International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

Influence Of Demographic Factors On Learning Styles Of Higher Secondary Students Of West Tripura

Ms. Sulekha Chakraborty[1], Prof. (Dr.) Prem Shankar Srivastava[*2]

[1]Research Scholar, Faculty of Education, The ICFAI University, Tripura, India.
[*2]Principal, Faculty of Education, The ICFAI University, Tripura, India.

Abstract

This study investigated the influence of demographic factors (gender and academic stream) on learning styles (cognitive, affective, and psychomotor) among 167 higher secondary students in West Tripura District. Using independent samples t-tests and one-way ANOVA, the results revealed no significant gender differences across all three learning style dimensions ($p > 0.05$). However, significant differences emerged in cognitive learning styles across academic streams ($F = 3.64$, $p = 0.030$), with science students ($M = 60.3$) scoring significantly higher than commerce students ($M = 56.6$). No significant stream differences were found for affective or psychomotor learning styles. These findings suggest that while gender does not influence learning style preferences, academic stream selection may be associated with certain cognitive learning approaches, though the causal direction remains unclear.

Keywords : *Learning style, Cognitive,Affective, Psychomotor, Gender difference, Academic stream.*

INTRODUCTION

Learning styles represent the preferential ways in which individuals absorb, process, comprehend, and retain information (Felder & Silverman, 1988). Understanding how demographic factors influence these preferences has significant implications for educational practice, particularly in diverse educational contexts like India. The three primary domains of learning styles - cognitive, affective, and psychomotor - align with Bloom's taxonomy of educational objectives and provide a comprehensive framework for examining learner differences (Bloom, 1956; Krathwohl, Bloom, & Masia, 1964).

The relationship between gender and learning styles has been extensively studied with mixed results. While some researchers report significant gender differences in learning preferences (Wehrwein, Lujan, & DiCarlo, 2007), others find minimal or no differences (Choudhary, Dullo, & Tandon, 2011). Similarly, academic stream selection - whether students choose science, arts, or commerce - may reflect or influence learning style development, though the direction of causality remains contested.

The Indian educational context presents unique considerations for studying learning styles. The rigid streaming system at the higher secondary level, combined with intense competition for professional courses, creates distinct learning environments that may shape cognitive preferences (Sharma & Sharma, 2021). Additionally, cultural factors influencing gender roles and academic choices in India may interact with learning style development in ways not captured by Western-developed instruments.

This study aims to examine the influence of gender and academic stream on cognitive, affective, and psychomotor learning styles among higher secondary students in West Tripura. Understanding these relationships can inform pedagogical approaches and support more effective teaching strategies in the Indian educational context.

METHODOLOGY

The study employed a descriptive survey design with 167 higher secondary students from West Tripura District. The sample comprised 79 female (47.3%) and 88 male (52.7%) students distributed across three academic streams: Science (n = 69, 41.3%), Arts (n = 54, 32.3%), and Commerce (n = 44, 26.4%). All participants were enrolled in Classes XI and XII in government and government-aided schools. Participation was voluntary, and confidentiality was assured. The completed questionnaires were scored according to the instrument guidelines, generating composite scores for each learning style dimension.

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

Statistical analyses were performed using Ja Movi Statistical software. Independent samples t-tests were conducted to examine gender differences in each learning style dimension. One-way ANOVA with Welch's correction (due to unequal variances) was used to analyze differences across academic streams. Post-hoc comparisons using Tukey's HSD were performed for significant ANOVA results. Assumptions of normality (Shapiro-Wilk test) and homogeneity of variances (Levene's test) were tested for all analyses. Effect sizes were calculated using Cohen's d for t-tests and eta-squared for ANOVA. The significance level was set at $p < 0.05$.

