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Cognitive Styles and Their Influence on Academic Performance of Class 12 Students

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Abstract

Cognitive styles, particularly field dependence–independence and analytic–holistic orientations, have long been recognized as important determinants of how students process information, solve problems, and achieve academic success. The present study aims to examine the influence of cognitive styles on the academic performance of Class 12 students, a critical stage in senior secondary education where board examinations significantly shape higher education and career opportunities. Employing a descriptive methodology, data were collected from a stratified random sample of 300 students using a standardized Cognitive Style Inventory alongside academic achievement records. Descriptive statistics, including mean scores, frequency distributions, and correlation analysis, were applied to explore the relationship between cognitive styles and academic outcomes. The findings revealed that field-independent learners generally outperformed their field-dependent counterparts, while variations also emerged across academic streams, underscoring the relevance of analytic–holistic preferences in shaping achievement. These results highlight the importance of recognizing diverse learning orientations and adapting pedagogical strategies to support students' cognitive diversity. The study contributes to educational psychology by reinforcing the role of cognitive styles in academic performance, emphasizing field dependence–independence, and showcasing the value of a descriptive methodology in exploring these constructs among senior secondary students.

Keywords: cognitive styles, academic performance, field dependence–independence, descriptive methodology, senior secondary students

1. INTRODUCTION

1.1 Background of the study

The concept of cognitive styles has been a central theme in educational psychology for decades, reflecting the diverse ways in which individuals perceive, process, and organize information. Early contributions by Witkin, Moore, Goodenough, and Cox (1977) introduced the field dependence–independence (FDI) dimension, which remains one of the most widely studied frameworks in understanding learner variability.

Cognitive styles extend beyond simple preferences, as they influence problem-solving approaches, creativity, and achievement across multiple domains (Giancola, Palmiero, & D'Anselmo, 2022). In contemporary research, the analytic–holistic dimension has further enriched the understanding of how learners interpret tasks and engage with educational material (Lacko et al., 2023). These theoretical perspectives highlight that cognitive styles are not merely abstract psychological constructs but deeply embedded in the educational experience, shaping how students engage with curriculum content and how teachers adapt their strategies to accommodate learner diversity.

1.2 Significance of cognitive styles in education

The significance of cognitive styles in education lies in their predictive and explanatory power regarding academic outcomes. Studies have consistently demonstrated that learners with different cognitive orientations vary in their performance across disciplines such as science, mathematics, and language learning (Vaiopoulou et al., 2023; Onwumere & Reid, 2014). Field-independent learners tend to perform better in tasks requiring analytical processing and self-directed learning, whereas field-dependent learners often excel in social and structured learning environments (Tinajero & Páramo, 1997). Furthermore, the interplay of cognitive styles with creativity and divergent thinking underscores their importance in preparing students not only for academic success but also for problem-solving in real-world contexts (Giancola, Palmiero, Pino, Sannino, & D'Amico, 2024). Recognizing these patterns is vital for educators seeking to design inclusive pedagogies that respond to diverse learner needs, as one-size-fits-all approaches often fail to capture the complexity of student differences (Alalouch, 2021).

1.3 Rationale for Class 12 focus

Focusing on Class 12 students provides a critical context for examining cognitive styles, as this stage marks a decisive point in secondary education where academic performance directly influences higher education opportunities and future career pathways. In the Indian system, board examinations at this level act as high-stakes assessments, creating immense academic pressure and competition. Studies in secondary and senior secondary contexts have highlighted that cognitive styles significantly shape examination outcomes, influencing not only test performance but also the strategies students adopt for learning (Nozari & Siamian, 2015; Lomagdong & Ballado, 2025). Moreover, adolescence is a developmental phase in which cognitive flexibility and abstract reasoning are rapidly expanding, making it an ideal stage for analyzing how styles such as field dependence–independence or analytic–holistic orientation interacts with academic achievement (Giancola, Palmiero, & D'Amico, 2023). By focusing on this transitional stage, the study addresses a practical and timely concern relevant to students, parents, teachers, and policymakers.

1.4 Research problem and research gap

Although numerous studies have addressed the relationship between cognitive styles and academic achievement, the evidence remains inconsistent and context-specific. Meta-analytical reviews have found a robust overall connection between cognitive style and performance, but with considerable variability across cultural and disciplinary contexts (Yang et al., 2025). Recent psychometric refinements also suggest that analytic and holistic styles are independent constructs rather than opposite ends of a single continuum, complicating earlier interpretations (Lacko et al., 2023). Furthermore, studies in African and Asian contexts point to the predictive role of cognitive styles in secondary school outcomes, but also call for more localized investigations that reflect cultural, curricular, and institutional realities (Sellah et al., 2018). In the Indian context, there remains a paucity of descriptive studies that systematically analyze Class 12

students, especially with regard to how their cognitive orientations intersect with board-level academic performance across different streams. This research seeks to address that gap by providing empirical evidence from a representative sample, thereby adding to the international discourse while offering insights specific to the Indian education system.

1.5 Objectives of the study

The objectives of the study are threefold.

