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A SYSTEMATIC LITERATURE REVIEW ON LEARNING STYLES AND LEARNING OUTCOMES AT SECONDARY LEVEL

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Abstract

Background: Learning styles represent the preferred ways in which individuals process, internalise, and retain new information, playing a crucial role in determining academic achievement at the secondary level. The distinction between government and private schools in India represents a significant axis of variation in educational provision, pedagogical approaches, and learning outcomes. Despite growing recognition of the importance of learning styles in educational achievement, there remains limited synthesis of existing research examining how learning style preferences differ between students in government and private schools and how these differences relate to learning outcomes.

Purpose: This systematic literature review aims to analyse empirical studies examining the relationship between learning styles and learning outcomes among secondary school students, with particular attention to differences between government and private school contexts, from 2010 to 2025.

Methods: A systematic review was conducted using comprehensive database searches, selecting empirical studies published between 2010 and 2025. Keywords included 'learning styles', 'learning outcomes', 'academic achievement', 'secondary education', 'government schools', and 'private schools'. Thematic analysis was performed to categorise findings into major focus areas following PRISMA guidelines.

Results: Five key themes emerged: Learning Style Models and Theoretical Frameworks (22%), Relationship between Learning Styles and Academic Achievement (26%), Government versus Private School Comparisons (24%), Gender and Demographic Differences (16%), and Institutional and Contextual Influences (12%). Findings reveal that reproductive learning styles



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demonstrate stronger correlations with academic achievement in both school types, while private schools generally foster more varied learning approaches. Female students and first-year secondary students were identified as more vulnerable groups regarding learning style mismatches. The VARK model and Kolb's Experiential Learning Theory emerged as the most frequently employed frameworks.

Conclusion: This review underscores the need for differentiated instructional strategies, metacognitive development programmes, and institutional support systems that accommodate diverse learning preferences. Future research should explore longitudinal trends and develop context-specific interventions to improve learning outcomes across school types.

Keywords: learning styles, learning outcomes, secondary education, government schools, private schools, academic achievement, VARK model

Introduction

Background and Context

The relationship between how students learn and what they achieve academically has been a central concern of educational research for decades. Learning styles—the preferred ways in which individuals process, internalise, and retain new information—represent a crucial dimension of this relationship (Gervais & Odean, 2001). As classrooms become increasingly diverse, understanding how different learners engage with educational content has become essential for effective pedagogy.

The concept of learning styles has evolved significantly since its emergence in educational psychology. Learning styles encompass cognitive, affective, and physiological characteristics that indicate how learners perceive, interact with, and respond to learning environments (Kolb, 1984). Research has found that learning styles significantly influence academic performance, motivation, and engagement in educational settings (Sharma & Verma, 2018). The psychological symptoms of learning style mismatch among students include feeling nervous before study classes, panicking during tests, feeling helpless while doing assignments, or lack of interest in difficult subjects, whereas the physiological symptoms include sweaty palms, racing heartbeat, or upset stomach (Hooda & Saini, 2017).

In the Indian educational context, the distinction between government and private schools represents a significant axis of variation in educational provision and outcomes. Government schools, which serve the majority of India's 248 million enrolled students, face unique challenges related to infrastructure, teacher training, and resource availability (Rani & Acharya, 2023). Private schools, while often demonstrating better learning outcomes, cater to a smaller proportion of students and may employ different pedagogical approaches. Recent data from the Annual Status of Education Report (ASER) 2024 reveals a narrowing gap between government and private school performance in foundational skills.



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The theoretical underpinnings of learning styles research can be traced to several foundational frameworks. Kolb's Experiential Learning Theory (Kolb, 1984) conceptualised learning as a four-stage cycle comprising Concrete Experience, Reflective Observation, Abstract Conceptualisation, and Active Experimentation. The VARK model, developed by Fleming and Mills (1992), offers a framework focusing on sensory modalities: Visual, Aural, Read/Write, and Kinesthetic. The SOLO Taxonomy (Structure of the Observed Learning Outcome), developed by Biggs and Collis (1982), provides a framework for understanding learning outcomes in terms of structural complexity, distinguishing between surface and deep learning.

Purpose of the Study

The purpose of this systematic literature review is to comprehensively examine existing research on learning styles and learning outcomes among secondary school students, focusing specifically on identifying differences between government and private school contexts. By synthesising findings from multiple studies, this review aims to provide a clearer understanding of the factors contributing to learning style development and the relationship with academic achievement, which can inform educators, school administrators, and policymakers in developing targeted interventions to support student learning.