RESULTS

Analysis 1: Gender Differences in Cognitive Learning Styles

Table 1 Independent Samples T-Test

	Statistic	df	p
Cognitive Learning Skills			
Student's t	-0.896	165	0.371
Mann-Whitney U	3366		0.725

Note. H_a μFemale ≠ μMale

Table 2 Normality Test (Shapiro-Wilk)

	W	p
Cognitive Learning Skills	0.992	0.498

Note. A low p-value suggests a violation of the assumption of normality

Table 3 Homogeneity of Variances Test (Levene's)

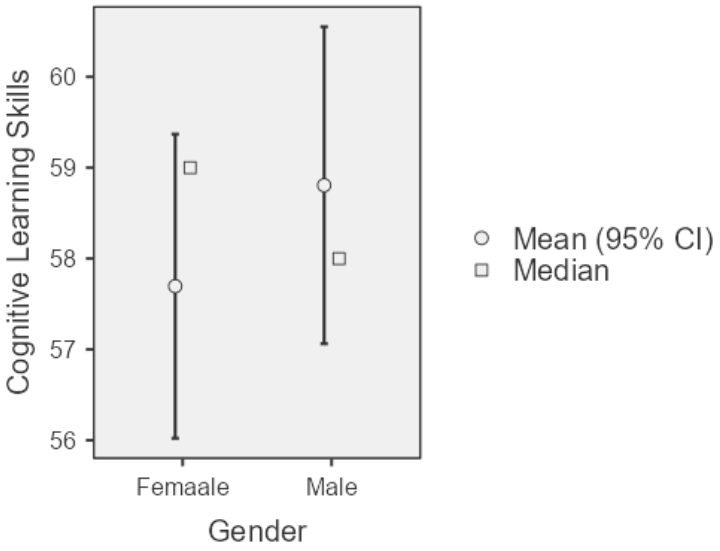
	F	df	df2	p
Cognitive Learning Skills	0.795	1	165	0.374

Note. A low p-value suggests a violation of the assumption of equal variances

Table 4 Group Descriptives

	Group	N	Mean	Median	SD	SE
Cognitive Learning Skills	Female	79	57.7	59.0	7.59	0.854
	Male	88	58.8	58.0	8.35	0.890

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php



Source; jamovi. (Version 2.6)

The independent samples t-test revealed no significant difference in cognitive learning styles between female and male students, $t(165) = -0.896$, $p = 0.371$. The Mann-Whitney U test, conducted as a non-parametric alternative, confirmed this finding ($U = 3366$, $p = 0.725$). Female students ($M = 57.7$, $SD = 7.59$) scored slightly lower than male students ($M = 58.8$, $SD = 8.35$), but this difference was not statistically significant.

Assumption checks indicated that the data met the normality assumption (Shapiro-Wilk $W = 0.992$, $p = 0.498$) and homogeneity of variances (Levene's $F(1,165) = 0.795$, $p = 0.374$). The small effect size ($d = 0.14$) suggests minimal practical difference between genders.

Analysis 2: Gender Differences in Affective Learning Styles

Table 5 Independent Samples T-Test

	Statistic	df	p
Affective Learning Skills			
Student's t	0.124[a]	165	0.901
Mann-Whitney U	3386		0.774

Note. H_a μFemale ≠ μMale [a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Table 6 Normality Test (Shapiro-Wilk)