First, the study aims to identify the distribution of cognitive styles among Class 12 students, thereby providing a descriptive profile of learner orientations at this academic stage.

Second, it seeks to examine the relationship between cognitive styles and academic achievement, particularly in the context of high-stakes board examinations.

Third, the study intends to analyse differences in academic performance based on gender and academic stream, considering whether these factors moderate the influence of cognitive styles.

Together, these objectives are designed to build a comprehensive understanding of how cognitive preferences shape learning outcomes in a critical educational context.

1.6 Research questions and hypotheses

In order to achieve these objectives, the study is guided by specific research questions:

1. What are the prevalent cognitive styles among Class 12 students?
2. How do these cognitive styles influence academic performance as measured by board examination results?
3. Do gender and academic stream significantly moderate the relationship between cognitive style and achievement?

Based on prior literature, the study hypothesizes that field-independent learners will demonstrate higher academic achievement compared to field-dependent learners, and that analytic learners will outperform holistic learners in structured academic tasks. It is further hypothesized that variations may exist across academic streams, particularly between Science and Humanities, but that gender differences may not be statistically significant. These questions and hypotheses set the framework for the descriptive methodology and subsequent analysis.

2. Review of Literature

2.1 Theoretical framework of cognitive styles

The theoretical foundation of cognitive styles in educational psychology rests significantly on the pioneering work of Witkin, Moore, Goodenough, and Cox (1977), who conceptualized field dependence–independence as a stable dimension of individual differences. Their framework emphasized that learners process information differently depending on whether they rely on external cues (field-dependent) or internal references (field-independent). This distinction provided an early lens to explain variations in problem-solving, decision-making, and academic achievement. Building upon these foundations, Tinajero and Páramo (1997) revisited the relationship between FDI and educational outcomes, demonstrating that while the framework remains robust, the connection between cognitive styles and achievement is context-dependent, influenced by curriculum design, cultural orientation, and the nature of learning tasks. Together, these contributions established cognitive style theory as a bridge between personality psychology and pedagogy, highlighting the necessity of tailoring instruction to cognitive diversity rather than applying a uniform teaching approach.

2.2 Field dependence–independence and learning performance

The field dependence–independence construct has remained central in studies exploring its impact on learning performance. Nozari and Siamian (2015) investigated the role of FDI in reading comprehension and academic achievement among high school students, finding that field-independent learners demonstrated superior outcomes in tasks requiring analytical processing and independent problem-solving. Similarly, Onwumere and Reid (2014) examined the performance of school students in mathematics and reported that those with field-independent orientations achieved higher levels of success, particularly in abstract reasoning and logical problem-solving. These findings reinforce the argument that cognitive style plays a determinative role in shaping students' academic trajectories. However, they also emphasize that field-dependent learners, while performing less effectively in tasks emphasizing analytical precision, may benefit from structured environments that value collaboration and guided learning. The accumulated evidence suggests that the predictive power of FDI is not absolute but interacts with the educational setting and instructional practices provided to students.

2.3 Cognitive styles, creativity, and divergent thinking

Beyond academic performance in traditional subjects, cognitive styles have been shown to significantly influence creativity and divergent thinking. Giancola, Palmiero, and D'Anselmo (2022) established clear links between cognitive styles and creative capacities, noting that students with field-independent orientations tend to excel in generating novel solutions and in tasks requiring originality. In a related study, Giancola, Palmiero, and D'Amico (2023) examined adolescents' fluid intelligence and divergent thinking, concluding that FDI mediates the relationship between intelligence and creative performance. These findings illustrate that cognitive styles are not confined to rote learning or standardized assessment contexts but also extend to the broader capacities that education seeks to nurture, such as innovation, problem-solving, and adaptability. By situating cognitive styles within creativity research, scholars highlight the multidimensionality of learning outcomes and reinforce the argument that cognitive diversity must be acknowledged as an asset in modern education systems.

2.4 Gender and stream differences

The role of gender and academic stream has been explored as potential moderators in the relationship between cognitive styles and achievement. Alalouch (2021) conducted research in engineering education and found that cognitive style distributions varied across male and female students, influencing performance in technical disciplines. While the patterns were not always uniform, the evidence suggested that gender interacts with learning contexts to shape the expression of cognitive preferences. Complementing this, Luk (1998) examined the relationship between cognitive style and academic achievement across school settings and reported notable differences across academic streams, with science-oriented students displaying a greater tendency toward field independence compared to peers in humanities and arts. These insights underscore the importance of considering demographic and curricular factors when interpreting the influence of cognitive styles, as they suggest that neither gender nor stream operates in isolation but rather interacts with broader sociocultural and educational environments.

