Female	280	3.61	1.52				

No significant gender difference: $t(498) = 1.23$, $p = 0.219$, $d = 0.08$ (trivial effect).

5.2.2 ANOVA Results: Stream and Gender Effects

Table

3

Two-Way ANOVA for Metacognitive Composite Scores

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η^2
Stream	3.15	2	1.575	0.67	0.513	0.003
Gender	1.89	1	1.89	0.81	0.369	0.002
Stream × Gender	2.42	2	1.21	0.52	0.597	0.002

Error	1175.32	494	2.38			
Total	1182.76	499				

Levene's Test: $F(5,494) = 1.12, p = 0.346$ (equal variances).

No significant effects emerged (all $p > 0.05, \eta^2 < 0.01$).

5.2.3 Correlation Analysis

Table

4

Correlations Between Metacognitive Strategies and GPA

Variable	1	2	3	4	GPA
1. Planning	—	0.78**	0.75**	0.68**	0.39**
2. Monitoring		—	0.80**	0.71**	0.42**
3. Evaluation			—	0.73**	0.40**
4. Composite				—	0.42**

$p < 0.001$. All strategies positively correlate with GPA ($r = 0.39$ – 0.42).

6. Discussion

6.1 Interpretation of Findings

Gender neutrality in metacognitive strategy use aligns with Zimmerman's (1990) assertion that SRL represents individualized, context-driven processes rather than demographic traits. The trivial effect size ($d = 0.08$) reinforces this universality.

Stream invariance challenges expectations from domain-specific cognition literature (García et al., 2020), suggesting contemporary curricula converge on strategy demands. Uniform university assessment cultures may explain this convergence.

Achievement correlations ($r \approx 0.40$) confirm metacognition's practical significance, consistent with Pintrich and De Groot (1990; $\beta = 0.35$).

6.2 Theoretical Implications

Results support integrative SRL models over segmented demographic approaches. Expectancy-value constructs likely operate similarly across groups (Wigfield & Eccles, 2000).

6.3 Comparison with Previous Research

Findings converge with Pintrich and De Groot (1990) and diverge from gender-differentiated studies (Schunk & Pajares, 2002), potentially reflecting cultural moderation.

6.4 Limitations

1. Self-report methodology risks social desirability bias.
2. Cross-sectional design precludes causality.
3. Single-institution sampling limits generalizability.
4. GPA as sole achievement measure overlooks skill-based outcomes.

7. Conclusions

1. Metacognitive learning strategies demonstrate remarkable consistency across genders and academic streams.
2. These strategies maintain moderate, positive relationships with academic achievement irrespective of demographics.
3. Self-regulation emerges as a universal learner competency rather than group-specific trait.

8. Educational Implications

8.1 Curriculum Design

- Integrate metacognitive prompts in syllabi (e.g., "How will you monitor progress?").
- Implement strategy modeling via think-aloud protocols.

8.2 Faculty Development

- Mandatory SRL training workshops.
- Course-embedded reflection rubrics.

8.3 Institutional Policy

- Universal metacognitive screening at admission.
- Digital learning analytics for strategy tracking.

8.4 Student Support

- Peer mentoring in strategy deployment.
- Learning strategy centers across streams.

9. Recommendations for Future Research

1. Longitudinal tracking of strategy development across degree programs.
2. Experimental interventions testing strategy training efficacy.
3. Cross-cultural comparisons of metacognitive patterns.
4. Neuroimaging studies of strategy deployment.
5. Integration with emerging AI learning tools.

References

- Asian Social Science. (2013). Learning strategies across disciplines. *Asian Social Science*. <https://ccsenet.org/journal/index.php/ass/article/view/42920>
- Christ University Journals. (n.d.). Metacognition in humanities education. *Artha Journal*. <https://journals.christuniversity.in/index.php/artha/article/download/717/533/1411>
- Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, 34(10), 906–911. <https://doi.org/10.1037/0003-066X.34.10.906>

García, L., et al. (2020). Metacognitive awareness in higher education. *Revista Redalyc*, 1342. <https://www.redalyc.org/journal/1342/134265182002/html/>

International Journal for Multidisciplinary Research. (2024). Self-regulated learning patterns. *International Journal for Multidisciplinary Research*, 6(5). <https://www.ijfmr.com/papers/2024/5/27642.pdf>

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33–40. <https://doi.org/10.1037/0022-0663.82.1.33>

Rodríguez, M. (2020). Academic achievement and learning strategies. *Revista Colombiana de Educación*. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0121-43812020000100009

Schunk, D. H., & Pajares, F. (2002). The development of academic self-efficacy. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 15–31). Academic Press. <https://doi.org/10.1016/B978-012750053-9/50003-6>

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology*, 25(1), 68–81. <https://doi.org/10.1006/ceps.1999.1020>

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, 25(1), 3–17. https://doi.org/10.1207/s15326985ep2501_1