	W	p
Affective Learning Skills	0.979	0.011

Note. A low p-value suggests a violation of the assumption of normality

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

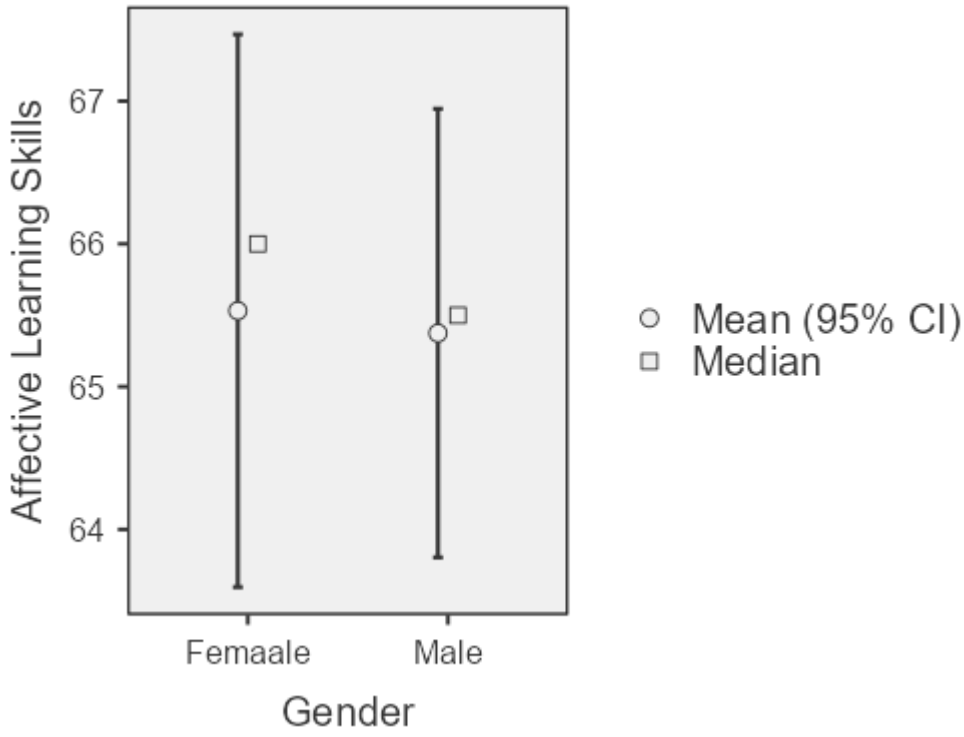
Table 7 Homogeneity of Variances Test (Levene's)

	F	df	df2	p
Affective Learning Skills	4.27	1	165	0.040

Note. A low p-value suggests a violation of the assumption of equal variances

Table 8 Group Descriptives

	Group	N	Mean	Median	SD	SE
Affective Learning Skills	Female	79	65.5	66.0	8.78	0.988
	Male	88	65.4	65.5	7.52	0.802



Source; jamovi. (Version 2.6)

No significant gender difference was found for affective learning styles. Female students (M = 65.5, SD = 8.78) scored similarly to male students (M = 65.4, SD = 7.52), t(165) = 0.124, p = 0.901. The Mann-Whitney U test supported this finding (U = 3386, p = 0.774).

The normality assumption was violated (W = 0.979, p = 0.011), and Levene's test indicated unequal variances (F(1,165) = 4.27, p = 0.040), necessitating the use of Welch's t-test. Despite these violations, both parametric and non-parametric tests yielded consistent results, strengthening confidence in the null finding.

Analysis 3: Gender Differences in Psychomotor Learning Styles

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

Table 9 Independent Samples T-Test

	Statistic	df	p
Psychomotor Learning Skills			
Student's t	0.345	165	0.731
Mann-Whitney U	3372		0.739

Note. H_a μFemale ≠ μMale

Table 10 Normality Test (Shapiro-Wilk)

	W	p
Psychomotor Learning Skills	0.986	0.088

Note. A low p-value suggests a violation of the assumption of normality

Table 11 Homogeneity of Variances Test (Levene's)