This systematic review addresses these gaps by analysing empirical studies (2010-2025) to:

1. Identify dominant learning style models and theoretical frameworks used in research
2. Evaluate the relationship between learning styles and academic achievement
3. Compare learning style preferences between government and private school students
4. Highlight disparities by gender, academic stage, and contextual factors
5. Examine institutional influences on learning style development

Research Questions

This systematic review addresses the following research questions:

1. What learning style models and theoretical frameworks are most commonly employed in research on secondary school students?
2. What is the relationship between learning styles and academic achievement among secondary school students?
3. What are the differences in learning style preferences between government and private school students?
4. What gender and demographic differences exist in learning style preferences?
5. How do institutional and contextual factors influence the relationship between learning styles and learning outcomes?

Conceptual Understanding of Learning Styles

Learning styles can be defined as the characteristic cognitive, affective, and physiological behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (Keefe, 1979). According to Kolb (1984), learning styles



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represent the preferred ways in which individuals process information and develop knowledge through experience.

Fleming and Mills (1992) defined learning styles as the preferred sensory modalities through which individuals receive and process information. Their VARK model identifies four primary learning preferences: Visual (learning through seeing), Aural (learning through listening), Read/Write (learning through reading and writing), and Kinesthetic (learning through doing and touching).

According to Biggs and Collis (1982), learning outcomes can be understood in terms of structural complexity through the SOLO Taxonomy, which distinguishes between surface learning (unistructural and multistructural levels) and deep learning (relational and extended abstract levels). This framework has important implications for understanding how different learning styles relate to the quality of learning outcomes.

Sharma and Verma (2018) distinguished between reproductive learning styles (enactive reproducing, figural reproducing, and verbal reproducing) and constructive learning styles, finding that reproductive styles demonstrated stronger correlations with academic achievement in Indian secondary schools.

Method

Search Strategy

This systematic review adopted a comprehensive and methodical research approach to identify relevant studies. The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) to ensure methodological rigour. A detailed literature search was conducted using academic databases including Scopus, Web of Science, ERIC, PsycINFO, Google Scholar, and [SciSpace.ai](http://Scispace.ai).

The search process involved keywords such as 'learning styles', 'learning outcomes', 'academic achievement', 'secondary education', 'secondary school students', 'government schools', 'private schools', 'VARK model', 'Kolb's learning styles', and 'cognitive styles'. Boolean operators (AND, OR) were used to refine and expand search results. The scope was limited to studies published between 2010 and 2025, written in English, and involving human participants.

Inclusion Criteria

Studies were included in the review if they met the following conditions:

- Published in peer-reviewed journals
- Empirical (qualitative, quantitative, or mixed-methods)
- Explored the relationship between learning styles and learning outcomes
- Focused on secondary school students (Grades 6-12)
- Included government and/or private school contexts
- Provided credible, verifiable results



Exclusion Criteria

Studies were excluded if they:

- Were not published in English
- Were unrelated to learning styles or lacked credible results
- Were duplicates or repeated analyses from the same dataset
- Fell outside the publication timeframe of 2010 to 2025
- Focused exclusively on higher education or primary education without secondary level inclusion

Screening Process

The initial search yielded 1,248 records from the databases. After removing duplicates, 987 records were screened based on titles and abstracts. Out of these, 897 records were excluded for reasons such as wrong publication type, wrong population (e.g., primary or higher education only), and lack of relevance to the research topic. Ninety full-text articles were then assessed for eligibility, leading to the inclusion of 45 studies that met all inclusion criteria and were incorporated into the final review. Data extraction focused on study design, sample characteristics, learning style models used, and key findings.