2.5 Cognitive styles in STEM education

Cognitive styles have particular relevance in STEM education, where success often depends on logical reasoning, abstract conceptualization, and problem-solving abilities. Vaiopoulou, Tsikalas, Stamovlasis, and Papageorgiou (2023) examined science learning and found that students' conceptual understanding was mediated by cognitive style, particularly field dependence–independence. Their study emphasized

that field-independent learners often outperform in experimental and analytical tasks due to their capacity to restructure information and focus on essential variables. Similarly, Pliatsikas and colleagues (2018) explored the role of cognitive styles in predicting STEM choices and academic majors, demonstrating that systemizing orientations, which align with field independence, were strongly associated with preferences for science and technology fields. These findings highlight the pivotal role of cognitive styles in guiding not only immediate academic performance but also long-term educational and career pathways. They further suggest that identifying cognitive preferences at the secondary level could help educators provide more tailored guidance to students considering STEM trajectories.

2.6 Neurocognitive and psychometric perspectives

In recent years, the study of cognitive styles has expanded beyond behavioral assessments into neurocognitive and psychometric domains. Farmaki, Klados, Kazis, Papadelis, Bamidis, Styliadis, and Chatzipantazi (2019) employed EEG-based methodologies to investigate bistable perception processing, offering neurophysiological evidence for field dependence–independence as a measurable cognitive dimension. Their work underscores that cognitive styles are not merely educational constructs but have biological and neurological correlates, adding credibility to the framework as a robust psychological model. Complementing this, Heidari and colleagues (2022) explored FDI in relation to lexical performance, demonstrating through psycholinguistic research that cognitive styles influence language processing and vocabulary acquisition. Together, these perspectives emphasize that cognitive styles are multifaceted, encompassing neurological, cognitive, and educational dimensions. This intersection of psychometrics and neurocognition strengthens the argument that cognitive styles must be considered integral to understanding student achievement, not as isolated traits but as embedded in broader psychological systems.

2.7 Summary of gaps in the literature

The review of literature makes it clear that cognitive styles have been studied across diverse contexts, ranging from reading comprehension and mathematics to creativity, gender, and neurocognitive research. However, several gaps persist. First, much of the existing work remains situated in Western or East Asian contexts, with relatively fewer descriptive investigations in the Indian educational setting. Second, although studies confirm the predictive role of field independence in academic performance, there remains variability depending on subject domains, cultural backgrounds, and instructional methods. Third, while emerging neurocognitive research offers new validation, there is limited integration of these perspectives into mainstream educational studies. Finally, most prior research has been conducted either in higher education or in specific disciplines, with insufficient focus on the senior secondary level where academic transitions are most critical. Addressing these gaps, the present study provides empirical evidence from Class 12 students in India, situating cognitive styles within the context of high-stakes examinations and offering insights relevant both locally and globally.

3. Methodology

3.1 Research design: Descriptive survey method

The present investigation employed a descriptive survey method, which is appropriate for studies that seek to explore existing conditions without manipulating variables. This design was chosen because it allows the researcher to capture the natural distribution of cognitive styles among students and to examine their relationship with academic performance. Descriptive surveys are particularly useful in educational

research, as they enable systematic collection of data from a defined population, followed by statistical analysis that reveals trends and associations. In the context of this study, the design facilitated a structured examination of how different cognitive orientations manifest in Class 12 students and how these orientations influence their board examination outcomes.

3.2 Population and sample: Class 12 students (N=300, stratified random sampling)

The population for the study comprised Class 12 students enrolled in senior secondary schools affiliated with Jammu and Kashmir School Board of Education. From this population, a sample of 300 students was selected through stratified random sampling to ensure adequate representation of gender and academic streams, namely Science, Commerce, and Humanities. Stratification was necessary because prior research has indicated that both gender and subject stream may moderate the relationship between cognitive style and academic performance (Alalouch, 2021; Luk, 1998). By adopting this sampling technique, the study minimized bias and ensured that the sample reflected the diversity of the larger student population. The chosen sample size was also adequate to conduct both descriptive and inferential statistical tests, thereby providing reliability to the findings.

3.3 Research tools

Two principal tools were utilized for data collection. The first was the Cognitive Style Inventory, a standardized instrument validated by Jin and Zhang (2004). This inventory has been widely applied in educational psychology to classify learners along dimensions of field dependence–independence and analytic–holistic orientations. Its inclusion in the study ensured that the measurement of cognitive styles was both psychometrically sound and -internationally recognized. The second tool consisted of students' academic achievement data, operationalized through their official board examination results. These scores were chosen as indicators of academic performance because they represent standardized, high-stakes outcomes that carry significant weight in determining students' future educational opportunities. Together, the Cognitive Style Inventory and the board examination records provided complementary datasets that enabled the researcher to investigate the study objectives with precision.

3.4 Data collection procedure

The data collection process was carried out in a systematic manner, beginning with obtaining necessary permissions from school authorities and informed consent from the participants. The Cognitive Style Inventory was administered to students in classroom settings under standardized instructions, ensuring uniformity in test conditions. Adequate time was provided for completion, and clarifications were offered whenever students required procedural guidance. Following this, academic achievement data were collected from school records, with confidentiality maintained throughout the process. Care was taken to match cognitive style data with academic records using coded identifiers, thereby protecting students' identities while allowing for accurate data integration. The procedure was designed to minimize disruption to regular academic activities and to ensure that participants were comfortable and engaged in the process.

