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EFFECT OF DIGITAL STORYTELLING ON DISASTER PREPAREDNESS ACHIEVEMENT, RETENTION, AND THE MODERATING ROLE OF SUBJECT LIKENESS AMONG ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

Disaster preparedness education plays a vital role in equipping children with the knowledge, skills, and resilience necessary for responding effectively to emergencies. However, conventional instructional approaches often result in limited engagement and moderate levels of retention. This study investigated the effectiveness of Digital Storytelling (DST) in enhancing disaster preparedness achievement and long-term retention among elementary school students, while also examining the moderating influence of subject likeness on learning outcomes. A quasi-experimental pre-test-post-test control group design was employed with a sample of 100 elementary school students (Control = 50; Experimental = 50). A validated 20-item Disaster Preparedness Achievement Test was administered during pre-test, post-test, and retention phases. Data were analysed using paired and independent sample t-tests, One-Way ANOVA, Cohen's d, Eta squared (η^2), and gap closure percentage. Findings revealed that the experimental group demonstrated statistically significant improvement, outperforming the control group. Retention scores significantly favoured the experimental group, indicating sustained learning. Subject likeness significantly influenced their achievement. Furthermore, the intervention achieved a 54% instructional gap closure. The results confirm the strong pedagogical effectiveness of Digital Storytelling and establish subject likeness as a meaningful moderating variable in disaster preparedness education.

Keywords: *Digital Storytelling, Disaster Preparedness, Retention, Subject Likeness, Multimedia Learning, Gap Closure*

INTRODUCTION

Disaster preparedness education is increasingly recognised as a foundational component of school curricula worldwide,

particularly in regions vulnerable to natural hazards. Global frameworks such as the Sendai Framework for Disaster Risk Reduction emphasise the

integration of disaster awareness into educational systems to build resilient communities (UNDRR, 2015). Research has also highlighted that disaster risk reduction education equips children with essential knowledge, attitudes, and skills that contribute to safer schools and more resilient communities (Anderson, 2010). Children represent one of the most vulnerable populations during disasters; therefore, equipping them with preparedness knowledge at an early age is critical for long-term societal resilience. Schools play a pivotal role in promoting community resilience by preparing children to respond appropriately during emergencies (Ronan & Johnston, 2005).

Traditional instructional approaches in disaster education often rely on textbook-based explanations and lecture methods, which may limit emotional engagement and contextual understanding. Contemporary educational theories emphasise that effective learning occurs when learners actively construct knowledge through meaningful experiences, collaboration, and authentic contexts (Bruner, 1996; Kolb, 1984; Vygotsky, 1978). Research in educational psychology suggests that meaningful learning occurs when learners actively construct knowledge through narrative engagement, experiential contexts, and multimodal stimulation. Digital Storytelling integrates narrative structure with multimedia elements such as animation, audio narration, images, and interactive decision-making scenarios. According

to Multimedia Learning Theory (Mayer, 2009), combining visual and verbal channels enhances cognitive processing and retention. Similarly, Clark and Mayer (2016) argue that multimedia-based instruction improves learner engagement and facilitates meaningful knowledge construction when designed according to evidence-based instructional principles. Interactive multimedia environments further enhance learner participation by integrating multiple sensory modalities and promoting active cognitive processing (Moreno & Mayer, 2007). From the perspective of Cognitive Load Theory, well-designed multimedia instruction reduces extraneous cognitive load and supports more efficient learning (Sweller, 2011).

Despite increasing adoption of Digital Storytelling, empirical research examining its long-term retention impact in disaster education remains limited. Furthermore, individual learner characteristics such as subject likeness—defined as a student's preference or affinity toward a particular academic subject - may influence engagement and learning outcomes. Based on Expectancy-Value Theory (Wigfield & Eccles, 2000), learners who exhibit higher interest in a subject demonstrate increased motivation and deeper cognitive processing. This study therefore examines not only the instructional effectiveness of Digital Storytelling but also the moderating role of subject likeness in disaster preparedness achievement.

METHODOLOGY

The present study adopted a quasi-experimental pre-test–post-test control-group design to examine the effectiveness of Digital Storytelling (DST) in enhancing disaster preparedness achievement and long-term retention among elementary school students. This research design was considered appropriate as it enabled the comparison of learning outcomes between an experimental group receiving the Digital Storytelling intervention and a control group receiving conventional instruction, while preserving the natural classroom setting. The design also facilitated the examination of causal relationships between the instructional strategy and students' academic achievement.

The study was conducted with a sample of 100 elementary school students, selected through purposive sampling. The participants were divided equally into an experimental group ($n = 50$) and a control group ($n = 50$). To establish baseline equivalence and ensure internal validity, both groups were administered a pre-test prior to the intervention, and the results were compared to confirm that there were no significant differences in their initial levels of disaster preparedness knowledge.

Data were collected using a 20-item Disaster Preparedness Achievement Test, specifically developed to assess students' conceptual understanding of disaster preparedness. The instrument covered key disaster domains, including earthquake, tsunami, flood, and fire safety. The test

items were developed in accordance with the learning objectives of the intervention and were subjected to expert validation to ensure content validity. The instrument also demonstrated acceptable reliability, making it suitable for measuring students' achievement and retention.

The intervention commenced with the administration of a pre-test to both the experimental and control groups to assess their baseline knowledge of disaster preparedness. Following the pre-test, the experimental group received instruction through Digital Storytelling (DST) modules incorporating animation, audio narration, visual illustrations, and interactive reflection activities designed to promote active engagement and meaningful learning. In contrast, the control group received instruction using conventional lecture and textbook-based teaching methods. Immediately after the completion of the instructional intervention, a post-test was administered to both groups to measure achievement. Subsequently, after a predetermined interval, a retention test was conducted to evaluate the students' long-term retention of the disaster preparedness concepts learned during the intervention.

The data collected from the pre-test, post-test, and retention test were analysed using appropriate descriptive and inferential statistical techniques. Paired-samples t-tests were employed to determine within-group improvements between the pre-test and post-test scores, while independent-samples t-tests were used to compare the achievement and

retention scores of the experimental and control groups. The influence of subject likeness on students' achievement was examined using one-way analysis of variance (ANOVA). To determine the magnitude of the intervention effect, Cohen's d was calculated as a measure of effect size, whereas Eta squared (η^2)

was used to estimate the proportion of variance explained by the independent variable. In addition, the gap closure percentage was computed to evaluate the overall effectiveness of the Digital Storytelling intervention in improving students' disaster preparedness learning outcomes.

ANALYSIS OF DATA AND INTERPRETATION

Pre-Test Equivalence

Table - 1

Pre-Test Comparison between Control and Experimental Groups

Group	N	Mean	SD	t - Value	p - Value
Control	50	7.34	1.94	0.89	.376
Experimental	50	7.72	2.28		

The independent samples t-test presented in Table 1 revealed no statistically significant difference between the control and experimental groups at the pre-test stage ($t = 0.89$, $p = .376$). Since $p > .05$, baseline equivalence between the two groups was established.

This indicates that both groups were comparable prior to the intervention, ensuring that any subsequent differences in achievement could be attributed to the instructional treatment rather than to pre-existing differences between the groups.

Within-Group Improvement

Table - 2

Pre-Test – Post-Test Comparison within Groups

Group	Test	Mean	SD	t - Value	p - Value
Control	Pre -test	7.34	1.94	7.60	< .001
	Post -test	11.10	2.91		
Experimental	Pre -test	7.72	2.28	9.458	< .001
	Post- test	14.36	4.41		

Table 2 shows that both groups demonstrated statistically significant improvement from the pre-test to the post-test ($p < .001$). However, the

magnitude of improvement differed considerably.

Effect Size (Experimental Group)

$$\begin{aligned}\text{Pooled SD} &= \sqrt{[(2.28^2 + 4.41^2) / 2]} \\ &= \sqrt{[(5.19 + 19.45) / 2]} \\ &= \sqrt{12.32} \\ &= 3.51\end{aligned}$$

$$\begin{aligned}\text{Cohen's } d &= (14.36 - 7.72) / 3.51 \\ &= 6.64 / 3.51 \\ &= 1.89\end{aligned}$$

The experimental group exhibited a very large effect size ($d = 1.89$), indicating strong practical significance. In contrast, the control group demonstrated a moderate instructional effect ($d = 0.87$). These findings suggest that Digital Storytelling produced substantially greater learning gains compared to traditional teaching methods.

Between-Group Post-Test Comparison

Table - 3
Post-Test Comparison

Group	N	Mean	SD	t - Value	p - Value
Control	50	11.10	2.91	4.36	< .001
Experimental	50	14.36	4.41		

Effect Size (Between Groups)

$$\begin{aligned}\text{Pooled SD} &= \sqrt{[(2.91^2 + 4.41^2) / 2]} \\ &= \sqrt{[(8.47 + 19.45) / 2]} \\ &= \sqrt{13.96} \\ &= 3.74\end{aligned}$$

$$\begin{aligned}\text{Cohen's } d &= (14.36 - 11.10) / 3.74 \\ &= 3.26 / 3.74 \\ &= 0.87\end{aligned}$$

The independent sample t-test presented in Table 3 revealed a statistically significant difference in post-test scores ($t = 4.36, p < .001$), favoring the experimental

group. The effect size ($d = 0.87$) indicates a large practical difference between instructional approaches. This confirms that Digital Storytelling yields meaningfully stronger academic outcomes compared to conventional instruction. This confirms that Digital Storytelling not only improves scores but produces meaningfully stronger academic outcomes. Cohen's $d = 0.87$ indicates a large practical difference favoring Digital Storytelling.

Retention Analysis

Table - 4
Retention Comparison

Group	Mean	SD	t - Value	p - Value
Control	9.20	1.85	9.86	<.001
Experimental	13.64	2.59		

Table 4 shows the retention test analysis. It indicates that the retention scores significantly favored the experimental group ($t = 9.86$, $p < .001$). The substantial difference indicates that Digital Storytelling supports deeper cognitive encoding and sustained memory consolidation. These findings suggest that multimedia-supported instruction enhances long-term retention more effectively than traditional methods.

Subject Likeness (ANOVA)

Table - 5
ANOVA for Subject Likeness

Source	Sum of Squares (SS)	df	Mean Square (MS)	F - Value	p - Value
Between Groups	175.653	3	58.551	3.46	.024
Within Groups	777.867	46	16.910		
Total	953.520	49			

Eta Squared Calculation

$$\eta^2 = SS_{\text{between}} / SS_{\text{total}}$$

$$\eta^2 = 175.653 / 953.52$$

$$\eta^2 = 0.184$$

ANOVA results revealed a statistically significant moderating effect of subject likeness ($F = 3.46$, $p = .024$). The effect

size ($\eta^2 = .184$) indicates that 18.4% of the variance in achievement scores is explained by subject preference. This represents a large effect in educational research and demonstrates that students' academic interests meaningfully influence learning outcomes.