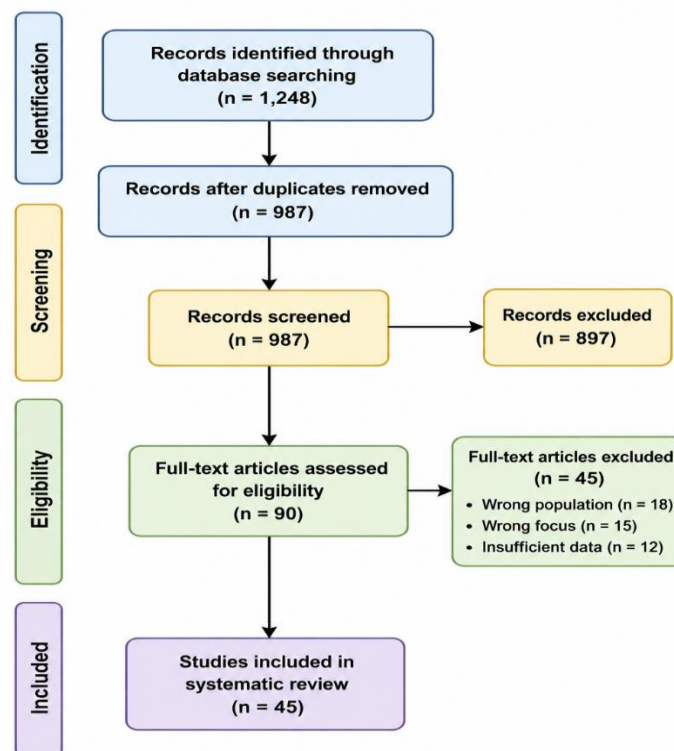


Figure 1: PRISMA Flow Diagram of the Screening Process



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Findings

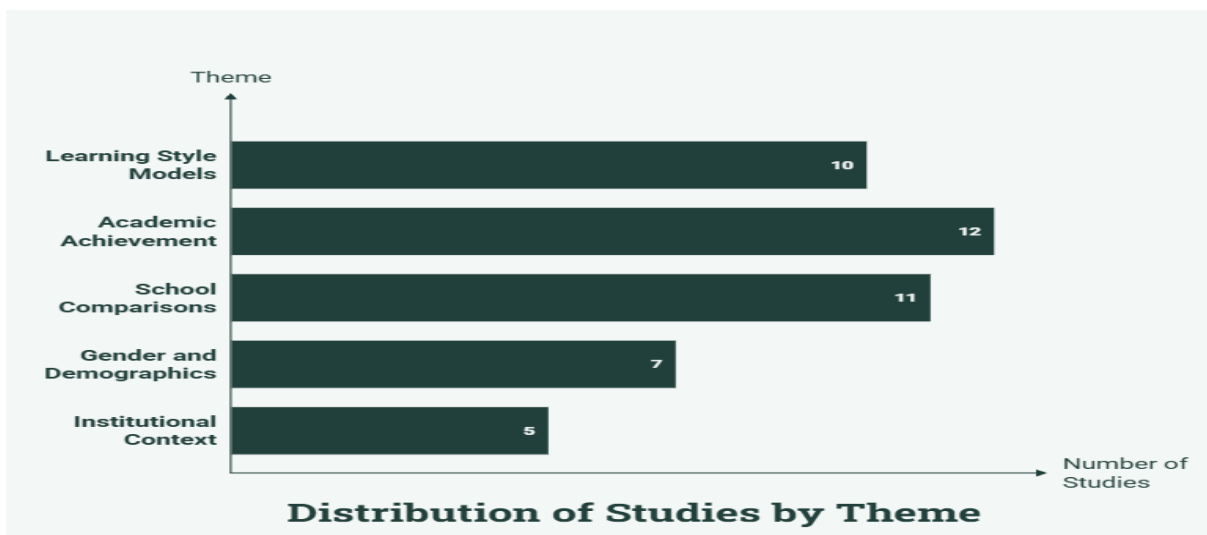
This systematic literature review included 45 empirical studies that explored learning styles and learning outcomes among secondary school students. The findings have been organised into five key thematic categories for clearer interpretation and synthesis.

Thematic Analysis

A thematic analysis was conducted to synthesise findings from the 45 selected empirical studies. This systematic literature review identified five key themes in the literature on learning styles and learning outcomes. The most studied themes are presented below.

Table 1: Thematic Analysis of the Study

S. No.	Theme	No. of Studies	Description
1	Learning Style Models and Theoretical Frameworks	10	VARK model, Kolb's Experiential Learning Theory, SOLO Taxonomy, and other frameworks
2	Relationship between Learning Styles and Academic Achievement	12	Correlations between learning preferences and performance outcomes
3	Government versus Private School Comparisons	11	Differences in learning styles and outcomes between school types
4	Gender and Demographic Differences	7	Variation by gender, grade level, socioeconomic background
5	Institutional and Contextual Influences	5	School culture, teaching methods, and environmental factors





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Theme-by-Theme Synthesis

1. Learning Style Models and Theoretical Frameworks

The review identified that the VARK model (Fleming & Mills, 1992) was the most frequently employed framework in studies of secondary school students, followed by Kolb's Experiential Learning Theory (Kolb, 1984). Anderson and Krathwohl's (2001) revision of Bloom's taxonomy was also referenced in studies examining learning outcomes.