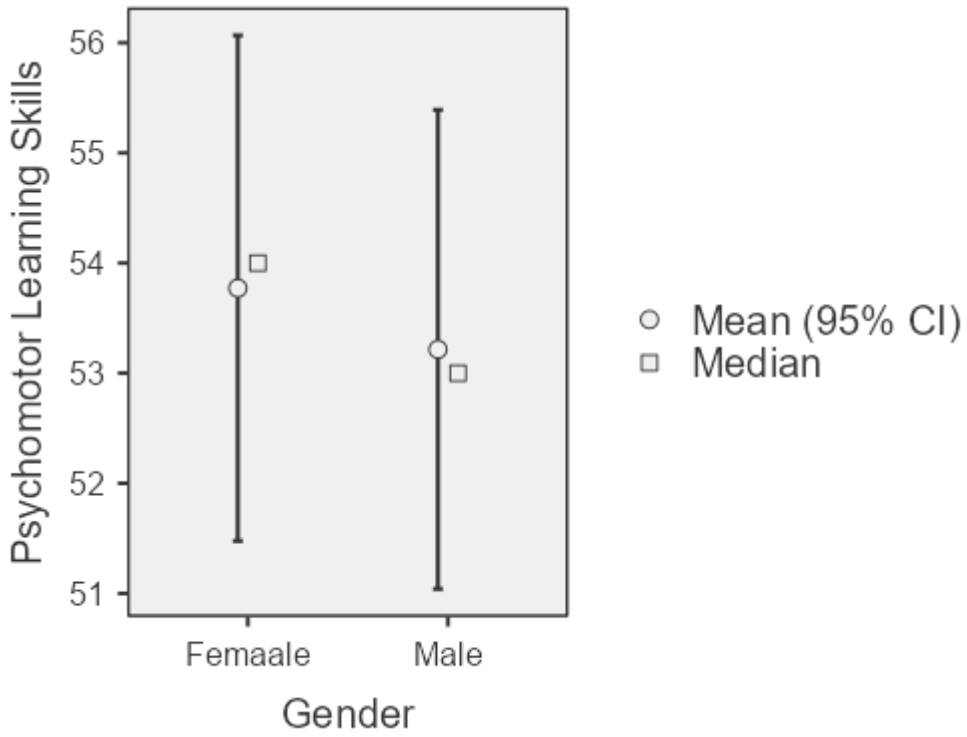
	F	df	df2	p
Psychomotor Learning Skills	0.0229	1	165	0.880

Note. A low p-value suggests a violation of the assumption of equal variances

Table 12 Group Descriptives

	Group	N	Mean	Median	SD	SE
Psychomotor Learning Skills	Female	79	53.8	54.0	10.4	1.17
	Male	88	53.2	53.0	10.4	1.11

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php



Source; jamovi. (Version 2.6)

Psychomotor learning styles showed no significant gender differences. Female students (M = 53.8, SD = 10.4) and male students (M = 53.2, SD = 10.4) demonstrated nearly identical mean scores, t(165) = 0.345, p = 0.731. The Mann-Whitney U test corroborated this finding (U = 3372, p = 0.739).

Assumptions were satisfactorily met, with normality (W = 0.986, p = 0.088) and homogeneity of variances (F(1,165) = 0.0229, p = 0.880) both non-significant. The negligible effect size (d = 0.06) indicates no practical difference between genders.

Analysis 4: Academic Stream Differences in Cognitive Learning Styles

Table 13 One-Way ANOVA (Welch's)

	F	df1	df2	p
Cognitive Learning Skills	3.64	2	104	0.030

Table 14 Group Descriptives

	Academic Stream	N	Mean	SD	SE
Cognitive Learning Skills	Arts	54	57.1	7.17	0.975
	Commerce	44	56.6	7.54	1.137
	Science	69	60.3	8.54	1.028

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

Table 15 Normality Test (Shapiro-Wilk)

	W	p
Cognitive Learning Skills	0.992	0.503

Note. A low p-value suggests a violation of the assumption of normality

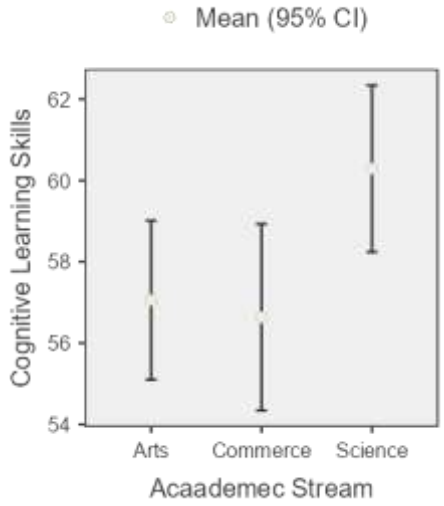
Table 16 Homogeneity of Variances Test (Levene's)