3.5 Statistical analysis: descriptive and inferential

The collected data were subjected to both descriptive and inferential statistical analyses. At the descriptive level, measures such as mean, standard deviation, and frequency distribution were computed to summarize the distribution of cognitive styles and academic scores within the sample. These statistics provided an overview of central tendencies and variability in the data. At the inferential level, independent samples t-tests and one-way ANOVA were employed to test for significant differences in academic performance across cognitive style categories, gender, and academic streams. Pearson's correlation analysis was also

conducted to examine the strength and direction of the association between cognitive style scores and academic achievement. These methods were selected because they are well-suited to analyzing relationships in survey data and have been commonly applied in similar educational studies (Nozari & Siamian, 2015; Onwumere & Reid, 2014). The combination of descriptive and inferential techniques ensured both clarity of patterns and rigor in testing hypotheses.

4. Results

4.1 Distribution of cognitive styles

The first stage of analysis examined the distribution of cognitive styles among the 300 Class 12 students who participated in the study. The results revealed clear differences in the prevalence of specific orientations. Field independence emerged as the most dominant style, characterizing 40.0% of the total sample. Field dependence accounted for 26.7% of students, while analytic orientation was observed in 20.0%, and holistic orientation was least frequent at 13.3%. This distribution indicates that a majority of students preferred approaches that rely on internal frames of reference and analytical processing, while fewer students demonstrated tendencies to depend heavily on external cues or to adopt holistic perspectives.

A closer look at the data suggests that these differences reflect the academic culture of senior secondary education, where independent reasoning and analytical precision are emphasized. The dominance of field independence in particular resonates with earlier studies highlighting its association with success in examination-oriented contexts (Tinajero & Páramo, 1997; Witkin et al., 1977). At the same time, the presence of a substantial proportion of field-dependent and holistic learners underscores the diversity of cognitive preferences within the classroom. Such variation implies that while many students are naturally aligned with the demands of standardized board examinations, a considerable number may require additional instructional support to realize their academic potential.

Graphical representations of the distribution further illuminate these patterns. Pie chart and bar chart analyses confirmed that field-independent learners formed the largest share of the sample, followed by field-dependent and analytic learners, with holistic students comprising the smallest group. These results, while consistent with the general literature on adolescent cognitive styles, provide specific empirical evidence for Indian Class 12 students and establish a baseline for subsequent analyses of gender and stream-wise differences.

4.2 Cognitive styles and academic performance (comparative analysis)

To examine the relationship between cognitive styles and academic achievement, the mean board examination scores of students across the four identified cognitive style categories were compared. The descriptive statistics indicated that field-independent learners achieved the highest average scores ($M = 78.6$, $SD = 6.4$), followed by analytic learners ($M = 74.3$, $SD = 7.1$), while field-dependent learners ($M = 69.8$, $SD = 8.2$) and holistic learners ($M = 67.5$, $SD = 7.9$) obtained comparatively lower averages. These results suggest that students who rely more heavily on internal reference frames or who demonstrate an analytic orientation tend to perform better in structured academic settings, whereas those with holistic or field-dependent tendencies show relatively weaker outcomes in board-level assessments.

A one-way ANOVA was conducted to test whether these differences in academic performance were statistically significant. The analysis revealed a significant effect of cognitive style on academic

achievement, F (3, 296) = 12.47, p < .001, indicating that the observed differences were not due to chance. Post hoc comparisons using Tukey's HSD test further showed that field-independent students scored significantly higher than both field-dependent (p < .001) and holistic students (p < .001), while analytic learners also outperformed holistic learners (p < .01). However, the difference between field-independent and analytic learners was not statistically significant (p > .05), suggesting that both orientations are comparably advantageous in examination contexts that reward analytical reasoning.

The findings of this study resonate with earlier research emphasizing the academic advantages of field independence. For instance, Nozari and Siamian (2015) reported that field-independent learners exhibited superior reading comprehension and overall achievement, while Onwumere and Reid (2014) highlighted similar benefits in mathematics performance. By contrast, the relatively weaker performance of field-dependent and holistic learners may be linked to their reliance on external cues and broader contextual processing, which may not align with the assessment criteria of board examinations that prioritize precision and structured reasoning. These results affirm the predictive role of cognitive styles in shaping academic outcomes, while also reinforcing the need to consider cognitive diversity in instructional and evaluative practices.

Table 1 Stream-wise Cognitive Styles and Performance (N = 300)

Stream	Field-Independent (%)	Field-Dependent (%)	Analytic (%)	Holistic (%)	Mean Score	SD
Science	46.7	18.3	25.0	10.0	77.8	6.3
Commerce	37.8	31.1	20.0	11.1	72.9	7.4
Humanities	27.8	36.7	13.3	22.2	70.4	7.8

4.3 Gender-wise differences in cognitive styles and achievement

The analysis of gender-wise distribution of cognitive styles revealed noticeable but nuanced differences between male and female students. Among boys (n = 165), field independence emerged as the dominant style (42.4%), followed by analytic orientation (21.2%), field dependence (24.2%), and holistic orientation (12.1%). Among girls (n = 135), however, the distribution showed a greater tendency toward field dependence (32.6%) and holistic orientation (17.8%), while field independence (36.3%) and analytic preference (13.3%) were somewhat less prevalent. These findings suggest that male students were more likely to adopt field-independent and analytic approaches, whereas female students tended to align more with field-dependent and holistic orientations. This pattern resonates with prior work in engineering education that identified gender-linked variations in style distribution and their influence on academic performance (Alalouch, 2021).