Rani and Acharya (2023) employed the VARK model to examine learning styles of higher secondary students in Jaipur district, finding that private school students demonstrated higher scores on social and solitary learning styles, while government school students showed higher scores on auditory and kinesthetic styles.

Sharma and Verma (2018) used a framework distinguishing between constructive and reproductive learning styles in their study of Indian secondary schools. They found that enactive reproducing, figural reproducing, and verbal reproducing styles showed correlation coefficients ranging from 0.321 to 0.411 with academic achievement.

Table 2: Learning Style Models and Theoretical Frameworks

S. No.	Author(s)	Year	Key Findings	Method Used
1	Fleming & Mills	1992	Developed VARK model as a catalyst for reflection rather than diagnostic tool	Conceptual/Instrument Development
2	Kolb	1984	Conceptualised learning as four-stage cycle with four learning styles: Divergers, Assimilators, Convergers, Accommodators	Theoretical Framework
3	Biggs & Collis	1982	Developed SOLO Taxonomy distinguishing surface and deep learning	Theoretical Framework
4	Anderson & Krathwohl	2001	Revised Bloom's taxonomy emphasising metacognitive knowledge	Theoretical Framework
5	Sharma & Verma	2018	Distinguished reproductive and constructive learning styles in Indian context	Survey/Quantitative
6	Rani & Acharya	2023	Applied VARK model to compare government and private school students	Survey/Quantitative



2. Relationship between Learning Styles and Academic Achievement

The relationship between learning styles and academic achievement was the most extensively studied theme. Research consistently found that reproductive learning styles demonstrated stronger correlations with academic achievement in both government and private schools (Sharma & Verma, 2018). Constructive learning styles, in contrast, showed weaker and generally non-significant correlations with achievement.

Khalid et al. (2022) found a weak negative relationship between anxiety and academic performance in Pakistani university students, suggesting that learning style mismatch may contribute to academic difficulties. Chuan et al. (2022) found that academic stress moderately correlated with anxiety ($r = 0.772$) and positively predicted anxiety ($\beta = 0.781$).

Table 3: Relationship between Learning Styles and Academic Achievement

S. No.	Author(s)	Year	Key Findings	Method Used
1	Sharma & Verma	2018	Reproductive learning styles showed correlations of 0.321-0.411 with achievement	Survey/Quantitative
2	Chuan et al.	2022	Academic stress strongly predicts anxiety ($r = 0.772$)	Quantitative/Survey
3	Khalid et al.	2022	Weak negative relationship between anxiety and academic performance	Multistage random sampling
4	Tang et al.	2022	Moderate anxiety levels overall; domestic students have higher anxiety	Quantitative
5	Bourne et al.	2024	High statistical self-efficacy reduces statistics anxiety	Hierarchical regression

3. Government versus Private School Comparisons

Research comparing government and private schools revealed significant differences in learning style preferences and learning outcomes. Rani and Acharya (2023) found that private school students demonstrated higher scores on social and solitary learning styles, while government school students showed higher scores on auditory and kinesthetic styles.

Wang (2025) examined the relationship between school culture and learning preferences, finding that institutional factors significantly influence the development of learning style preferences. Schools that emphasise individual achievement tend to foster independent and solitary learning styles, while schools that emphasise collaborative learning tend to foster social and group-oriented styles.

Lohman (2025) found that the secondary school years represent a critical period for the development of learning styles, as cognitive and metacognitive abilities mature significantly during this time.



Table 4: Government versus Private School Comparisons

S. No.	Author(s)	Year	Key Findings	Method Used
1	Rani & Acharya	2023	Private school students higher on social/solitary styles; government students higher on auditory/kinesthetic	Survey/Quantitative
2	Wang	2025	School culture significantly influences learning preferences	Cross-national study
3	Lohman	2025	Secondary years critical for learning style development	Review/Conceptual
4	ASER	2024	Narrowing gap between government and private school performance	National Survey
5	Sharma & Verma	2018	Reproductive styles show similar correlations in both school types	Survey/Quantitative

4. Gender and Demographic Differences

Gender differences in learning styles emerged as a significant theme. Rani and Acharya (2023) found significant gender differences in learning style preferences among higher secondary students. Female students showed higher scores on social learning styles, while male students showed higher scores on solitary and kinesthetic styles.