	F	df1	df2	p
Cognitive Learning Skills	1.08	2	164	0.342

Table 17 Tukey Post-Hoc Test - Cognitive Learning Skills

		Arts	Commerce	Science
Arts	Mean difference	...	0.419	-3.23
	t-value	...	0.263	-2.27
	df	...	164	164
	p-value	...	0.963	0.064
Commerce	Mean difference		...	-3.65*
	t-value		...	-2.41
	df		...	164
	p-value		...	0.045
Science	Mean difference			...
	t-value			...
	df			...
	p-value			...

Note. * p < .05, ** p < .01, *** p < .001



Source; jamovi. (Version 2.6)

One-way ANOVA revealed significant differences in cognitive learning styles across academic streams, Welch's $F(2,104) = 3.64$, $p = 0.030$. Science students ($M = 60.3$, $SD = 8.54$) scored highest, followed by Arts ($M = 57.1$, $SD = 7.17$) and Commerce ($M = 56.6$, $SD = 7.54$) students.

Post-hoc Tukey tests indicated that the significant difference was primarily between Science and Commerce students (mean difference = 3.65, $p = 0.045$). The difference between Science and Arts students approached significance (mean difference = 3.23, $p = 0.064$), while Arts and Commerce students did not differ significantly (mean difference = 0.419, $p = 0.963$).

Assumption checks showed acceptable normality ($W = 0.992$, $p = 0.503$) and homogeneity of variances (Levene's $F(2,164) = 1.08$, $p = 0.342$). The effect size ($\eta^2 = 0.043$) indicates a small to moderate practical significance.

Analysis 5: Academic Stream Differences in Affective Learning Styles

Table 18 One-Way ANOVA (Welch's)

	F	df1	df2	p
Affective Learning Skills	1.41	2	99.3	0.250

Table 19 Group Descriptives

	Academic Stream	N	Mean	SD	SE
Affective Learning Skills	Arts	54	64.1	7.63	1.038
	Commerce	44	65.4	8.84	1.333
	Science	69	66.5	7.97	0.959

Table 20 Normality Test (Shapiro-Wilk)

	W	p
Affective Learning Skills	0.980	0.015

Note. A low p-value suggests a violation of the assumption of normality

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

Table 21 Homogeneity of Variances Test (Levene's)

	F	df1	df2	p
Affective Learning Skills	1.64	2	164	0.197

Table 22 Tukey Post-Hoc Test - Affective Learning Skills

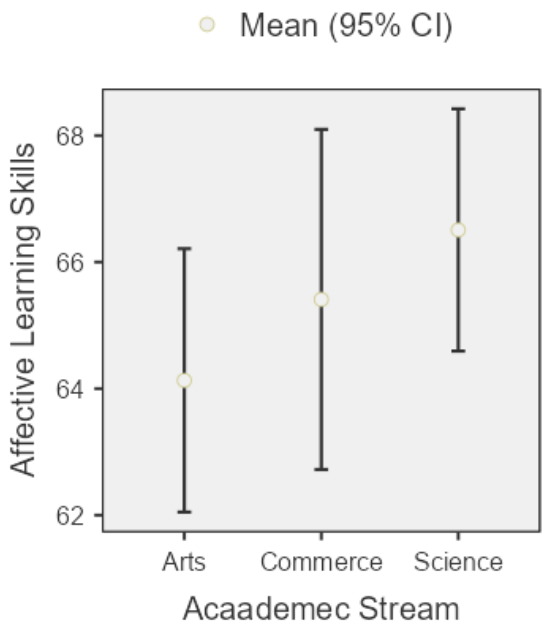
		Arts	Commerce	Science
Arts	Mean difference	⎓	-1.28	-2.38
	t-value	⎓	-0.778	-1.616
	df	⎓	164	164
	p-value	⎓	0.717	0.242
Commerce	Mean difference		⎓	-1.10
	t-value		⎓	-0.703
	df		⎓	164
	p-value		⎓	0.762
Science	Mean difference			⎓
	t-value			⎓
	df			⎓
	p-value			⎓