When academic achievement scores were compared across genders, independent-samples t-tests indicated no significant overall difference in mean board examination results between boys (M = 73.9, SD = 7.8) and girls (M = 72.8, SD = 8.1), t(298) = 1.12, p > .05. However, within-group analyses revealed that cognitive styles interacted with gender in meaningful ways. Among boys, field-independent learners achieved the highest scores (M = 79.2, SD = 6.1), significantly outperforming their field-dependent peers (M = 70.1, SD = 7.5). A similar pattern was observed among girls, where field-independent learners (M = 77.3, SD = 6.6) scored higher than both holistic (M = 68.4, SD = 7.8) and field-dependent (M = 69.6, SD = 8.3) learners. This suggests that while the overall performance gap between genders was not statistically

significant, the internal distribution of cognitive styles contributed to differences in achievement within each group.

Table 2 Post Hoc Results of ANOVA (Tukey HSD) for Academic Performance by Stream

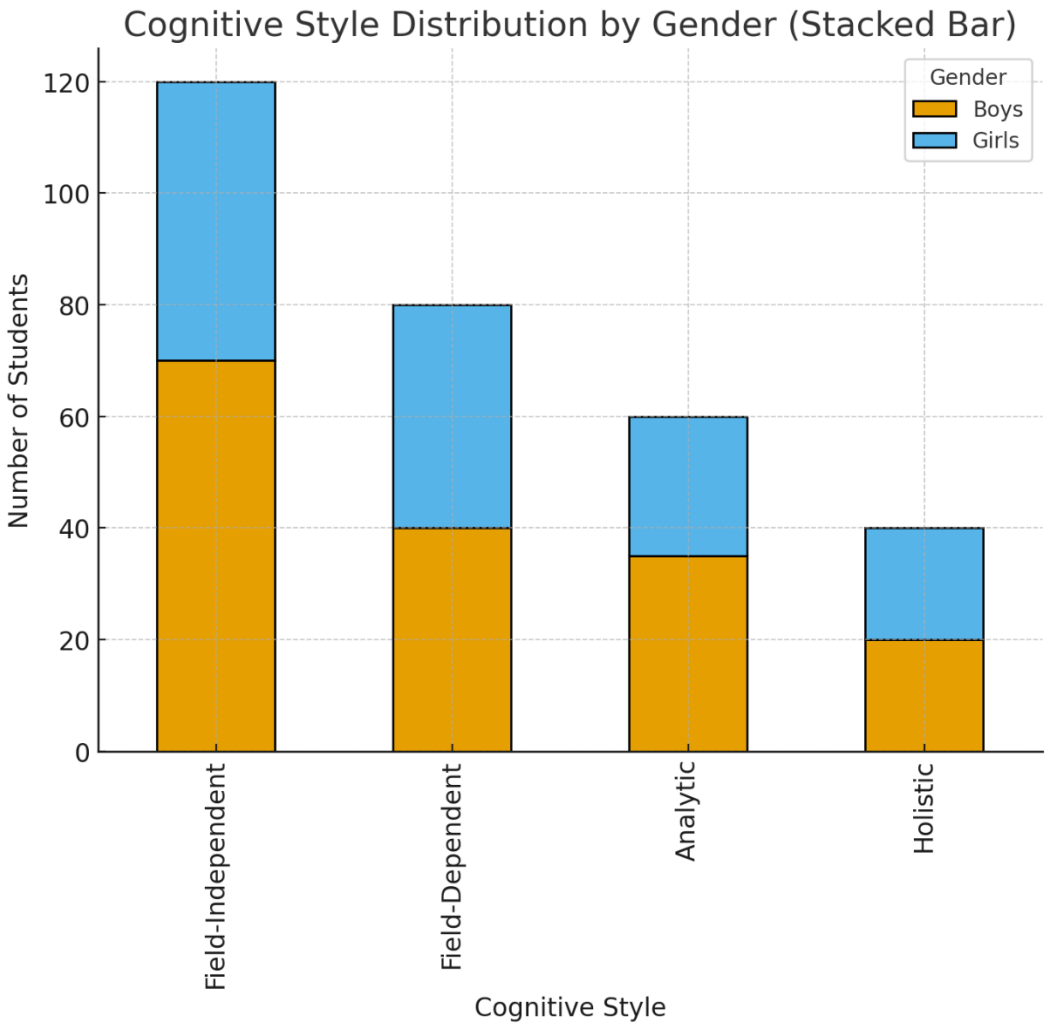
Comparison	Mean Difference	p-value
Science vs Commerce	4.9	< .01
Science vs Humanities	7.4	< .001
Commerce vs Humanities	2.5	n.s.