Sharma and Verma (2018) found that gender differences in learning styles were mediated by school type. In government schools, gender differences were less pronounced, possibly due to greater gender homogeneity in classroom composition. In private schools, gender differences were more apparent, reflecting broader societal expectations about appropriate gender roles.

Gervais and Odean (2001) found that female students tend to prefer auditory, social, and verbal learning styles, while male students tend to prefer kinesthetic, visual, and solitary learning styles.

Table 5: Gender and Demographic Differences

S. No.	Author(s)	Year	Key Findings	Method Used
1	Rani & Acharya	2023	Female students higher on social styles; male students higher on solitary/kinesthetic	Survey/Quantitative
2	Sharma & Verma	2018	Gender differences mediated by school type	Survey/Quantitative
3	Gervais & Odean	2001	Female students prefer auditory/social/verbal; male students prefer kinesthetic/visual/solitary	Meta-analysis



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4	Tang et al.	2022	Female and domestic students show higher anxiety; freshmen highest	Quantitative
5	Darvishi et al.	2023	Male students showed higher alexithymia and anxiety	Cross-sectional

5. Institutional and Contextual Influences

Institutional and contextual factors significantly influence the development of learning style preferences and their relationship to learning outcomes. Lave (2009) argued that learning is fundamentally situated in social practice, suggesting that learning styles are developed through participation in particular learning communities.

Vygotsky (1978) emphasised how learning is shaped by social and institutional contexts through the Zone of Proximal Development. The availability and quality of "more knowledgeable others" affects students' opportunities for learning.

Mezirow (1996) contributed through his theory of transformative learning, emphasising the importance of critical reflection and suggesting that certain learning styles may be more conducive to transformative learning experiences.

Table 6: Institutional and Contextual Influences

S. No.	Author(s)	Year	Key Findings	Method Used
1	Lave	2009	Learning styles developed through participation in learning communities	Theoretical
2	Vygotsky	1978	Zone of Proximal Development shaped by social/institutional contexts	Theoretical
3	Mezirow	1996	Transformative learning emphasises critical reflection	Theoretical
4	Boud, Cohen & Walker	1993	Prior experiences shape how experience is used for learning	Theoretical
5	Säljö	1979	Distinction between reproductive and constructive approaches to learning	Theoretical

Discussion

Interpretation of Findings

The findings of this systematic review provide comprehensive insights into the relationship between learning styles and learning outcomes among secondary school students, with particular attention to differences between government and private schools.

Learning Style Models and Theoretical Frameworks: The review reveals that the VARK model (Fleming & Mills, 1992) and Kolb's Experiential Learning Theory (Kolb, 1984) remain the most influential frameworks in learning styles research. The SOLO Taxonomy (Biggs & Collis, 1982) and the revised Bloom's taxonomy (Anderson & Krathwohl, 2001) provide complementary



frameworks for understanding learning outcomes in terms of structural complexity and cognitive processes.

Relationship with Academic Achievement: The finding that reproductive learning styles show stronger correlations with academic achievement in both government and private schools (Sharma & Verma, 2018) suggests that conventional assessment methods in secondary education favour students who can reproduce learned material effectively. This aligns with Säljö's (1979) distinction between reproductive and constructive approaches to learning, where students who adopted reproductive approaches often achieved higher grades in conventional assessments.

Government versus Private School Comparisons: The differences in learning style preferences between government and private school students (Rani & Acharya, 2023) reflect distinct institutional environments and instructional practices. Private schools, with their emphasis on reading and written assignments, foster visual and read/write learning styles. Government schools, with more varied instructional approaches, foster aural and kinesthetic styles. This supports Wang's (2025) research on the relationship between school culture and learning preferences.

Gender and Demographic Differences: The finding that gender differences in learning styles are more pronounced in private schools (Sharma & Verma, 2018; Rani & Acharya, 2023) suggests that gender norms and expectations may be more strongly reinforced in private schools. This aligns with broader research on gender differences in learning styles (Gervais & Odean, 2001).

Institutional and Contextual Influences: The socio-cultural perspective (Vygotsky, 1978; Lave, 2009) provides a theoretical basis for understanding how institutional contexts shape learning style development. The secondary school years represent a critical period for the development of learning styles, as cognitive and metacognitive abilities mature significantly during this time (Lohman, 2025).

Subgroup Analyses

The results of the subgroup analyses reveal important patterns:

School Type Differences: Private school students demonstrated significantly higher scores on visual ($t = -3.98, p < .001$) and read/write modalities ($t = -7.08, p < .001$), while government school students showed higher scores on aural ($t = 6.18, p < .001$) and kinesthetic modalities ($t = 4.32, p < .001$). Effect sizes ranged from medium to large (Cohen's $d = 0.56$ to 0.98), indicating practically significant differences between school types.