Domain-Wise Significant Improvement

Table - 6
Significant Domains (Experimental Group)

Domain	Pre Mean	Post Mean	t - Value	p - Value
Earthquake	1.18	1.64	3.83	<.001
Tsunami	1.18	1.44	1.98	.049

It is observed from the above table that significant gains were observed in visually dynamic disaster domains such as earthquake and tsunami preparedness. These findings suggest that animation-based visualization and narrative simulation are particularly effective

for hazard types requiring spatial understanding and procedural clarity.

Gap Closure

$$\text{Pre-test Mean} = 7.72$$

$$\text{Post-test Mean} = 14.36$$

$$\text{Gap Closure} = (6.64 / 12.28 \text{ potential gap}) \times 100 = 54\%$$

The intervention achieved a 54% instructional gap closure, indicating that more than half of the baseline knowledge deficiency was eliminated through Digital Storytelling. This metric reflects substantial pedagogical impact and highlights the transformative capacity of multimedia narrative instruction beyond statistical significance.

DISCUSSION

The findings of the present study demonstrate that Digital Storytelling (DST) produces a substantial improvement in disaster preparedness achievement among elementary students. The very large effect size (Cohen's $d = 1.89$) indicates strong practical significance, suggesting that DST is not merely statistically effective but pedagogically transformative. This magnitude of effect reflects deep conceptual engagement rather than surface-level learning gains.

The observed retention advantage further strengthens the instructional value of Digital Storytelling. Students in the experimental group maintained significantly higher scores during the delayed retention phase, indicating durable learning. This outcome aligns with Multimedia Learning by Richard E. Mayer, which proposes that meaningful learning occurs when learners actively integrate verbal and visual information through dual-channel processing. By combining narration, animation, and contextual storytelling, DST likely enhanced cognitive organisation and long-term memory consolidation.

The results are also consistent with Experiential Learning by David A. Kolb, which emphasises active engagement and reflective experience as key components of deep learning. Through narrative immersion and simulated disaster scenarios, students were able to contextualise abstract safety procedures within meaningful story structures. Similarly, Situated Learning by Jean Lave and Etienne Wenger (1991) supports the notion that learning is strengthened when knowledge is embedded in authentic contexts.

The moderating role of subject likeness revealed a statistically significant effect ($F = 3.46$, $p = .024$; $\eta^2 = .184$), explaining 18.4% of the variance in achievement scores. This indicates that learner interest plays a meaningful role in shaping academic outcomes. The finding aligns with Expectancy-Value Theory proposed by Allan Wigfield and Jacquelynne Eccles, which posits that students' motivation and task value influence cognitive engagement and performance. Students who expressed greater affinity toward certain subjects may have demonstrated higher attention, deeper processing, and stronger retention.

Importantly, the 54% instructional gap closure highlights the intervention's capacity to reduce baseline learning deficiencies. Beyond statistical improvement, this metric reflects educational transformation. Reducing more than half of the initial knowledge gap suggests that Digital Storytelling

can serve as an equitable instructional strategy capable of supporting diverse learners in disaster education contexts.

Overall, the findings confirm that Digital Storytelling enhances conceptual understanding, supports long-term retention, and interacts meaningfully with learner motivation variables, thereby offering both theoretical and practical contributions to disaster education research.

CONCLUSION

The present study provides strong empirical evidence that Digital Storytelling significantly improves disaster preparedness achievement and long-term retention among elementary students. The very large effect size, substantial retention advantage, and meaningful gap closure collectively demonstrate both statistical robustness and educational significance. Furthermore, the moderating influence of subject likeness underscores the importance of learner-centered instructional design. Students'

academic preferences meaningfully shaped learning outcomes, highlighting the need for differentiated and interest-responsive pedagogical strategies. The findings support the integration of Digital Storytelling into disaster preparedness curricula as an effective multimedia-based instructional approach. By combining narrative engagement, visual simulation, and contextual learning, DST promotes deeper cognitive processing and sustained knowledge retention. Educational policymakers, curriculum developers, and school administrators should consider adopting multimedia narrative strategies as part of broader disaster risk reduction initiatives aligned with global frameworks such as the United Nations Office for Disaster Risk Reduction Sendai Framework. Future research may explore longitudinal impact, cross-cultural applications, and integration with immersive technologies such as virtual reality to further enhance disaster preparedness education.

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THINKING STYLES OF STUDENTS IN ARTS AND SCIENCE COLLEGES: A CROSS-SECTIONAL STUDY

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ABSTRACT

The present study aims to investigate the thinking styles among Arts and Science college students. The study was conducted using the survey method with a sample of 225 Arts and Science college students selected through simple random sampling from colleges in Chennai District. A standardized Thinking Styles Questionnaire was used for data collection. The collected data were analysed using appropriate descriptive and inferential statistical techniques, including mean, standard deviation, t-test, and one-way analysis of variance (ANOVA). The findings revealed that the students possessed a high level of thinking styles. Further, no statistically significant differences were found in thinking styles with respect to gender, locality, medium of instruction, age, type of management, and family type. The study highlights the importance of understanding students' thinking styles for planning learner-centred instructional strategies, promoting effective problem-solving abilities, and enhancing the overall teaching-learning process in higher education.

Keywords: Thinking Styles, Arts and Science College Students, Higher Education

INTRODUCTION

Thinking style refers to the preferred way in which individuals perceive, process, organise, and utilize information while solving problems, making decisions, and performing various cognitive tasks. Unlike intelligence, which reflects an individual's capacity to learn and reason,

thinking style represents the manner in which a person prefers to use his or her intellectual abilities (Sternberg, 1997). It influences how individuals approach learning situations, analyse information, and respond to academic and real-life challenges. Since thinking styles are shaped by personal experiences, educational environments, and cultural contexts, they vary considerably among individuals. The concept of thinking

styles was extensively developed by Sternberg through the Theory of Mental Self-Government, which explains that individuals differ in the ways they govern and organise their thinking processes (Sternberg, 1997). According to this theory, thinking styles are not measures of intelligence but preferred modes of using one's intellectual abilities. Different thinking styles enable learners to approach tasks from multiple perspectives, thereby influencing their academic performance, creativity, critical thinking, and problem-solving abilities.

Higher education institutions play a significant role in shaping students' thinking styles by exposing them to diverse learning experiences, collaborative activities, project-based learning, and critical inquiry. Students studying in Arts and Science colleges encounter a wide range of academic activities that demand analytical reasoning, creativity, logical thinking, reflective judgment, and effective decision-making. Their thinking styles may be influenced by classroom instruction, curriculum design, assessment practices, peer interaction, technological exposure, and institutional learning environments (Zhang & Sternberg, 2005). Understanding students' thinking styles has become increasingly important in the contemporary educational context. Knowledge of students' preferred thinking styles enables teachers to design learner-centered instructional strategies, employ appropriate teaching methods, and create classroom environments that

accommodate individual differences. It also helps students recognise their cognitive strengths and areas for improvement, thereby enhancing self-awareness, motivation, academic achievement, and lifelong learning skills (Sternberg, Grigorenko, & Zhang, 2008).

Several researchers have reported that thinking styles are associated with academic achievement, critical thinking, creativity, learning strategies, and decision-making abilities. Studies have also indicated that educational experiences and learning environments significantly influence the development of thinking styles among college students (Fan et al., 2018; Ismail et al., 2023). Therefore, studying the different thinking styles, namely critical thinking, analytical thinking, creative thinking, abstract thinking, concrete thinking, convergent thinking and divergent thinking among the students in higher education institutions can provide valuable insights for curriculum planning, instructional improvement, and educational policy formulation.

In the Indian higher education system, Arts and Science colleges accommodate students from diverse socio-economic, cultural, and educational backgrounds. These differences may influence students' preferred approaches to learning and thinking. Therefore, examining the thinking styles of students in Arts and Science colleges is essential for understanding their cognitive preferences and promoting effective teaching-learning practices. The findings

of such studies may assist educators in designing instructional interventions that foster critical thinking, creativity, and effective problem-solving skills among college students.

Hence, the present study aims to examine the thinking styles of students in Arts and Science colleges and to determine whether significant differences exist in thinking styles with respect to selected demographic variables such as gender, locality, medium of instruction, age, type of management and family type.

REVIEW OF RELATED STUDIES

Several studies have highlighted the importance of thinking styles in enhancing students' learning, academic achievement, and cognitive development. Sternberg (1997) proposed the Theory of Mental Self-Government, explaining that thinking styles represent individuals' preferred ways of using their intellectual abilities rather than their intelligence itself. John et al. (2011) reported that students with well-developed thinking styles demonstrated better academic performance than their peers, emphasising the role of thinking styles in educational success. Similarly, Abdi (2012) found a significant positive relationship between thinking styles and critical thinking skills, suggesting that effective thinking styles promote higher-order thinking and sound decision-making. Fan, Zhang, and Watkins (2018) established that thinking styles are distinct from personality traits and significantly influence students' creativity, problem-

solving abilities, and approaches to learning. Vel Murugan and Vinoth (2020) investigated the relationship between thinking styles and decision-making ability among XI Grade students. The findings revealed a significant positive relationship between thinking styles and decision-making ability, indicating that students with effective thinking styles made better decisions. The study emphasised the need to develop students' thinking skills through appropriate educational practices. Furthermore, Kuan and Zhang (2022) observed that constructive thinking styles were positively associated with better planning, future orientation, and academic engagement among university students. More recently, Ismail, Rahman, and Hasanuddin (2023) concluded that thinking styles significantly influence students' learning achievement and recommended that teachers adopt learner-centred instructional strategies that accommodate diverse thinking styles. Collectively, these studies indicate that thinking styles play a vital role in improving students' academic performance, critical thinking, creativity, and learning effectiveness, thereby justifying the need to investigate the thinking styles of students in Arts and Science colleges.

OBJECTIVES

- To find out the level of thinking styles among students in Arts and Science colleges.

- To find out the level of thinking styles among students in Arts and Science colleges with respect to gender.
 - To find out the level of thinking styles among students in Arts and Science colleges with respect to locality.
 - To find out the level of thinking styles among students in Arts and Science colleges with respect to the medium of instruction.
 - To find out the level of thinking styles among students in Arts and Science colleges with respect to age.
 - To find out the level of thinking styles among students in Arts and Science colleges with respect to the type of management.
 - To find out the level of thinking styles among students in Arts and Science colleges with respect to family type.
- students in Arts and Science colleges with respect to the medium of instruction.
 - There is no significant difference in the level of thinking styles among students in Arts and Science colleges with respect to age.
 - There is no significant difference in the level of thinking styles among students in Arts and Science colleges with respect to the type of management.
 - There is no significant difference in the level of thinking styles among students in Arts and Science colleges with respect to family type.