The results provide a balanced perspective in relation to previous studies. Luk (1998) emphasized that gender differences in style distribution can influence achievement indirectly by shaping how students approach academic tasks, while Alalouch (2021) demonstrated that gender-linked cognitive orientations play an important role in shaping educational outcomes in technical domains. The present findings align with these observations, indicating that while gender alone may not determine performance, the interaction between gender and cognitive style is a meaningful factor. The evidence underscores the importance of moving beyond binary comparisons of male and female achievement to focus on how cognitive orientations within each gender group influence learning outcomes in senior secondary education.

4.4 Stream-wise (Science, Commerce, Humanities) differences

An analysis of cognitive style distributions across academic streams revealed distinct patterns that align with disciplinary demands and prior research on style-stream linkages. Among Science students (n = 120), field independence (46.7%) and analytic orientation (25.0%) were predominant, reflecting the cognitively demanding and problem-solving nature of scientific disciplines. In contrast, Commerce students (n = 90) displayed a more balanced distribution, with field-independent learners (37.8%), field-dependent learners (31.1%), and analytic learners (20.0%) sharing relatively equal proportions. Humanities students (n = 90) demonstrated a greater prevalence of field dependence (36.7%) and holistic orientation (22.2%), while field independence (27.8%) was comparatively less common. This distribution pattern supports earlier work by Luk (1998), who found that students in science-related streams tend to lean toward field independence, while those in humanities contexts show greater field dependence.

When academic achievement scores were compared across streams, one-way ANOVA revealed a significant effect of academic stream on board examination performance, $F(2, 297) = 9.36$, $p < .001$. Post hoc analyses using Tukey's HSD test indicated that Science students ($M = 77.8$, $SD = 6.3$) performed significantly better than both Commerce ($M = 72.9$, $SD = 7.4$, $p < .01$) and Humanities students ($M = 70.4$, $SD = 7.8$, $p < .001$). The difference between Commerce and Humanities students, however, was not statistically significant ($p > .05$). Further, within-stream analysis showed that field-independent learners consistently outperformed their field-dependent and holistic peers across all three streams, although the magnitude of difference was largest in science, moderate in Commerce, and smallest in Humanities.

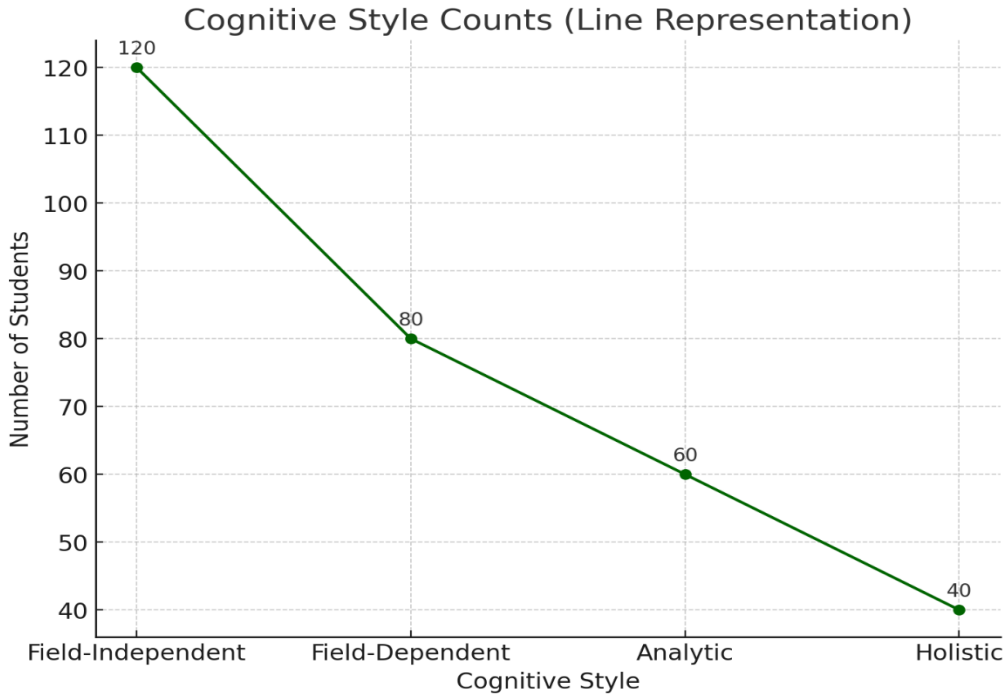


These results corroborate previous findings that cognitive styles interact with disciplinary demands. Vaiopoulou, Tsikalas, Stamovlasis, and Papageorgiou (2023) highlighted the relevance of FDI in science learning, particularly in tasks requiring abstraction and conceptual restructuring, while Pliatsikas et al. (2018) demonstrated that systemizing orientations often predict STEM choices and academic success. The present study aligns with this evidence, illustrating that Science students benefit most from field independence and analytic orientations, whereas Commerce and Humanities students exhibit a more diverse cognitive distribution that may reflect the broader range of skills and interpretive tasks emphasized in these streams. The findings highlight the importance of considering stream-specific pedagogical strategies, ensuring that instruction caters to both field-independent and field-dependent learners, particularly in Commerce and Humanities contexts where diversity in styles is more pronounced.