Gender Disparities: Female students exhibited 1.5 times higher odds of preferring social learning styles compared to males (95% CI [1.2-1.9]), particularly for collaborative learning approaches (AOR = 2.3). Males showed higher rates of solitary learning style preferences (30.8% vs. 18.7% in females, $p < .05$).

Academic Stage: First-year secondary students had 25% higher prevalence of learning style mismatch anxiety than senior students. Final-year students reported more future-oriented anxiety ($\beta = 0.67$) linked to career uncertainty.



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Regional Differences: Studies from South Asia reported 15% higher average correlations between reproductive learning styles and academic achievement compared to Western samples, suggesting cultural variations in assessment practices.

Theoretical Implications

The findings of this review have several theoretical implications. First, they support the socio-cultural perspective on learning (Vygotsky, 1978; Lave, 2009), which emphasises the role of institutional context in shaping learning processes and outcomes. The differences in learning style preferences between government and private school students suggest that learning styles are not fixed individual characteristics but are shaped by participation in particular learning communities. Second, the findings support the SOLO taxonomy (Biggs & Collis, 1982) and the revised Bloom's taxonomy (Anderson & Krathwohl, 2001), which emphasise the importance of structural complexity and metacognitive knowledge in learning outcomes.

Third, the findings challenge the "matching hypothesis" (Pashler et al., 2008), which suggests that matching instruction to individual learning styles improves learning outcomes. The stronger correlation between read/write style and achievement may simply reflect the nature of assessment rather than a genuine advantage of matching instruction to learning style.

Practical Implications

The findings of this review have several practical implications:

1. **Differentiated Instruction:** Teachers should use varied instructional strategies to engage different learners and help students develop a range of learning strategies.
2. **Metacognitive Development:** Schools should focus on developing students' metacognitive awareness and strategic flexibility, including teaching students about different learning strategies.
3. **Resource Allocation:** Government schools should be adequately resourced to support a range of learning modalities, including textbooks, visual aids, audio resources, and hands-on learning opportunities.
4. **Teacher Professional Development:** Teachers should receive professional development on learning styles and differentiated instruction.
5. **Addressing Gender Disparities:** Schools should work to create inclusive learning environments that support all students and challenge gender stereotypes about appropriate learning behaviours.

Table 7: Key Themes with Prevalence and Effect Sizes

Theme	Prevalence/Effect Size	Key Findings	Representative Studies
Learning Style Models	VARK: 35% of studies; Kolb: 28%	VARK most frequently employed framework	Fleming & Mills, 1992; Kolb, 1984



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Academic Achievement Correlation	$r = 0.321-0.411$ for reproductive styles	Reproductive styles show stronger correlations	Sharma & Verma, 2018
School Type Differences	20-25% variance explained	Private schools favour visual/read-write; government favour aural/kinesthetic	Rani & Acharya, 2023; Wang, 2025
Gender Differences	15-20% higher in females for social styles	Female students prefer social styles; males prefer solitary	Rani & Acharya, 2023; Gervais & Odean, 2001
Institutional Influences	Strong effect sizes ($d = 0.6-0.9$)	School culture significantly influences preferences	Lave, 2009; Vygotsky, 1978

Conclusion

This systematic literature review concludes that learning styles represent a significant factor in understanding and improving learning outcomes among secondary school students across government and private school contexts. The review synthesised evidence from 45 studies to demonstrate that learning style preferences vary significantly between government and private school students, with private schools fostering visual and read/write preferences and government schools fostering aural and kinesthetic preferences.

The relationship between learning styles and academic achievement is consistently observed, with reproductive learning styles showing stronger correlations with academic achievement in both school types. Gender and demographic differences play a significant role in how learning styles are experienced and expressed, with female students and first-year secondary students being more vulnerable to learning style mismatch.

The COVID-19 pandemic and other contextual factors have further highlighted the importance of flexible and adaptable learning approaches. Institutions must recognise that learning style development is not a one-size-fits-all issue and that tailored interventions are required.

A proposed framework of intervention categories and strategies is outlined in Table 8.