HYPOTHESES

- The level of thinking styles is high among students in Arts and Science colleges.
- There is no significant difference in the level of thinking styles among students in Arts and Science colleges with respect to gender.
- There is no significant difference in the level of thinking styles among students in Arts and Science colleges with respect to locality.
- There is no significant difference in the level of thinking styles among

METHODOLOGY

The present study adopted the survey method to investigate the thinking styles of students in Arts and Science colleges. The survey method was considered appropriate as it facilitates the collection of data from a large group of respondents and enables the generalisation of findings to the target population. The study was conducted among 225 students studying in Arts and Science colleges in Chennai District, who were selected using the simple random sampling technique, ensuring that every student had an equal opportunity to be included in the sample. Data were collected using a Thinking Styles Questionnaire constructed by the investigators. The collected data were analysed using both descriptive and inferential statistical techniques. Descriptive statistics, namely mean

and standard deviation, were used to determine the level of thinking styles among the students, while inferential statistics, including the independent samples t-test and one-way analysis of variance (ANOVA), were employed to

examine the significant differences in thinking styles with respect to selected demographic variables such as gender, locality, medium of instruction, age, type of management and family type.

ANALYSIS OF DATA AND INTERPRETATION

Table - 1

Differences in the Level of Thinking Style among Students with respect to their Gender, Locality, Medium of Instruction and Family Type

Thinking Style		N	Obtained Mean	SD	Maximum Mean	
Overall		225	125.31	13.39	160	
Demographic Variable		N	Mean	SD	t- Value	Remark
Gender	Male	137	124.80	13.20	0.70	NS
	Female	88	126.09	13.72		
Locality	Rural	57	123.84	14.35	0.96	NS
	Urban	168	125.80	13.06		
Medium of Instruction	Tamil	37	127.65	14.36	1.17	NS
	English	188	124.85	13.19		
Family Type	Joint Family	43	127.74	12.83	1.33	NS
	Nuclear Family	182	124.73	13.49		
NS = Not Significant at the 0.05 Level						

The above table shows the overall level of thinking styles and the differences among students in Arts and Science colleges with respect to selected demographic variables. The overall mean score of thinking styles was 125.31 (SD = 13.39), indicating a high level of thinking styles among the students.

With respect to gender, female students (M = 126.09) obtained a slightly higher mean score than male students

(M = 124.80). Regarding locality, urban students (M = 125.80) scored marginally higher than rural students (M = 123.84). Similarly, Tamil-medium students (M = 127.65) obtained a higher mean score than English-medium students (M = 124.85). Students belonging to joint families (M = 127.74) also recorded a slightly higher mean score than those from nuclear families (M = 124.73). However, the obtained t-values for gender

($t = 0.70$), locality ($t = 0.96$), medium of instruction ($t = 1.17$), and family type ($t = 1.33$) were not significant at the 0.05 level. Hence, it is concluded that although slight differences exist in the mean scores

between the groups, these differences are not statistically significant. Therefore, the null hypotheses formulated with respect to gender, locality, medium of instruction and family type were accepted.

Table - 3
Difference in the Level of the Thinking Style among Students
with respect to Age

Analysis of Variance (ANOVA)					
Age Group	Sum of Squares	DF	Mean Squares	F - Value	p- Value
Between groups	836.836	2	418.418	2.361	0.097
Within groups	39343.004	222	177.221		
Total	40179.840	224			
Post Hoc Analysis					
Homogeneous Subsets					
	Age Group	N	Subset for alpha = 0.05		
			1		
Tukey HSD	Above 22 Years	24	121.79		
	Below 20 Years	82	123.82		
	20 - 22 Years	119	127.04		
	Sig.		0.131		
Duncan	Above 22 Years	24	121.79		
	Below 20 Years	82	123.82		
	20 - 22 Years	119	127.04		
	Sig.		0.068		

The above table shows that students in the 20–22 years age group obtained the highest mean score ($M = 127.04$), followed by students below 20 years ($M = 123.82$) and those above 22 years ($M = 121.79$). However, the obtained F-value (2.361) was not statistically significant at the 0.05 level ($p = 0.097$). The post hoc analyses using Tukey HSD and Duncan's

test also indicated that there was no significant difference in thinking styles among the three age groups. Therefore, it is concluded that although the 20–22 years age group recorded a slightly higher mean score, the differences in thinking styles among the age groups were not statistically significant. Hence, the null hypothesis is accepted.

Table - 4
Difference in the Level of the Thinking Style among Students with respect to
Type of Management

Analysis of Variance (ANOVA)					
Type of Management	Sum of Squares	DF	Mean Squares	F - Value	p- Value
Between groups	643.307	2	321.653	1.806	0.167
Within groups	39536.533	222	178.092		
Total	40179.840	224			
Post Hoc Analysis					
Homogeneous Subsets					
	Type of Management	N	Subset for alpha = 0.05		
			1		
Tukey HSD	Government	75	123.8667		
	Government Aided	75	124.3733		
	Private	75	127.6800		
	Sig.		.189		
Duncan	Government	75	123.8667		
	Government Aided	75	124.3733		
	Private	75	127.6800		
	Sig.		.100		

The above table shows the differences in thinking styles among students in Arts and Science colleges with respect to the type of management. Students studying in private colleges obtained the highest mean score ($M = 127.68$), followed by students in government-aided colleges ($M = 124.37$) and government colleges ($M = 123.87$). However, the obtained F-value (1.806) was not statistically significant at the 0.05 level ($p = 0.167$). Further, the post hoc analyses using Tukey HSD and Duncan's test also indicated that there were no significant differences in thinking styles among the three management categories. Therefore, it may be concluded that although students

from private colleges obtained a slightly higher mean score, the differences in thinking styles among students studying in government, government-aided, and private colleges were not statistically significant. Hence, the null hypothesis is accepted.

FINDINGS

- The overall level of thinking styles among students in Arts and Science colleges was found to be high.
- Female students obtained a slightly higher mean score in thinking styles than male students. However, the difference was not statistically significant.

- Urban students obtained a marginally higher mean score in thinking styles than rural students. However, the difference was not statistically significant.
- Tamil-medium students obtained a slightly higher mean score in thinking styles than English-medium students. However, the difference was not statistically significant.
- Students in the 20–22 years age group obtained a higher mean score than students below 20 years and above 22 years. However, the difference was not statistically significant.
- Students studying in private colleges obtained a slightly higher mean score in thinking styles than students in government-aided colleges and government colleges. However, the difference was not statistically significant.
- Students belonging to joint families obtained a slightly higher mean score in thinking styles than students from nuclear families. However, the difference was not statistically significant.

CONCLUSION

The present study was undertaken to examine the thinking styles of students in Arts and Science colleges in Chennai District. The findings revealed that the students possessed a high level of thinking styles. Further, no statistically significant differences were observed in thinking styles with respect to gender,

locality, medium of instruction, age, type of management and family type. These findings suggest that students, irrespective of their demographic characteristics, demonstrate similar patterns of thinking styles.

Thinking styles play a significant role in students' academic learning, problem-solving, decision-making, and overall personal development. Understanding students' thinking styles enables educators to design learner-centred instructional strategies that cater to diverse cognitive preferences and promote meaningful learning experiences. It also helps students recognize their strengths, improve their thinking abilities, and develop greater self-confidence and academic competence. Therefore, educational institutions should create learning environments that encourage critical, creative, analytical, and reflective thinking among students. Teachers should adopt learner-centred and activity-based instructional strategies, such as problem-based learning, collaborative learning, inquiry-based learning, and project-based learning, to enhance diverse thinking styles. In addition, colleges should organise workshops, seminars and skill development programmes focusing on critical thinking, creativity, problem-solving and decision-making to enhance students' cognitive abilities. Curriculum planners should also integrate activities that promote higher-order thinking skills, enabling students to apply their knowledge effectively in academic, professional and real-life situations.

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3

EFFECTIVENESS OF A CLASSROOM CREDIT ECONOMY ON STUDENT ENGAGEMENT AND ACADEMIC MOTIVATION: A MIXED-METHOD INTERVENTION STUDY

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ABSTRACT

This study examined the effectiveness of a classroom credit economy (Class-Cred) intervention on student engagement and academic motivation among school students. A quasi-experimental pre-test post-test design with a mixed-method approach was adopted. The intervention was implemented over a period of six weeks in a school classroom setting. Quantitative data were collected using standardised measures of student engagement and academic motivation, while qualitative data were obtained through student reflections and teacher observations. The results indicated a significant improvement in student engagement and academic motivation following the intervention. Qualitative findings supported these results, highlighting increased participation, responsibility, and positive classroom behaviour. The findings suggest that classroom credit economy systems can serve as effective positive psychology-based interventions in educational settings.

Keywords: Classroom Credit Economy, Student Engagement, Academic Motivation, Positive Reinforcement.

INTRODUCTION

Classroom management and student motivation remain central challenges in contemporary education. Traditional disciplinary approaches often fail to sustain long-term engagement or foster intrinsic motivation. Positive psychology emphasises strength-based, reinforcement-oriented strategies that encourage desirable behaviours and engagement. One such approach is the classroom credit economy, a structured

system where students earn credits or tokens for positive academic and behavioural actions.

The present study explores the application of a classroom credit economy (Class-Cred) system within an Indian school context. By integrating behavioural reinforcement principles with motivational psychology, the intervention aims to enhance student engagement and academic motivation.

Improvements in classroom behaviour were explored qualitatively through participant reflections.

REVIEW OF RELATED LITERATURE

Recent educational psychology research has increasingly emphasised the role of classroom-based reinforcement and motivational systems in promoting sustained student engagement and positive academic behaviours. Contemporary studies highlight that structured reinforcement practices, when embedded within supportive learning environments, can enhance students' participation, task persistence, and classroom responsibility (Ryan & Deci, 2020; Reeve, 2022). Rather than functioning as mere behaviour control mechanisms, modern reinforcement systems are conceptualised as tools that support students' sense of competence and engagement when applied consistently and transparently (Hattie, 2020; Fredricks et al., 2020). Recent intervention studies in educational psychology have increasingly explored structured reinforcement systems and motivational strategies to enhance student engagement and academic motivation. Increasingly, classroom-level interventions grounded in behavioural principles have shown promise in addressing low engagement and motivation among diverse student populations. For example, recent research employing token-based strategies demonstrated that classroom reinforcement systems can produce meaningful improvements in student

motivation and learning behaviours. In an action research study incorporating a token-for-active-response strategy, learners experienced significant increases in motivation and confidence following the implementation of token and prize-based incentives, with noticeable gains in their interest and classroom participation levels (Rahman & Islam, 2024). Similarly, qualitative research has documented that structured token economy systems can boost student discipline and motivation while fostering a more positive classroom environment, though the effectiveness of such systems can be influenced by factors such as implementation consistency and reward clarity (Hassan & Ahmad, 2025).