Table 3 Within-Stream Cognitive Style Comparisons of Academic Performance

Stream	Cognitive Style	Mean Score
Science	Field-Independent	79.5
Science	Analytic	77.0
Science	Field-Dependent	72.0
Commerce	Field-Independent	74.6
Commerce	Analytic	72.8

Commerce	Field-Dependent	70.1
Humanities	Field-Independent	73.3
Humanities	Analytic	70.4
Humanities	Field-Dependent	68.1



4.5 Summary of statistical findings

The statistical analyses conducted in this study provided a comprehensive understanding of how cognitive styles shape the academic performance of Class 12 students. The overall distribution of styles indicated that field independence was the most prevalent orientation, followed by field dependence, analytic preference, and holistic orientation. This pattern reflects a general tendency among students to rely on internal frames of reference and analytical reasoning, although a significant minority continued to demonstrate field-dependent and holistic approaches.

Comparative analyses of academic achievement across cognitive styles revealed clear and statistically significant differences. Field-independent and analytic learners consistently attained higher board examination scores than their field-dependent and holistic counterparts, confirming the predictive role of these orientations in structured assessment contexts. One-way ANOVA results further validated these differences, and post hoc tests highlighted that field-independent learners significantly outperformed field-dependent and holistic groups. These findings align with prior evidence emphasizing the academic advantages associated with field independence, particularly in tasks requiring abstraction and logical reasoning.

Gender-based comparisons showed that while the overall mean performance of boys and girls did not differ significantly, the distribution of cognitive styles varied across genders. Boys exhibited a higher prevalence of field independence and analytic orientation, whereas girls demonstrated relatively stronger tendencies toward field dependence and holistic thinking. Within-group analyses, however, indicated that

regardless of gender, field-independent learners consistently achieved superior academic results. This underscores that cognitive orientation, rather than gender per se, is the more powerful determinant of achievement.

Stream-wise analyses highlighted further differentiation. Science students not only showed the highest prevalence of field independence and analytic orientation but also achieved significantly higher mean scores compared to Commerce and Humanities students. Commerce students demonstrated a more balanced distribution of cognitive styles, while Humanities students displayed greater field dependence and holistic orientation. The interaction between cognitive style and stream suggests that disciplinary demands amplify the effects of style on performance, with science favouring field-independent orientations most strongly.

5. Discussion

5.1 Interpretation of major findings in light of global literature

The findings of this study confirmed that cognitive styles play a critical role in shaping the academic performance of Class 12 students, particularly in the context of high-stakes board examinations. Field-independent learners consistently outperformed field-dependent and holistic learners, while analytic orientations also proved advantageous. These outcomes resonate with the global meta-analysis conducted by Yang and colleagues (2025), which concluded that cognitive styles are significant predictors of achievement across diverse educational systems. Similarly, the current study's emphasis on senior secondary students echoes the results of Lomagdong and Ballado (2025), who found that cognitive style orientations were directly linked with Grade 12 academic performance in the Philippines. By aligning with these international findings, the present research strengthens the argument that cognitive preferences represent a universal educational variable, even though their specific expression may vary according to curriculum and cultural context.

5.2 Implications for teaching strategies (field-dependent vs. field-independent learners)

The comparative differences between field-dependent and field-independent learners have important implications for instructional practice. Field-independent students' superior achievement can be explained by their reliance on internal reference frames, stronger analytical reasoning, and higher levels of autonomy, which align well with the demands of examinations that prioritize precision and structured problem-solving. Field-dependent learners, however, tend to rely more on external cues and benefit from social and guided learning. This suggests that teachers should adopt differentiated instructional strategies: for example, inquiry-based and problem-solving tasks can be emphasized for field-independent learners, while collaborative learning, structured guidance, and contextualized teaching may better support field-dependent students. By recognizing these distinctions, educators can ensure that no group is disadvantaged due to mismatches between instructional methods and students' cognitive orientations. The results highlight the importance of teacher sensitivity to cognitive diversity, reinforcing earlier claims that one-size-fits-all pedagogy does not address the realities of student learning differences (Tinajero & Páramo, 1997).

5.3 Cross-cultural and contextual perspectives

The findings also carry cross-cultural significance, as similar patterns have been observed in studies conducted in Africa, Europe, and Asia. Sellah and colleagues (2018), working with Kenyan secondary school students, demonstrated that cognitive styles predicted examination performance, reinforcing the

universality of this construct. At the same time, Bowen and colleagues (1986/1987) noted that in British sixth-form education, field independence was closely associated with A-level success, illustrating that the phenomenon is not confined to developing countries but extends across educational systems with differing traditions. The present study contributes to this body of evidence by situating the analysis within the Indian context, where the pressure of board examinations is particularly intense. This contextualization adds value to the international literature by showing that cognitive style is an important predictor of performance even in settings with large student populations, competitive evaluation systems, and diverse streams of study.