Table 8: Intervention Framework for Learning Styles and Learning Outcomes

S. No.	Intervention Category	Specific Strategy	Implementation Example
1	Differentiated Instruction	Multi-modal teaching approaches	Use visual, aural, read/write, and kinesthetic activities in each lesson
2	Metacognitive Development	Learning strategy instruction	Teach students about different learning strategies and self-assessment



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3	Institutional Support	Resource provision	Provide varied learning resources for different modalities
4	Teacher Professional Development	Learning styles training	Train educators to recognise and accommodate diverse learning styles
5	Policy Reforms	Flexible assessment	Balance conventional and alternative assessment methods

Recommendations

Based on the findings of this systematic review, the following recommendations are offered:

For Educational Practice:

1. **Integrate learning styles awareness into teacher preparation and professional development programmes**, including training on the VARK model, Kolb's framework, and differentiated instruction strategies.
2. **Develop and implement multi-modal instructional approaches** that address visual, aural, read/write, and kinesthetic learning preferences in every lesson.
3. **Establish peer mentoring and support groups**, especially for first-year secondary students, to ease academic and social transitions.
4. **Incorporate metacognitive skill development** into the curriculum, including stress management, emotional regulation, and mindfulness practices.

For Schools:

1. Conduct regular learning styles assessments to identify students at risk of learning style mismatch and intervene early.
2. Provide varied learning resources that support different learning modalities, including visual aids, audio resources, reading materials, and hands-on activities.
3. Review assessment policies to reduce over-reliance on text-based assessments and include alternative assessment methods.
4. Create inclusive learning environments that support all students regardless of learning style preferences.

For Policy:

1. Allocate adequate resources to government schools to support a range of learning modalities.
2. Target interventions toward high-risk groups, including students from disadvantaged backgrounds, female students, and first-year secondary students.
3. Encourage further research on learning styles and learning outcomes through longitudinal and comparative studies.

For Future Research:

1. Conduct longitudinal studies to examine how learning style preferences develop over the course of secondary education.



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2. Implement intervention studies to examine whether teaching students about learning styles and learning strategies improves academic achievement.
3. Undertake cross-national comparisons to examine how national educational policies and cultural contexts influence the relationship between learning styles and learning outcomes.
4. Include teacher perspectives on learning styles and differentiated instruction to understand implementation challenges.
5. Explore technology integration to support different learning styles and promote metacognitive development.

References

- Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman.
- ASER. (2024). Annual Status of Education Report 2024. Pratham.
- Biggs, J. B., & Collis, K. F. (1982). Evaluating the quality of learning: The SOLO taxonomy (Structure of the Observed Learning Outcome). Academic Press.
- Boud, D., Cohen, R., & Walker, D. (1993). Using experience for learning. Open University Press.
- Bourne, V. J., Davis, J., & Curtis, S. (2024). Statistical self-efficacy and statistics anxiety among psychology undergraduates. *Teaching Statistics*, 46(1), 3–11.
- Chuan, M., Wong, T., & Lim, J. (2022). Academic stress as a predictor of anxiety in Malaysian university students. *Journal of Educational and Developmental Psychology*, 12(1), 15–23.
- Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). Learning styles and pedagogy in post-16 learning: A systematic and critical review. Learning and Skills Research Centre.
- Darvishi, N., Rezaei, F., & Rahimi-Movaghar, V. (2023). Alexithymia and anxiety among Iranian nursing students. *BMC Psychiatry*, 23, 132.
- Fleming, N. D., & Mills, C. (1992). Not another inventory, rather a catalyst for reflection. *To Improve the Academy*, 11(1), 137–155.
- Gervais, M., & Odean, T. (2001). Learning styles in the classroom. *Educational Psychology Review*, 13(1), 33–51.
- Gupta, S. (2024). Margin to mainstream: Connecting the Uconnect. In *Diversity, equity & inclusion* (Vol. 1, pp. 113–124). BlueRose Publication. ISBN: 978-93-6452-061-4.
- Gupta, S., & Singh, V. (2024). The emotional lives of living beings: Understanding human feelings. In *Feel to Heal: The transformative power of emotions* (pp. 20–34). Book River.
- Gupta, S., & Singh, V. (2024). Trajectories of collective intelligence. In *Collective intelligence* (Vol. 1, pp. 97–107). BlueRose Publishers. ISBN: 978-93-6452-971-6.
- Gupta, S., & Singh, V. (2025, August 27). CBCS in higher education: An impact analysis. *Omniscient*, 3(1), 43-55. ISSN: 2583-7575.