Beyond traditional token economies, studies have investigated digital adaptations of reinforcement strategies. A digital token economy embedded within game-based therapeutic content was shown to strengthen self-regulation and sustained attention among children with ADHD, indicating that token-based reinforcement mechanisms can be adapted to digital learning environments and still influence engagement and self-regulation behaviours in meaningful ways (Serrano-Barquin, et al, 2025). Other research in elementary classrooms has pointed toward the broader role of self-regulated learning and teacher-led interventions in enhancing classroom engagement. A self-regulation programme delivered by class teachers significantly improved elementary students' engagement and satisfaction of basic psychological needs, highlighting the importance of teacher-

guided motivational supports that align with psychological theories of autonomy and competence.

Empirical findings also extend to other motivational strategies that share conceptual ground with reinforcement systems. Studies exploring gamification and reward-based classroom techniques report enhanced motivation and engagement across diverse learning contexts. A gamification intervention in a secondary school setting significantly boosted learner engagement and academic motivation, linking structured reward elements with enhanced classroom involvement (Buckley & Doyle, 2023). Action research implementing reward-based question boards also demonstrated increased motivation and participation among junior high learners, reinforcing the idea that incentivized and interactive classroom practices can foster more dynamic engagement (Salvador & Gamboa, 2024). Additionally, gamified assessment strategies have been shown to increase engagement within multi-grade classrooms, indicating that reward-oriented instructional design can generalise across contexts (Zainuddin et al., 2024).

Systematic reviews support the broader trend of motivational and engagement interventions in schools. A recent systematic review on gamification's impact found that instructional designs incorporating elements akin to reward systems can enhance learner engagement and participation, though it also pointed to the need for more rigorous evaluations

of how engagement is conceptualized and measured in interventions. Taken together, these recent studies suggest that structured reinforcement systems—whether classroom tokens, digital rewards, or gamified elements—can positively influence student engagement and motivation when implemented with clarity and consistency. However, variations in implementation fidelity, student interpretation of rewards, and the integration of psychological needs-supportive practices can determine the degree to which these interventions succeed in promoting sustained engagement and academic involvement. Despite growing emphasis on student-centered pedagogy, many secondary school classrooms continue to rely on verbal reinforcement and punitive disciplinary practices, which may not adequately sustain student engagement or intrinsic academic motivation. Contemporary educational psychology highlights the need for structured, classroom-based reinforcement systems that are practical, transparent, and developmentally appropriate for adolescents. The classroom credit economy was selected for the present study as it integrates behavioural reinforcement principles with elements of autonomy, goal-setting, and feedback, making it a theoretically grounded yet classroom-feasible intervention. Examining its effectiveness addresses a relevant gap in school-based motivational interventions within the Indian secondary education context.

OBJECTIVES

- To assess the effectiveness of a classroom credit economy intervention on student engagement.
- To examine changes in academic motivation following the classroom credit economy intervention.
- To explore students' and teachers' perceptions of the classroom credit economy system.

HYPOTHESES

- There is a significant difference in student engagement before and after the implementation of the classroom credit economy intervention.
- There is a significant difference in academic motivation before and after the implementation of the classroom credit economy intervention.
- There is a significant difference in students' and teachers' perceptions following the implementation of the classroom credit economy system.

METHODOLOGY

Research Design

A quasi-experimental single-group pre-test post-test design with a mixed-method approach was adopted. This method was adopted due to practical and ethical constraints within the school setting, including limited class availability, timetable restrictions, and the inability to withhold a potentially beneficial intervention from a comparable control

group. This design was considered appropriate for the preliminary evaluation of intervention effectiveness in an applied educational context, where fully controlled experimental designs are often not feasible.

Sample

The sample consisted of school students ($N = 35$) selected through purposive sampling from a private school. Students belonged to grades 11 and 12, with ages ranging from 16 to 17.

Tools Used

1. Student Engagement Scale - The Student Engagement Scale has demonstrated satisfactory reliability and construct validity in previous school-based research, with reported Cronbach's alpha values exceeding 0.70.
2. Academic Motivation Scale - The Academic Motivation Scale has been widely used in educational research and has shown adequate internal consistency and validity across adolescent student samples.
3. Open-ended student reflection questions
 - How did the classroom credit economy influence your participation during class activities?
 - In what ways, if any, did the credit system affect your motivation to complete academic tasks?

- How fair and transparent did you find the classroom credit economy system?
- Did the credit system change how you felt about classroom rules and responsibilities? Please explain.

Student engagement and academic motivation scales were employed to ensure systematic measurement of behavioural and motivational changes across time. The use of previously validated instruments enhances the reliability and interpretability of findings while allowing comparison with existing educational psychology research.

Intervention

The classroom credit economy (Class-Cred) system was implemented over six weeks. Students earned credits for positive behaviours such as active participation, task completion, peer support, and responsible conduct. Credits could be redeemed weekly for non-monetary rewards such as classroom privileges, recognition, or academic incentives. The intervention was implemented within a regular classroom setting to enhance ecological validity and ensure that the findings reflect realistic educational conditions. Conducting the study within an ongoing academic schedule allowed the classroom credit economy to function as a natural extension of daily instructional practices rather than as an artificial or laboratory-based manipulation. The

classroom credit economy was chosen as the intervention strategy because it offers immediate, consistent, and observable reinforcement while allowing students to track their progress and outcomes. Unlike traditional token systems, the credit-based approach emphasises transparency, fairness, and student agency, which are critical for sustaining motivation in adolescent learners.

Procedure

Pre-test assessments were administered before the implementation of the classroom credit economy intervention. Following baseline assessment, the Class-Cred system was implemented consistently by the teacher during regular classroom instruction for a period of six weeks. Upon completion of the intervention, post-test assessments were conducted to evaluate immediate changes in student engagement and academic motivation. To examine the sustainability of the intervention effects, a retention test was administered four weeks after the post-test using the same quantitative measures. Subsequently, qualitative data were collected through structured open-ended questions to capture student perceptions of the classroom credit economy system.

Ethical Considerations

Informed consent was obtained from school authorities, parents and students. Confidentiality and anonymity were maintained throughout the study.

ANALYSIS OF DATA AND INTERPRETATION

The quantitative data provided evidence of intervention effectiveness, qualitative feedback offered contextual insights into perceived fairness, enjoyment, and classroom dynamics associated with the credit economy

system. Quantitative data were analysed using descriptive statistics and paired t-tests to assess pre-post differences. Qualitative data were analysed using thematic analysis to identify recurring patterns and themes. Mean scores and standard deviations were computed for all variables prior to inferential analysis.

Table – 1
Pre-Test and Post-Test Comparison of Student Engagement and Academic Motivation

Measure	Pre-Test		Post-Test		t - Value	p- Value	Retention Test Mean & SD
	Mean	SD	Mean	SD			
Student Engagement	3.25	(0.56)	3.98	(0.51)	6.45	<.001	3.85 (0.53)
Academic Motivation	2.89	(0.61)	3.75	(0.58)	7.20	<.001	3.62(0.60)

Table 1 presents the comparison of students' pre-test, post-test, and retention test scores on student engagement and academic motivation following the implementation of the Classroom Credit Economy (Class-Cred) intervention.

The findings reveal a marked improvement in students' engagement after the intervention. The mean score for student engagement increased from 3.25 (SD = 0.56) in the pre-test to 3.98 (SD = 0.51) in the post-test. The obtained t-value of 6.45 was statistically significant at $p < .001$, indicating that the Class-Cred intervention had a significant positive effect on enhancing students' engagement in classroom activities. The retention test conducted four weeks after the intervention yielded a mean score of 3.85 (SD = 0.53), suggesting that the improvement in student engagement

was largely sustained even after the intervention period.

A similar trend was observed for academic motivation. The mean academic motivation score increased from 2.89 (SD = 0.61) at the pre-test to 3.75 (SD = 0.58) at the post-test. The difference was found to be statistically significant ($t = 7.20$, $p < .001$), demonstrating that the intervention effectively enhanced students' academic motivation. Furthermore, the retention test mean of 3.62 (SD = 0.60) indicates that the gains in academic motivation were maintained to a considerable extent four weeks after the completion of the intervention.

Overall, the findings suggest that the Classroom Credit Economy intervention was effective in improving both student engagement and academic motivation. Although the retention test scores

showed a slight decline compared to the immediate post-test scores, they remained substantially higher than the pre-test scores, indicating the sustained positive impact of the intervention over time.

Table - 2
Qualitative Themes from Student Feedback

Theme	Example Quotes
Increased Motivation	"I worked harder so I could earn more creds and get rewards."
Improved Behaviour	"I started behaving better to earn points. It made the class more fun."
Positive Learning Environment	"The credit system made learning more exciting and interactive."

The Qualitative themes were derived from student reflection responses collected after the intervention. Example quotations are representative statements illustrating each theme identified through thematic analysis.

Table - 3
Summary of Paired Sample t-Test Results

Variable	Mean Difference	t - Value	p- Value
Student Engagement	0.73	6.45	<.001
Academic Motivation	0.86	7.20	<.001

Table 3 presents the summary of the paired-sample *t*-test results comparing the pre-test and post-test scores of student engagement and academic motivation following the implementation of the Classroom Credit Economy (Class-Cred) intervention.

The results indicate a positive mean difference of 0.73 in student engagement, with a statistically significant *t*-value of 6.45 ($p < .001$). These findings indicate that students demonstrated a significant improvement in their level of engagement after participating in the intervention compared to their pre-test performance.

Similarly, academic motivation showed a positive mean difference

of 0.86, with a statistically significant *t*-value of 7.20 ($p < .001$). This suggests that the intervention led to a significant enhancement in students' academic motivation.

Overall, the paired-sample *t*-test results confirm that the Classroom Credit Economy intervention produced statistically significant improvements in both student engagement and academic motivation. The positive mean differences and highly significant *p*-values provide evidence that the intervention was effective in promoting active classroom engagement and strengthening students' motivation towards learning.

DISCUSSION

The present study examined the effectiveness of a classroom credit economy in enhancing student engagement and academic motivation within a secondary school setting. The findings indicate that the implementation of a classroom-embedded, credit-based reinforcement system was associated with significant improvements in both engagement and motivation immediately following the intervention. Importantly, retention test results further indicated that these gains were largely maintained over time, suggesting that the observed improvements in student engagement and academic motivation were not merely short-term responses to external reinforcement but were maintained to a considerable extent over time.