Note. * p < .05, ** p < .01, *** p < .001

Table 23 Kruskal-Wallis (Non-parametric)

	χ^2	df	p
Affective Learning Skills	2.60	2	0.273

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php



Source; jamovi. (Version 2.6)

No significant differences were found in affective learning styles across academic streams, Welch's F(2,99.3) = 1.41, p = 0.250. Science students showed the highest mean scores (M = 66.5, SD = 7.97), followed by Commerce (M = 65.4, SD = 8.84) and Arts (M = 64.1, SD = 7.63) students, but these differences were not statistically significant.

The Kruskal-Wallis test, used due to normality violations (W = 0.980, p = 0.015), confirmed the non-significant finding ($\chi^2(2) = 2.60$, p = 0.273). Post-hoc comparisons showed no significant pairwise differences between any of the academic streams.

Analysis 6: Academic Stream Differences in Psychomotor Learning Styles

Table 24 One-Way ANOVA (Welch's)

	F	df1	df2	p
Psychomotor Learning Skills	1.64	2	98.8	0.199

Table 25 Group Descriptives

	Academic Stream	N	Mean	SD	SE
Psychomotor Learning Skills	Arts	54	52.4	9.42	1.28
	Commerce	44	52.1	11.58	1.75
	Science	69	55.2	10.20	1.23

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

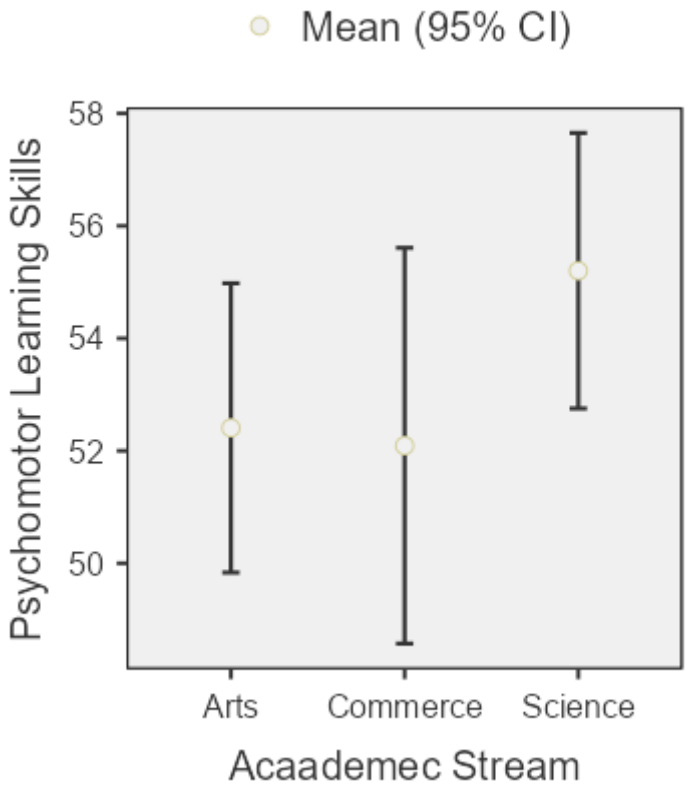
Table 26 Normality Test (Shapiro-Wilk)

	W	p
Psychomotor Learning Skills	0.986	0.105

Note. A low p-value suggests a violation of the assumption of normality

Table 27 Homogeneity of Variances Test (Levene's)

	F	df1	df2	p
Psychomotor Learning Skills	0.925	2	164	0.399



Source; jamovi. (Version 2.6)

Psychomotor learning styles showed no significant differences across academic streams, Welch's F(2,98.8) = 1.64, p = 0.199. Science students had slightly higher mean scores (M = 55.2, SD = 10.20) compared to Arts (M = 52.4, SD = 9.42) and Commerce (M = 52.1, SD = 11.58) students, but these differences did not reach statistical significance.