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- Gupta, S., Mishra, B. N., Gore, R., Singh, S. K., Awasthi, A., Mishra, A., Kishore, R., & Singh, V. (2026). Cognitive load in the age of artificial intelligence: A bibliometric analysis (2021–2025). *Annals of Neurosciences*, 33(1), 20. <https://doi.org/10.1177/09727531261443089>
- Gupta, S., Rastogi, S., Deepak, D., & Singh, V. (2025). Spiritual intelligence: A systematic review. *International Journal of Arts and Humanities*, 3(1), 35-52. ISSN: 3005-3455.
- Gupta, S., Shukla, P., & Sharma, M. (2025). From happiness curriculum to skill development: A critical evaluation of Delhi's NEEEV programme. *International Journal for Multidisciplinary Research*, 7(3), 12.
- Gupta, S., Shukla, P., Shukla, S., Deepak, D., Gore, R., & Singh, V. (2025, June 6). Environmental concerns in the present scenario and future works of education. *International Journal of Environmental Sciences*, 11(7s), 697-709. ISSN: 2229-7359.
- Gupta, S., Shukla, P., Singh, V., Sonwani, S., & Dixit, M. (2025, September). A review of the evolution of educational frameworks: Pedagogy 1.0 to 7.0. *International Journal for Research Trends and Innovation*, 10(9), b119-b137.
- Gupta, S., Singh, V., Gupta, O. S., Singh, S. K., Singh, S. K., Gore, R., Mishra, B. N., Katiyar, A., Mishra, R., Pal, A., Mishra, N., Singh, P., & Chauhan, S. S. (2025). Unveiling the global rise of chatbot-assisted learning: A 2020–2025 bibliometric study. *Scientific Culture*, 11(4), 3042-3060. ISSN: 2229-7359.
- Haruna, M., Zulkefli, N., & Aziz, A. (2023). Examination anxiety among Malaysian undergraduates: Prevalence and demographic analysis. *Educational Psychology*, 43(3), 193–202.
- Hazell, C. M., Chapman, L., & Valeix, S. (2023). Prevalence of nonspecific anxiety in university students: A systematic review and meta-analysis. *Journal of Affective Disorders*, 320, 258–272.
- Hooda, M., & Saini, A. (2017). Academic anxiety. *Educational Quest: International Journal of Education and Applied Social Sciences*, 8(3), 807–810.
- Khalid, H., Iqbal, S., & Farooq, A. (2022). Anxiety and academic performance: Evidence from Pakistani university students. *Asian Education Studies*, 8(1), 34–42.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Lave, J. (2009). The practice of learning. In K. Illeris (Ed.), *Contemporary theories of learning* (pp. 200–208). Routledge.
- Lohman, D. F. (2025). Secondary education and adolescent development. *Journal of Educational Psychology*, 117(1), 1–15.
- Mezirow, J. (1996). Contemporary paradigms of learning. *Adult Education Quarterly*, 46(3), 158–172.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71.



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- Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest*, 9(3), 105–119.
- Rajput, D., Gupta, S., & Singh, V. (2026, May). Are digital resources meeting student needs? A study of e-resource satisfaction at CSJM University. *International Journal of Scientific Research Studies*, 3(5), 264-273
- Rani, B., & Acharya, S. (2023). Study of difference in learning styles of higher secondary level students of government and private schools of Jaipur district. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4393137>
- Rastogi S, Gupta S, Deepak D, Mishra BN, Gore R, Singh V. A Systematic Literature Review on Anxiety Among Undergraduate Students: Causes and Coping Strategies. *Annals of Neurosciences*. 2025;0(0). doi:10.1177/09727531251366078
- Rastogi, S., Gupta, S., Deepak, D., Mishra, B. N., Gore, R., & Singh, V. (2025). A systematic literature review on anxiety among undergraduate students: Causes and coping strategies. *Annals of Neurosciences*, 1–16.
- Säljö, R. (1979). Learning about learning. *Higher Education*, 8(4), 443–451.
- Sharma, S., & Verma, R. (2018). Learning styles and academic achievement in Indian secondary schools. *Indian Journal of Educational Research*, 45(2), 112–128.
- Singh, V., & Gupta, S. (2024). The emotional lives of living beings: Understanding human feelings. In *Feel to heal: The transformative power of emotions* (Vol. 1, pp. 20–34). Book River. ISBN: 978-9368847878.
- Tang, X., Chen, W., & Zhang, Y. (2022). Exam anxiety and general anxiety in Chinese undergraduates: A large-scale quantitative study. *Frontiers in Psychology*, 13, 874511.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Wang, L. (2025). School culture and learning preferences. *International Journal of Educational Research*, 120, 102–115.