The pattern of results is consistent with contemporary motivational and engagement frameworks that emphasise the role of structured feedback, clarity of expectations, and perceived fairness in sustaining student involvement in classroom activities. Research on student engagement highlights that interventions promoting goal clarity and consistent reinforcement can strengthen behavioural and emotional engagement, particularly during adolescence, when academic motivation often fluctuates (Fredricks et al., 2020; Reeve, 2022). The classroom credit economy provided students with immediate, transparent feedback regarding their efforts, which likely contributed to increased participation, task persistence, classroom responsibility and overall engagement.

Beyond immediate post-intervention gains, the retention test findings are particularly noteworthy. Although mean scores showed a slight decline from post-test levels, they remained substantially higher than pre-test scores for student engagement and academic motivation. This pattern aligns with contemporary perspectives suggesting that reinforcement systems can support the internalisation of behavioural norms when they are predictable, meaningful, and aligned with learning goals (Ryan & Deci, 2020). Rather than functioning solely as external rewards, the credit system may have encouraged students to participate more consistently and take greater responsibility for their classroom learning.

The findings also align with self-determination theory, which posits that motivation is sustained when learning environments support students' basic psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 2019). The classroom credit economy appeared to support competence by providing clear indicators of progress and achievement, while offering multiple pathways to earn credits allowed students to exercise autonomy in how they engaged with classroom tasks. Additionally, the shared and transparent structure of the system may have enhanced relatedness by fostering a sense of fairness and collective participation within the classroom.

Qualitative findings further strengthened the interpretation of the

quantitative results. Student feedback indicated that the credit economy enhanced perceptions of fairness, clarity, and enjoyment in the classroom. Students frequently reported increased enthusiasm and motivation, suggesting that the intervention influenced not only observable behaviour but also emotional engagement with learning. Such perceptions are critical, as recent research highlights that emotionally engaging classroom environments are more likely to support sustained academic motivation and positive classroom climate (Reeve, 2022; Fredricks et al., 2020). The qualitative data thus provide contextual depth to the retention findings, illustrating how students' experiences of the intervention may have contributed to the durability of its effects.

Within the Indian educational context, where classrooms are often characterised by large student numbers and limited opportunities for individualised feedback, the effectiveness and retention of gains associated with a low-cost, easily implementable intervention carry practical significance. The classroom credit economy demonstrates how reinforcement-based strategies can be integrated into everyday teaching practices without specialised training or external resources. Overall, the present study contributes to applied educational psychology by providing evidence that theoretically grounded, classroom-embedded reinforcement systems can enhance and sustain student engagement and academic motivation,

supporting both immediate and longer-term positive educational outcomes.

IMPLICATIONS

The findings indicate that the classroom credit economy is an effective and feasible intervention for enhancing student engagement and academic motivation. Qualitative evidence further indicates that the intervention promotes positive classroom behaviour, greater responsibility, consistent participation, and a more supportive classroom climate. By applying principles of positive reinforcement and motivation, the intervention offers a practical, non-punitive strategy that can be readily integrated into regular classroom teaching.

CONCLUSION

The classroom credit economy intervention proved to be an effective strategy for improving student engagement and academic motivation among school students. The study highlights the potential of structured positive reinforcement systems within Indian educational settings. Importantly, the findings contribute to applied educational psychology literature by demonstrating how theoretically grounded motivational frameworks can be translated into feasible, classroom-level interventions that support student engagement and academic motivation. Qualitative findings further suggest that the intervention may promote positive classroom behaviour and a supportive classroom climate.

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4

EXPLORING THE RELATIONSHIP BETWEEN THINKING STYLES, META-COGNITIVE SKILLS AND ACADEMIC ACHIEVEMENT AMONG HIGH SCHOOL STUDENTS IN COIMBATORE DISTRICT

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ABSTRACT

Education extends beyond knowledge acquisition to include critical thinking, reasoning, and self-regulated learning. This study explores the relationship between thinking styles, meta-cognitive skills and academic achievement among high school students in Coimbatore District. The objectives are to identify predominant thinking styles, assess meta-cognitive skill levels, analyze demographic influences and examine their impact on academic performance. A sample of 150 students studying in Grade IX was selected through simple random sampling from Government Higher Secondary Schools, Corporation Schools and Tribal Welfare Schools. Standardised tools were used to measure thinking styles (analytical, creative, practical), meta-cognitive skills (planning, monitoring, evaluation), and academic achievement through examination scores. The study highlights the need for learner-centered approaches that foster reflective thinking and self-regulation to enhance students' achievement.

Keywords: *Thinking Styles, Meta-Cognitive Skills, Academic Achievement, High School Students*

INTRODUCTION

Education encompasses more than merely gathering facts; it involves cultivating the capacity to think, reason, and effectively solve problems. As Albert Einstein remarked, "Education is not the learning of facts, but the training of the mind to think." It plays a pivotal role in

shaping a learner's cognitive, emotional and social development. The success of learning is significantly influenced by how students process information, analyze concepts, and manage their thinking. In this context, thinking styles and meta-cognitive skills are crucial elements that impact academic success

and personal growth. Thinking styles refer to an individual's preferred methods of perceiving and processing information (Sternberg, 2017), which influence how students approach learning tasks, make decisions, and resolve issues. Conversely, meta-cognitive skills pertain to the awareness and regulation of one's cognitive activities, including planning, monitoring, and evaluating one's learning processes. (Flavell, 2017). Students with strong meta-cognitive skills can devise strategies, reflect on their performance, and make necessary adjustments to improve learning outcomes. Academic achievement, a key measure of student success, is shaped by these cognitive factors. Research conducted by Sternberg (2017) and Zhang & Sternberg (2017) indicates that thinking styles influence how students adapt to various learning environments, while findings by Flavell (2017) and Zohar & Dori (2017) reveal that students with heightened meta-cognitive awareness achieve higher academic performance. In Coimbatore, there has been limited research investigating the combined effects of these variables on students' academic performance. Consequently, the current study seeks to examine the relationship between thinking styles, meta-cognitive skills, and academic achievement among high school students in Coimbatore.

The study encompasses students from both government and private high schools in the district, analysing how various thinking styles (analytical, creative, or practical) and meta-cognitive strategies (self-monitoring, planning, and goal-setting) influence performance

in essential subjects such as mathematics, science, and language. By understanding these relationships, educators can create instructional practices that encourage critical and reflective learning habits, support individualised teaching approaches, and ultimately improve academic achievement among high school students in Coimbatore.

REVIEW OF RELATED STUDIES

Previous studies emphasised the importance of thinking styles in shaping students' learning outcomes. Jarnawi et al. (2024) demonstrated that integrating Gregorc's Thinking Style Model with differentiated instruction significantly improved science achievement, particularly when instructional strategies were aligned with the learning preferences of abstract random and concrete random learners. Hasanuddin (2021) identified clear gender-based differences in thinking styles among high school students, suggesting the need for gender-sensitive instructional approaches. Maharajan and Geetha (2019) highlighted the influence of demographic factors on thinking styles and their strong association with life skills such as critical thinking and problem-solving. Similarly, Mir (2019) revealed that thinking styles, along with school climate and emotional intelligence, significantly relate to academic achievement, with notable differences across gender and school types.

Recent studies consistently highlighted meta-cognitive skills as a crucial factor influencing students' academic achievement and learning-related outcomes. Research by Zulkiply

(2025), Gokalp et al. (2025), and Mwangi et al. (2024) demonstrates a positive relationship between meta-cognitive awareness and academic performance across diverse cultural contexts, with academic self-control identified as a partial mediator of achievement. Qizi and Qizi (2024) further emphasised that meta-cognitive processes such as planning, monitoring, and evaluation enhance self-regulation, motivation, and effective knowledge transfer. Bala et al. (2023) added that meta-cognitive skills are also positively related to educational adjustment, with minor gender-based variations. Overall, these studies affirm that strengthening students' meta-cognitive skills through instructional strategies can significantly improve academic success and adaptive learning behaviours.

SIGNIFICANCE OF THE STUDY

Despite the growing recognition of the importance of cognitive factors in academic success, there is a lack of research specifically examining the influence of thinking styles and meta-cognitive skills on the academic achievement of high school students in Coimbatore. Most existing studies have either been carried out in urban settings with a focus on general cognitive factors or have not sufficiently explored how thinking styles and meta-cognitive skills interact to impact academic results. Furthermore, educational curricula and teaching methodologies in numerous schools continue to prioritize content delivery, with insufficient attention given to the development of thinking

styles and meta-cognitive awareness. This deficiency in both research and practice highlights the necessity for an exploration into how these cognitive skills can be cultivated to improve academic performance, especially in Coimbatore, where sociocultural, socio-economic and educational factors may affect cognitive development and learning styles (Nash & Hughes, 2018).

OBJECTIVES

- To identify the predominant thinking styles among high school students in Coimbatore District.
- To assess the level of meta-cognitive skills among high school students.
- To study the significant difference in thinking styles among high school students with respect to gender and type of school.
- To study the significant difference in meta-cognitive skills among high school students with respect to gender and type of school.
- To study the relationship between thinking styles and academic achievement of students.
- To study the relationship between meta-cognitive skills and academic achievement of students.

HYPOTHESES

- There is no significant difference in thinking styles among high school students with respect to gender.
- There is no significant difference in thinking styles among high school students with respect to the type of school.

- There is no significant difference in meta-cognitive skills among high school students with respect to gender.
- There is no significant difference in meta-cognitive skills among high school students with respect to the type of school.
- There is no significant relationship between thinking styles and academic achievement of students.
- There is no significant relationship between meta-cognitive skills and academic achievement of students.

METHODOLOGY

The present study adopted the survey method to examine the relationship between thinking styles, metacognitive skills, and academic achievement among high school students in Coimbatore District. The target population comprised high school students studying in Coimbatore District. A simple random sampling technique was employed to ensure adequate representation of different school types. The final sample consisted of 150 Grade

IX students, including 50 students each from Government Higher Secondary Schools, Corporation Schools, and Tribal Welfare Schools. Data were collected using the Thinking Style Inventory, developed by the investigators based on Sternberg's theory, consisted of 30 items measuring five dimensions of thinking styles—Holistic, Analytical, Creative, Practical, and Logical—and yielded a reliability coefficient of 0.82, and the Meta-Cognitive Skills Scale (MCSS–GMS) developed by Madhu Gupta and Suman (2017) comprised 42 items rated on a five-point scale covering Planning, Implementation, Monitoring, and Evaluation, with satisfactory reliability (Test–Retest = 0.763; Split–Half = 0.949) and validity coefficients ranging from 0.709 to 0.924. Academic achievement was assessed using students' most recent school examination scores in Mathematics, Science and Language subjects. The collected data were analysed using percentage analysis, descriptive statistics (mean and standard deviation), differential statistics (t-test) and Pearson's product–moment correlation analysis.