Assumptions of normality (W = 0.986, p = 0.105) and homogeneity of variances (F(2,164) = 0.925, p = 0.399) were met. The small effect size (η^2 = 0.020) suggests minimal practical differences across streams.

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 19s, 2025
https://www.theaspd.com/ijes.php

DISCUSSION

The present study examined the influence of gender and academic stream on learning styles among higher secondary students in West Tripura. The findings reveal a nuanced pattern: while gender showed no significant association with any learning style dimension, academic stream demonstrated a significant relationship with cognitive learning styles but not with affective or psychomotor styles.

Gender and Learning Styles: Challenging Traditional Assumptions

The absence of significant gender differences across all three learning style dimensions aligns with recent meta-analytic evidence challenging traditional assumptions about gender-based learning preferences. Our findings corroborate the work of Yu and Zheng (2022), who found minimal gender differences in learning outcomes across multiple countries. This convergence of evidence suggests that pedagogical approaches based on assumed gender differences in learning styles may be unfounded.

However, these results contrast with some recent studies. Saxena et al. (2024) reported significant gender differences in learning strategies among medical students, with females scoring higher on attitude and resource utilization scales. The discrepancy may reflect differences in educational level (higher secondary versus professional education) or measurement approaches (learning styles versus learning strategies). Additionally, the medical education context, with its unique pressures and requirements, may accentuate gender differences not apparent in general higher secondary education.

The Indian cultural context adds complexity to interpreting these null findings. Despite strong societal gender role expectations that might predict different learning approaches, our results suggest that by the higher secondary level, male and female students in West Tripura have developed similar learning style preferences. This could indicate that educational experiences override cultural gender stereotypes in shaping learning approaches, or that our instruments may not capture culturally specific gender differences in learning.

ACADEMIC STREAM AND COGNITIVE LEARNING: SELECTION OR SOCIALIZATION?

The significant difference in cognitive learning styles across academic streams, with science students scoring highest, raises important questions about causality. Two primary explanations emerge: selection effects (students with certain cognitive preferences choose specific streams) and socialization effects (academic streams shape cognitive approaches).

Supporting the selection hypothesis, research on academic choice in India reveals that students often select streams based on perceived aptitude and career aspirations (Sahoo & Klasen, 2021). Students with stronger analytical and sequential processing preferences may gravitate toward science, while those with different cognitive strengths choose arts or commerce. The approaching significance of the science-arts difference ($p = 0.064$) suggests a gradient effect consistent with this interpretation.

Alternatively, the socialization hypothesis suggests that disciplinary training shapes cognitive approaches. Science education in India, particularly at the higher secondary level, emphasizes systematic problem-solving, hypothesis testing, and sequential reasoning - all components of the cognitive learning style dimension. The intensive preparation for competitive examinations like JEE and NEET in the science stream may further reinforce these cognitive patterns.

Our findings partially align with international research showing discipline-specific learning patterns. However, the absence of significant differences in affective and psychomotor dimensions challenges simple stereotypes about stream-based learning preferences. This suggests that while cognitive approaches may vary by discipline, emotional engagement with learning and preferences for hands-on activities remain relatively constant across streams.

THEORETICAL AND PRACTICAL IMPLICATIONS

These findings contribute to the ongoing debate about the validity and utility of learning styles frameworks. The limited demographic variations observed, particularly the complete absence of gender effects, align with recent critiques of learning styles theory (Newton & Salvi, 2020). The fact that only one of six possible demographic-

learning style associations reached significance could reflect Type I error rather than meaningful differences.

However, the significant stream difference in cognitive styles, while modest in effect size, suggests that some aspects of learning preference may relate to academic context. Rather than supporting fixed learning styles, this may indicate that students develop adaptive strategies suited to their disciplinary requirements. This interpretation aligns with contemporary cognitive science emphasizing the importance of flexible, context-appropriate learning strategies over fixed styles.