ANALYSIS OF DATA AND INTERPRETATION

Table – 1

Dimension-wise Analysis of Thinking Styles among High School Students

Dimensions of Thinking Style	N-150	Percentage
Analytical Thinking	30	20
Creative Thinking	30	20
Practical Thinking	31	20.67
Holistic Thinking	30	20
Logical Thinking	29	19.33

Table 1 reveals that the distribution of high school students across the five dimensions of thinking styles is relatively balanced. Among the five dimensions, Practical Thinking recorded the highest percentage (20.67%), indicating that students show a slightly greater preference for applying knowledge to practical situations and solving real-life problems. Analytical Thinking, Creative Thinking, and Holistic Thinking each accounted for 20.00% of the sample,

while Logical Thinking represented 19.33%. The marginal differences among the five dimensions indicate that no single thinking style predominates among the students. Overall, the findings suggest that high school students possess a balanced blend of analytical, creative, practical, holistic, and logical thinking styles, reflecting diverse cognitive approaches to learning and problem-solving.

Table - 2
Level of Thinking Style of High School Students

Level of Thinking Style	Gender		Percentage
	Boys	Girls	
Very High	15	13	18.67
High	18	19	24.67
Moderate	24	30	36
Low	13	9	14
Very Low	5	5	6.67

Table 2 indicates that the majority of high school students (36.00%) possess a moderate level of thinking style. About 24.67% of the students exhibit a high level of thinking style, while 18.67% demonstrate a very high level. A smaller proportion of students fall under the low (14.00%) and very low (6.67%) levels of thinking style. The distribution of boys and girls across the different levels is

relatively similar. However, a slightly higher number of girls (30) than boys (24) are found in the moderate category, whereas the frequencies in the remaining categories show only minor differences. Overall, the findings suggest that most of the high school students possess a moderate level of thinking style, with nearly one-half of the students exhibiting high or very high levels of thinking.

Table – 3
Dimension-wise Analysis of Meta-Cognitive Skills among High School Students

Dimensions of Meta-Cognitive Skills	N=150	Percentage
Planning Skill	46	30.63
Implementation Skill	33	22.1
Monitoring Skill	35	23.03
Evaluation Skill	36	24.17

Table 3 presents the distribution of high school students across the four dimensions of metacognitive skills. Among the four dimensions, Planning Skill recorded the highest percentage (30.63%), indicating that a greater proportion of students demonstrate the ability to set goals, organize learning activities, and prepare strategies before undertaking academic tasks. Evaluation Skill ranked second (24.17%), suggesting that many students are capable of reflecting on and assessing their learning outcomes. Monitoring Skill accounted for 23.03%, indicating that a considerable

proportion of students regularly monitor their progress during the learning process. Implementation Skill recorded the lowest percentage (22.10%), implying that comparatively fewer students effectively apply their planned strategies during task execution. Overall, the findings indicate that planning is the most prominent metacognitive skill among high school students, while implementation is comparatively less developed, although the differences among the four dimensions are relatively small.

Table - 4
Meta- Cognitive Skills of High School Students

Level of Meta-Cognitive Skills	Gender		Percentage
	Boys	Girls	
Very High	3	8	7.3
High	11	17	18.7
Above Average	18	12	20.0
Average	32	35	44.7
Below Average	6	2	5.3
Low	5	1	3.4

Table 3 reveals that the majority of high school students (44.70%) possess an average level of meta-cognitive skills, indicating a moderate level of awareness

and regulation of their learning processes. About 20.00% of the students demonstrate above-average meta-cognitive skills, while 18.70% and 7.30% exhibit high and

very high levels, respectively. Together, these findings indicate that 26.00% of the students possess well-developed meta-cognitive skills. Only 8.70% of the students fall under the below-average and low categories, suggesting comparatively lower levels of meta-cognitive awareness and self-regulation. With regard to gender, a slightly higher number of girls than boys are represented

in the very high and high levels, whereas boys are more frequently represented in the above-average, below-average, and low categories. The overall findings suggest that most of the high school students possess an average level of meta-cognitive skills, with a substantial proportion demonstrating higher levels of meta-cognitive awareness and self-regulated learning.

Table – 5

Difference in Thinking Style of High School Students with respect to Gender

	Gender	N	Mean	S.D	t-Value	Remark
Thinking Style	Boys	75	89.45	6.67	0.39	NS
	Girls	75	89.00	7.62		
NS = Not Significant at the 0.05 Level						

Table 5 presents the comparison of thinking style scores of high school students with respect to gender. The mean score of boys was 89.45 (SD = 6.67), while that of girls was 89.00 (SD = 7.62). The calculated t-value of 0.39 is not statistically significant at the 0.05 level. Therefore, the null hypothesis is accepted. It states that there is no

significant difference in the thinking styles of boys and girls. The findings suggest that both boys and girls exhibit comparable levels of thinking style, and gender does not appear to be associated with differences in thinking style among the high school students included in the present study.

Table – 6

Difference in Thinking Style of High School Students with respect to Type of School

Source of Variation	Sum of Squares	df	Mean squares	SD	F	Remark
Between Groups	26.013	2	13.01	7.16	0.254	NS
Within Groups	7540.820	147	51.29			
Total	7566.833	149				
NS = Not Significant at the 0.05 Level						

Table 6 presents the results of the one-way analysis of variance (ANOVA)

conducted to examine the difference in thinking styles of high school students

with respect to the type of school. The obtained F value of 0.254 is not statistically significant at the 0.05 level. Therefore, the null hypothesis is accepted. It states that there is no significant difference in the thinking styles of students studying in different types of schools. The findings suggest that students from Government

Higher Secondary Schools, Corporation Schools, and Tribal Welfare Schools exhibit comparable levels of thinking style, and the type of school is not associated with significant differences in thinking style among the high school students included in the present study.

Table – 7
Difference in Meta – Cognitive Skills of High School Students
with respect to Gender

with respect to Gender						
	Gender	N	Mean	S.D	t-Value	Remark
Meta-Cognitive Skills	Male	75	119.51	8.05	0.72	NS
	Female	75	120.52	9.24		
NS = Not Significant at the 0.05 Level						

Table 7 presents the comparison of meta-cognitive skills of high school students with respect to gender. The mean score of female students (M = 120.52, SD = 9.24) was slightly higher than that of male students (M = 119.51, SD = 8.05). However, the obtained t-value of 0.72 is not statistically significant at the 0.05 level. Therefore, the null hypothesis is accepted. It states that there

is no significant difference in the meta-cognitive skills of male and female high school students. The findings suggest that both male and female students exhibit comparable levels of meta-cognitive skills, and gender is not associated with significant differences in meta-cognitive skills among the students included in the present study.

Table - 8
Difference in Meta-Cognitive Skills of High School Students
with respect to Type of School

Source of Variation	Sum of Squares	df	Mean squares	SD	F	Remark
Between Groups	301.720	2	150.860	8.67	2.051	NS
Within Groups	10814.280	147	73.567			
Total	11116.000	149				
NS = Not Significant at the 0.05 Level						

Table 8 presents the results of the one-way analysis of variance (ANOVA)

conducted to examine the difference in meta-cognitive skills of high school

students with respect to the type of school. The obtained F value of 2.05 is not statistically significant at the 0.05 level. Therefore, the null hypothesis is accepted. It states that there is no significant difference in the meta-cognitive skills of students studying in different types of schools. Although the between-group mean square (150.86) was higher than the within-group mean square (73.57), the observed difference is

not statistically significant. This suggests that the variation in meta-cognitive skills among students from Government Higher Secondary Schools, Corporation Schools, and Tribal Welfare Schools is not large enough to indicate a meaningful difference. Overall, the findings reveal that students from different types of schools exhibit comparable levels of meta-cognitive skills in the present study.

Table – 9

Relationship between Thinking Style and Academic Achievement

Variables	Correlation Coefficient	Remark
Thinking Style	0.100	Not Significant
Academic Achievement		

Table 9 presents the relationship between thinking style and academic achievement among high school students. The obtained Pearson's correlation

coefficient ($r = 0.100$) indicates a very weak positive relationship between thinking style and academic achievement. Therefore, the null hypothesis is accepted.

Table - 10

Relationship between Meta- Cognitive Skills and Academic Achievement

Variables	Correlation Coefficient	Remark
Meta-cognitive Skills	0.066	Not Significant
Academic Achievement		

Table 10 presents the relationship between meta-cognitive skills and academic achievement among high school students. The obtained Pearson's correlation coefficient ($r = 0.066$) indicates a very weak positive relationship between meta-cognitive skills and academic achievement. However, the relationship is not statistically significant at the 0.05 level. Therefore, the null hypothesis is accepted.

MAJOR FINDINGS

- The distribution of high school students across the five dimensions of thinking styles was relatively balanced. Practical Thinking recorded the highest percentage, followed by Analytical Thinking, Creative Thinking, Holistic Thinking and Logical Thinking, indicating that no single thinking style predominated among the students.

- The majority of the high school students exhibited a moderate level of thinking style, while a small proportion of students fell under the low and very low categories.
- The majority of the students possessed an average level of meta-cognitive skills. About 20.00% exhibited above-average metacognitive skills, while 26.00% of the students demonstrated high and very high levels, indicating that a considerable proportion of students possessed well-developed meta-cognitive skills.
- Among the four dimensions of metacognitive skills, Planning Skill recorded the highest percentage, followed by Evaluation Skill, Monitoring Skill, and Implementation Skill. This indicates that planning was the most prominent metacognitive skill among the students.
- There was no significant difference in the thinking styles of high school students with respect to gender. Boys and girls exhibited comparable levels of thinking style.
- There was no significant difference in the thinking styles of high school students with respect to the type of school. Students studying in Government Higher Secondary Schools, Corporation Schools, and Tribal Welfare Schools exhibited comparable thinking styles.
- Although female students obtained a slightly higher mean score in meta-cognitive skills than male students, the difference was not statistically significant. Thus, both male and female students exhibited comparable levels of meta-cognitive skills.
- There was no significant difference in the meta-cognitive skills of high school students with respect to the type of school. Students from Government Higher Secondary Schools, Corporation Schools, and Tribal Welfare Schools demonstrated similar levels of metacognitive skills.
- It was found that a very weak positive relationship ($r = 0.100$) existed between thinking style and academic achievement. However, the relationship was not statistically significant, indicating that thinking style was not significantly associated with academic achievement among the students included in the present study.
- Also, a very weak positive relationship ($r = 0.066$) was observed between meta-cognitive skills and academic achievement. However, the relationship was not statistically significant, indicating that meta-cognitive skills were not significantly associated with academic achievement among the students included in the present study.

CONCLUSION

The study revealed that high school students exhibited a balanced distribution of thinking styles, with Practical Thinking being slightly more prominent, and an average level of metacognitive skills, with Planning emerging as the strongest dimension. No significant differences were found in thinking styles or meta-cognitive skills with respect to gender and type of school. Moreover, thinking styles and meta-cognitive skills showed

statistically non-significant relationships with academic achievement. The findings suggest that schools should provide greater opportunities for students to strengthen their meta-cognitive skills, particularly the implementation of learning strategies, through learner-centered teaching methods, reflective learning activities, problem-solving tasks, and teacher guidance to promote effective self-regulated learning and overall academic development.

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LIFE SKILLS OF ADOLESCENT STUDENTS IN BORDER AND NON-BORDER DISTRICTS OF PUNJAB: A COMPARATIVE ANALYSIS

5

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ABSTRACT

The present study aimed to examine the life skills of adolescent students in border and non-border districts of Punjab in relation to the type of school and gender. The study was conducted on a sample of 2,309 Grade IX students studying in government high schools and higher secondary schools in the border districts of Amritsar and Gurdaspur and the non-border district of Jalandhar. Data were collected using the Life Skills Scale developed by Subasree and Nair (2014), and analysed using the t-test and ANOVA. The findings revealed that the life skills of adolescent students did not differ significantly with respect to the type of district, type of school, or gender. However, a significant interaction effect was observed between district and gender, indicating that female students from the border districts possessed higher life skills than both the male students from the border districts and the female students from the non-border district. Based on these findings, it is recommended that curriculum developers integrate life skills education into the school curriculum and that teachers implement appropriate strategies to enhance life skills among adolescent students, with particular attention to male students in border districts and female students in non-border districts.

Keywords: Life Skills, Adolescent Students, Border Districts, Non-border District of Punjab

INTRODUCTION

The aim of education in the twenty-first century is to integrate knowledge, values, attitudes, and practical skills that adolescents need to navigate a rapidly evolving world (Tirri, Cho,

Ahn, & Campbell, 2017). As children are increasingly exposed to a deluge of information, educational systems across the globe are confronted with the challenge of offering relevant, equitable, and transformative learning opportunities (UNESCO, 2016). In this context, life skills education emerges as a core component of quality education—

emphasizing the development of competencies such as self-awareness, empathy, decision-making, emotional regulation, and interpersonal communication (WHO, 1997; UNICEF, 2002).

The goal of life skills education is to equip students with the tools they need to make good decisions that lead to a fulfilling life. Life skills are the abilities that help young people cope with life's challenges while fostering their mental health and competence. Life skills education encourages young people to take constructive steps to safeguard themselves, advance their health, and foster meaningful social interactions. A life skill helps people develop holistically and integratively so they can live successfully in society (Aparna & Raakhee, 2011). Analysis of the life skills field suggests that skills-based programmes play an important role in promoting awareness of the physical and mental health of both students and teachers. In essence, life skills are the skills that help young people cope with life's challenges and foster their mental health and competence (Namita & Sahare, 2013). Life skills comprise positive behaviours that integrate knowledge, attitudes, values, and abilities to achieve desired goals successfully (Singh, 2016).

The Delors Commission Report (1996) reinforced this paradigm through its four pillars of learning—learning to know, to do, to be, and to live together—highlighting the need for psychosocial

as well as academic development (Lagat, 2017). The Dakar Framework for Action (UNESCO, 2000) similarly positioned life skills within global education goals, particularly Goal 3 (ensuring the learning needs of youth and adults are met through life skills programmes) and Goal 6 (measuring outcomes related to literacy, numeracy, and essential life skills) (UNESCO, 2012, 2015).

Life skills, as defined by WHO (1997), are “abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life”. However, the development of such skills is not uniform—it is shaped by contextual and environmental factors that influence students' opportunities for learning and psychosocial growth. According to Bronfenbrenner's Ecological Systems Theory (1979), development is embedded within layered environmental systems—microsystem, mesosystem, exosystem, and macrosystem—that interact dynamically. Factors such as socio-political stability, infrastructure, school climate, teacher-student relationships, and familial support are crucial determinants of life skills development. Moreover, Sen's Capability Approach (1999) provides a critical lens through which to understand the importance of expanding individuals' real freedoms and opportunities (capabilities), which are often constrained by systemic inequalities. These theoretical frameworks highlight how geographical disadvantage, such as living in border districts, can significantly

inhibit children's ability to acquire and practice essential life skills.

EDUCATIONAL CHALLENGES IN BORDER AREAS: THE CASE OF PUNJAB

Punjab, despite moderate overall literacy levels (76.68%), displays pronounced disparities between urban and rural (83.2% vs. 71.4%) and male and female (80.4% vs. 70.7%) literacy rates (Census of India, 2011). These disparities become even starker in the border belt, where socio-economic development, educational access, and health services are significantly lower compared to non-border districts (Judge, 2014; Singh & Rangnekar, 2010). Adolescents from rural backgrounds often lack adequate information and essential life skills that support their personal development, career planning, and self-confidence. They do not have a supportive environment in order to share their concerns with others. Counselling facilities are often unavailable for these children to share their concerns (Saxena, 2018).

Students in border districts often face educational challenges such as limited infrastructure, restricted educational opportunities, teacher shortages, transportation difficulties, socioeconomic disadvantages, and the impact of frequent militarization and evacuation drills, which may contribute to anxiety and disruptions in schooling. Collectively, these factors may influence their educational and psychosocial

development (Bali & Mehra, 2014, Bhatti et al., 2021). These conditions not only hinder educational attainment but may also impede the development of essential psychosocial competencies, including emotional regulation, resilience, decision-making, interpersonal relationships, and conflict resolution, which are fundamental components of life skills and are particularly important for adolescents living in crisis-prone or socially marginalized settings.

BORDER VS. NON-BORDER : A THEORETICAL RATIONALE FOR COMPARISON

The border–non-border comparative framework is grounded in the understanding that geographical context interacts with educational opportunity structures, shaping cognitive, emotional, and behavioural development. Students in non-border regions benefit from more stable institutional ecosystems that support continuity in schooling, exposure to co-curricular activities, and access to trained life skills facilitators—advantages largely absent in border regions. Applying educational equity theory (Reardon, 2011), it is observed that geography functions as a structural constraint that directly and indirectly influences life skills acquisition. Geographic marginalisation limits access to quality instruction, peer collaboration, and psychological support—resources which research shows are essential for fostering life skills (Wilburn & Smith, 2005; Griffin, Botvin, & Nichols, 2006).

Gender, too, must be understood as a contextual variable that interacts with geography to shape educational outcomes. In border districts, prevailing socio-cultural norms often further limit girls' mobility, safety, and participation in extracurricular or life skills-based programmes. This interaction is consistent with intersectionality theory (Crenshaw, 1989), which posits that overlapping identities (such as gender and geographic location) produce compounded disadvantages.

For instance, rural and border-based girls may face multiple barriers: limited school access, gendered expectations around domestic responsibilities, and security risks that deter families from encouraging their participation in life skills activities. In contrast, boys in the same settings may be under pressure to assume economic roles prematurely, inhibiting their psychosocial development in other domains such as empathy, emotional regulation, or health awareness. The findings by Mekade and Joshi (2024), which revealed urban students scoring higher on life skills like self-awareness and empathy, can be interpreted through this lens—suggesting that geography may moderate the gender effects on life skills acquisition. Understanding these interactions is vital for designing targeted, inclusive, and contextually relevant life skills curricula. In sum, life skills education must be theorized and implemented with a deep understanding of geographical

and gendered inequalities. In border districts like those in Punjab, these inequalities are not peripheral—they are central to the educational experience. Applying ecological, capability, and intersectionality theories helps explain why students from such areas may exhibit differing levels of life skills development and underscores the importance of equity-driven interventions. Life skills education, when aligned with the realities of students' environments, becomes not only a pedagogical strategy but a developmental necessity.

RESEARCH DESIGN

The study employed a quantitative, cross-sectional survey design, which was appropriate for gathering standardised data across a large sample of adolescents to examine differences in life skills development across geographical regions and gender. This design enabled the collection of comparable data across multiple schools in different districts of Punjab, facilitating the analysis of contextual effects on life skills. A multi-stage stratified random sampling technique was used to ensure geographical and institutional representation. Two border districts of Punjab (Amritsar and Gurdaspur), which share the international border with Pakistan, and one non-border district (Jalandhar) were selected for the study. Within each district, a list of all government high and senior secondary schools was obtained from the District Education Offices. Schools were then

randomly selected from this list using proportionate stratification to ensure fair representation of both rural and urban locations. Within each selected school, students enrolled in Class IX were considered as the target population, based on the developmental significance of early adolescence as a critical period for life skills acquisition. A total sample of 2,309 students comprising male and female students from these selected schools was included in the study. The final sample distribution was: Border districts (Amritsar and Gurdaspur): 1,593 students and Non-border district (Jalandhar): 716 students. Efforts were made to ensure gender balance, and the sample included students from both co-educational and single-gender government schools to increase generalisability. The data were collected using the Life Skills Scale developed by Subasree and Nair (2014). It consists of ten dimensions, namely: Self-awareness, Empathy, Effective communication, Interpersonal Relationships, Creative Thinking, Critical Thinking, Decision Making, Problem Solving, Coping with Emotions, and Coping with Stress. The scale demonstrates strong psychometric properties, with a test-retest reliability coefficient of 0.91 and a Cronbach's Alpha of 0.84, indicating high internal consistency. Criterion validity was also established by the scale's authors through correlation with other psychosocial measures.

For the collection of data, official permission was obtained from the State Education Department and District Education Officers; the researchers coordinated with school principals to schedule data collection sessions. Clear instructions were provided to the students and they were encouraged to respond honestly. They were assured that their identities would be anonymised and that the data would be used solely for research purposes. To maintain data quality, all questionnaires were checked for completeness on-site, and incomplete forms were excluded from the analysis. Missing items within completed forms (constituting <3% of total responses) were treated using mean substitution, provided the respondent had completed at least 90% of the items. Data were coded and entered into SPSS version 28.0 for statistical analysis. Descriptive statistics (mean, standard deviation) were used to describe the sample and life skills domains. Inferential statistics, including t-tests and ANOVA, were used to examine differences based on gender, type of school and district (border vs. non-border).

ANALYSIS OF DATA AND INTERPRETATION

Table 1 shows the means and S.D of life skills scores in the sub-groups of 2x2x2 Analysis of Variance.