For educational practice in West Tripura and similar contexts, these findings suggest several recommendations. First, educators should avoid making assumptions about student learning preferences based on gender. The lack of gender differences indicates that instructional differentiation along gender lines is neither necessary nor beneficial. Second, while some cognitive differences exist across academic streams, the small effect size and absence of differences in other dimensions suggest that diverse pedagogical approaches benefiting all learners are more appropriate than stream-specific instruction.

LIMITATIONS AND FUTURE DIRECTIONS

Several limitations should be considered when interpreting these results. The cross-sectional design prevents causal inferences about whether academic streams shape cognitive styles or vice versa. The sample was limited to one district in Tripura, potentially limiting generalizability to other Indian contexts with different educational traditions or cultural backgrounds. Additionally, the learning styles instrument, while covering three important dimensions, may not capture all relevant aspects of learning preferences in the Indian context.

The violation of normality assumptions in the affective learning styles analysis, while addressed through non-parametric tests, suggests potential measurement issues that warrant further investigation. The relatively small sample sizes for stream comparisons may have limited power to detect smaller but potentially meaningful differences.

CONCLUSION

This study provides evidence that gender does not significantly influence learning style preferences among higher secondary students in West Tripura, challenging assumptions about gender-based pedagogical differentiation. While academic stream shows some association with cognitive learning styles, the modest effect size and absence of differences in other dimensions suggest that universal, evidence-based instructional strategies may be more beneficial than demographic-based differentiation. These findings contribute to the growing body of evidence questioning the practical utility of learning styles frameworks while highlighting the need for continued research on how educational contexts shape learning approaches in diverse cultural settings.

REFERENCES

1. Bloom, B. S. (1956). Taxonomy of educational objectives: The classification of educational goals. Longmans, Green.
2. Choudhary, R., Dullo, P., & Tandon, R. V. (2011). Gender differences in learning style preferences of first year medical students. Pakistan Journal of Physiology, 7(2), 42-45.
3. Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. Engineering Education, 78(7), 674-681.
4. Fox, J., & Weisberg, S. (2023). car: Companion to Applied Regression. [R package]. Retrieved from https://cran.r-project.org/package=car.)
5. Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1964). Taxonomy of educational objectives: The classification of educational goals. Handbook II: Affective domain. David McKay.
6. Newton, P. M., & Salvi, A. (2020). How common is belief in the learning styles neuromyth, and does it matter? A pragmatic systematic review. Frontiers in Education, 5, 270.
7. R Core Team (2024). R: A Language and environment for statistical computing. (Version 4.4) [Computer software]. Retrieved from https://cran.r-project.org. (R packages retrieved from CRAN snapshot 2024-08-07).
8. Sahoo, S., & Klasen, S. (2021). Gender segregation in education: Evidence from higher secondary stream choice in

India. Demography, 58(3), 987-1010.

9. Saxena, R., Bhat, C., Nair, A., & Nagaraj, K. (2024). Gender differences in learning and study strategies impact medical students' preclinical and USMLE step 1 examination performance. BMC Medical Education, 24, 494.
10. Sharma, P., & Sharma, M. (2021). Learning style preferences among Indian higher secondary students: Role of gender and academic stream. Indian Journal of Educational Psychology, 11(2), 123-135.
11. The jamovi project (2024). jamovi. (Version 2.6) [Computer Software]. Retrieved from https://www.jamovi.org.
12. Wehrwein, E. A., Lujan, H. L., & DiCarlo, S. E. (2007). Gender differences in learning style preferences among undergraduate physiology students. Advances in Physiology Education, 31(2), 153-157.
13. Yu, L., & Zheng, Y. (2022). A meta-analysis of gender differences in e-learners' self-efficacy, satisfaction, motivation, attitude, and performance across the world. Frontiers in Psychology, 13, 897386.