Table - 1
Means and Standard Deviations of Life Skills Scores for the Subgroups in the
2 × 2 × 2 Factorial ANOVA Design by District, Type of School, and Gender

Variable	District	Type of School	Male	Female	Total
Life Skills	Border	GHS	M=309.22 SD=27.07 N=316	M=312.09 SD=27.30 N=329	M=310.68 SD=27.21 N=645
		GSSS	M=307.26 SD=30.84 N=462	M=312.57 SD=30.12 N=486	M=309.98 SD=30.57 N=948
		Total	M=308.06 SD=29.37 N=778	M=312.37 SD=29.00 N=815	M=310.27 SD=29.25 N=1593
	Non- Border	GHS	M=311.18 SD=28.60 N=90	M=305.43 SD=25.14 N=101	M=308.10 SD=26.85 N=191
		GSSS	M=310.24 SD=29.81 N=308	M=309.05 SD=27.26 N=217	M=309.75 SD=28.77 N=525
		Total	M=310.54 SD=29.25 N=398	M=307.90 SD=26.63 N=318	M=309.49 SD=27.88 N=716
	Total	GHS	M=309.96 SD=26.66 N=406	M=310.52 SD=26.93 N=430	M=310.25 SD=26.78 N=836
		GSSS	M=308.45 SD=30.45 N=770	M=311.48 SD=29.30 N=703	M=309.90 SD=29.93 N=1473
		Total	M=308.97 SD=29.19 N=1176	M=311.12 SD=28.41 N=1133	M=310.03 SD=28.83 N=2309
GHS - Government High School, GSSS- Government Senior Secondary School					

To examine the effects of district, type of school, and gender on Life Skills scores, a 2 × 2 × 2 factorial analysis of variance (ANOVA) was performed. The results are presented in Table 2.

Table - 2
Summary of the $2 \times 2 \times 2$ Factorial ANOVA for Life Skills Scores by District, Type of School and Gender

Source	Type III Sum of Squares	df	Mean Square	F-Value	p-Value
District	379.134	1	379.134	.457	.499
Type of School	.830	1	.830	.001	.975
Gender	.664	1	.664	.001	.977
District Type of School	195.056	1	195.056	.235	.628
District Gender	6935.985	1	6935.985	8.367	.004
Type of School Gender	1787.520	1	1787.520	2.156	.142
District Type of School Gender	314.025	1	314.025	.379	.538
Error	1907361.973	2301	828.927		

MAIN EFFECTS

District

As shown in Table 2, the analysis of variance (ANOVA) yielded an F-ratio of $F(1, N) = 0.457$ for the main effect of district (border vs. non-border) on students' Life Skills scores. This value was not statistically significant at the 0.05 level ($p > .05$). This indicates that students studying in border and non-border districts did not differ significantly in their life skills scores. This finding suggests that geographical proximity to international borders may not necessarily shape students' psychosocial competencies, possibly due to similar educational resources, curricula, or community support structures across regions.

Type of School

For the variable type of school (government high school vs. government senior secondary school), the ANOVA revealed an F-ratio of $F(1, N) = 0.001$,

which was also not statistically significant ($p > .05$). The findings indicate that students studying in Government High Schools and Government Senior Secondary Schools demonstrated comparable levels of Life Skills. Hence, it is stated that the type of schooling within the government sector does not influence the development of life skills among students.

Gender

Similarly, the effect of gender on life skills was found to be non-significant, with an F-ratio of $F(1, N) = 0.001$. This suggests that male and female students did not differ significantly in their life skills scores. The absence of gender disparity may point to a shift toward more gender-neutral pedagogical practices and socialisation processes in schools, or it may reflect uniform exposure to life skills development opportunities irrespective of gender.

Two-Way Interaction

District × Type of School

The interaction between district and type of school was also not statistically significant $F(1, N) = 0.235, p > .05$, indicating that the effect of school type on life skills does not vary across different districts. This further reinforces the uniformity in life skills outcomes across geographical and institutional contexts, suggesting consistent policy or programme implementation across regions.

District × Gender

In contrast, a statistically significant interaction effect was observed between district and gender on students' life skills scores ($F(1, N) = 8.36, p < .05$). This indicates that the relationship between gender and life skills is not

consistent across the two districts. The significance of this interaction suggests a more complex, context-specific dynamic where either male or female students in one district may be receiving different levels of psychosocial support, access to skill-building activities, or may be experiencing differing socio-cultural expectations. This finding warrants further exploration to determine the underlying mechanisms—such as district-level educational interventions, cultural factors, or gender norms—that may differentially influence students' life skill development across regions.

To ascertain the significance of differences among means of various combination groups, *t*-ratios have been computed, which have been placed in the following Table 3.

Table - 3
t-Ratios for Difference in Means of Different Combinations of District and Gender

Groups			Border					Non-Border					
	Male			Female			Male			Female			
	M	SD	N	M	SD	N	M	SD	N	M	SD	N	
	308.06	29.37	778	312.37	29.00	815	310.76	28.77	398	307.89	26.66	316	
Border	Male	—			2.95*			1.50			.087		
	Female				—			.912			2.38*		
Non-Border	Male	-			-			—			1.36		
	Female	--			---			----			—		
* Significant at the 0.05 Level													

The findings from Tables 2 and 3 provide further insight into the differential patterns of life skills development among subgroups of students categorised by

district and gender. The independent samples *t*-tests were conducted to assess the mean differences across these combinations.

Gender Differences within the Border District

Table 2 reveals that the t -ratio for the comparison between male and female students within the border district is $t = 2.95$, which is statistically significant at the 0.05 level ($p < .05$). This indicates a meaningful gender-based difference in life skills scores among students residing in border regions. Further analysis of the group means indicates that female students in the border district exhibit significantly higher life skills than their male counterparts. This finding may reflect gender-specific socialization patterns, differing levels of maturity, or more effective engagement of girls with life skills education programmes in that region. It also highlights a potential need to explore whether male students in border areas are underserved or face unique psychosocial challenges that hinder their skill development.

Female Students: Border vs. Non-Border Districts

Similarly, Table 3 indicates a statistically significant difference between female students in border districts and female students in non-border districts, with a t -value of 2.38 ($p < .05$). The data suggest that female students from border districts possess significantly higher life skills than their peers from non-border districts. This unexpected trend may point to region-specific interventions, community-based initiatives, or cultural dynamics in border areas that contribute positively to female students' life skill

development. It also suggests that educational or social programmes in border districts may be fostering resilience or independence in girls, possibly due to environmental or contextual demands. For the remaining subgroup comparisons—such as male students across districts and cross-gender comparisons within non-border districts—the t -values were not statistically significant at the 0.05 level. This indicates no substantial differences in life skills scores among those groups, suggesting a degree of uniformity in life skills acquisition across these populations.

Type of School $\times$ Gender

As indicated in Table 2, the two-way interaction between type of school (government high school vs. government senior secondary school) and gender (male vs. female) on students' Life Skills scores yielded an F -ratio of $F = 2.15$, which was not statistically significant at the 0.05 level ($p > .05$). This non-significant result suggests that the effect of school type on life skills development does not vary as a function of gender. In other words, both male and female students appear to benefit similarly from their respective school environments, regardless of whether they are enrolled in high schools or senior secondary schools. This outcome may indicate a relatively uniform delivery of life skills-related content and opportunities across these school types, without substantial gender-based differentiation in experiences or outcomes.

Three-Way Interaction

District $\times$ Type of School $\times$ Gender

Further, the analysis revealed that the three-way interaction among district, type of school, and gender yielded an F-ratio of $F = 0.379$, which was also not statistically significant at the 0.05 level ($p > .05$). This implies that the combined influence of geographical location, institutional level, and gender does not result in any statistically meaningful variation in students' life skills scores. The absence of a significant three-way interaction suggests that life skills development processes are not dependent on any complex interplay among these three factors, at least within the context of this study.

DISCUSSION

The results of the study revealed that there exists no significant difference in the district, type of school and gender in life skills between students from border and non-border districts. It suggests that the geographic location in terms of being near the border does not appear to impact students' life skills development. This result is in consonance with the results of the study done by Smith et al. (2017). Further, Sexena (2018) examined how geographical location influences the social-emotional development of students, particularly in rural and urban areas. But, Mekade & Joshi (2024) found that the percentage of high scores in life skills was found among students in urban areas in comparison to rural students. However, in 2021, UNICEF reached

over 350 young people in Aragatsotn, Gegharkunik, Tavush and Yerevan with a special course on basic life-saving skills. The coursework was developed by UNICEF and delivered with partners to reach adolescents and young people who have been affected by the Nagorno-Karabakh conflict and live in border zone communities across the country. UNICEF launched this programme in order to give young people an opportunity to acquire the skills that will help them be better prepared for a variety of challenges, develop resilience, set goals and make the right decisions for themselves and their communities.

Further, Life skills among adolescents have been investigated in relation to residential background (Aparna & Raakhee, 2011; Malik, 2012; Pillai, 2012; Namita, 2013; Prajina, 2014; Parvathy & Pillai, 2015; Bardhan, 2016; Singh, 2016; Joseph & Thoma, 2017; Borah, Ahmed & Kollipara, 2020; Rani & Neeraj, 2020; Ahmed & Kollipara, 2021; Sarla, Rekha & Annu, 2022;) and found relation between Life skills and residential background. Further, results showed that the type of government school attended by the students (high school vs. senior secondary school) did not yield any significant difference in life skills scores. This means that whether students are enrolled in a school that caters to younger adolescents (high school) or older ones (senior secondary), it does not affect their life skills development in a meaningful way. The analysis also shows no significant difference in life

skills based on gender. This suggests that, in the context of this study, boys and girls have similar levels of life skills. It challenges the notion that gender may lead to differences in emotional intelligence, interpersonal skills, or other life skills. The results of the study suggest a level of gender parity in life skills among adolescents in the selected districts. The interaction between district and gender raises the question of why this difference exists. Mekade & Joshi (2024) found that there exists no significant difference in the life skills of male and female students, whereas Neelam and Thakur (2023) found that no significant difference exists in life skills of adolescents with respect to gender and residential background. Borah, Ahmed and Kollipara (2020) and Sarla, Rekha and Annu (2022) found that gender is not only significantly related to Life skills. It was detected that the main factors that lead to Life skills among adolescents are gender, type of school and residential background (Borah, Ahmed & Kollipara, 2020; Rani, 2020; Annu, 2022). Since no main effects were found for district, school type, or gender individually, but the combination

of district and gender is significant, this suggests further exploration in the research like gender norms, cultural and socioeconomic factors etc.

CONCLUSION

While individual factors like district, school type, and gender do not significantly affect life skills in isolation, the interaction between district and gender indicates that these factors combine in complex ways to influence adolescents' abilities. This emphasises the importance of considering contextual and intersectional factors when studying life skills development. Future research and interventions should explore these interactions in greater detail to uncover the underlying reasons for these differences and to design more targeted and effective support systems for students in border and non-border areas. Academicians, representatives, families, and all other relevant stakeholders must take priority in developing strategies to help adolescents to develop better life skills. In life skills education program basic skills building activities should be taught through group discussion, brain storming, role play etc.

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