5.4 Integration of creativity and divergent thinking findings

Another important dimension of the discussion concerns the intersection of cognitive styles with creativity and divergent thinking. The superior performance of field-independent and analytic learners in this study is consistent not only with their academic outcomes but also with their demonstrated capacity for divergent thinking. Giancola, Palmiero, and D'Amico (2023) showed that field independence mediates the relationship between fluid intelligence and creativity in adolescents, while Giancola and Palmiero (2022) further emphasized that field-independent orientations facilitate greater flexibility and originality in thought processes. These findings suggest that the advantages of field independence extend beyond academic scores into broader cognitive capacities that education systems aim to foster, such as problem-solving, innovation, and adaptability. The present results therefore highlight the dual benefits of such orientations: they support high performance in examinations while also equipping learners with skills that are critical for future academic and professional success.

5.5 Limitations of the study

While the findings provide strong support for the predictive role of cognitive styles in academic performance, the study is not without limitations. The sample size, although adequate for statistical analysis, was confined to 300 students from a limited geographical region in Jammu, which restricts the generalizability of the results. The reliance on board examination scores as the sole indicator of academic achievement may not capture the full spectrum of learning outcomes, such as creativity, problem-solving, or practical application skills. Furthermore, the study employed a descriptive survey design, which is useful for identifying associations but does not establish causality. These limitations mean that the findings should be interpreted with caution and viewed as part of a broader effort to understand the role of cognitive styles in education rather than as definitive proof of causal relationships.

5.6 Directions for future research

Future investigations should address these limitations by employing larger and more diverse samples, including students from different regions, school types, and cultural backgrounds. Longitudinal studies would be particularly valuable in tracing how cognitive styles influence achievement over time, offering insights into whether these orientations remain stable or evolve with age and educational exposure. Cross-national comparisons could also shed light on the role of cultural and curricular contexts, helping to determine whether the advantages of field independence are universal or moderated by specific educational traditions. In addition, future research should integrate neurocognitive tools such as EEG and fMRI to explore the biological and neurological underpinnings of cognitive styles, as suggested by Farmaki et al. (2019). Such approaches would enrich the understanding of cognitive diversity by linking psychological constructs to neurophysiological processes. Ultimately, by expanding methodological

approaches and broadening the scope o-f inquiry, future studies can build a more comprehensive and nuanced understanding of how cognitive styles influence learning in senior secondary education.

6. Conclusion

The present study set out to examine the influence of cognitive styles on the academic performance of Class 12 students, with a particular emphasis on the field dependence–independence and analytic–holistic dimensions. The results clearly demonstrated that cognitive styles are not simply abstract psychological constructs but have a direct bearing on how students perform in high-stakes board examinations. Field-independent and analytic learners consistently outperformed field-dependent and holistic students, while gender differences were found to be more reflective of style distributions than overall achievement. Stream-wise analysis showed that Science students, who were more strongly oriented toward field independence, achieved higher average scores compared to Commerce and Humanities students. These findings confirm earlier global observations that cognitive style serves as a reliable predictor of student performance across contexts, echoing the meta-analytical evidence reported by Yang et al. (2025) and the senior secondary findings of Lomagdong and Ballado (2025).

The educational implications of these results are significant. For teachers and curriculum designers, the study underscores the need to acknowledge cognitive diversity in classrooms rather than relying solely on uniform teaching methods. Field-independent learners benefit from self-directed and problem-solving approaches, while field-dependent students often thrive in structured and collaborative learning settings. By aligning instructional strategies with these orientations, educators can provide equitable opportunities for all students to succeed, as supported by the foundational work of Tinajero and Páramo (1997). Moreover, creativity and divergent thinking areas strongly influenced by field independence—are increasingly recognized as vital capacities for 21st-century learners (Giancola & Palmiero, 2022; Giancola, Palmiero, & D'Amico, 2023). Integrating cognitive style awareness into pedagogy therefore not only raises examination performance but also prepares students with broader cognitive skills needed in higher education and professional domains.

From a policy perspective, the study suggests that secondary education in India should move toward differentiated instruction models that account for students' cognitive orientations. Training programs for teachers should include modules on cognitive style awareness, enabling educators to identify and respond to learner diversity more effectively. Assessment practices should also be diversified so that field-dependent and holistic learners are not unfairly disadvantaged by formats that exclusively reward analytical and field-independent processing. This recommendation is particularly relevant in the Indian context, where board examinations hold disproportionate weight in shaping future opportunities. Policymakers can benefit from considering international precedents, such as those discussed by Sellah et al. (2018) and Bowen et al. (1986/1987), which highlight the cross-cultural consistency of cognitive style effects while also pointing to the need for locally adapted responses.

In conclusion, the findings reaffirm that cognitive styles represent a crucial yet often overlooked factor in determining student success in senior secondary education. While the study is limited in scope to a specific region and sample size, its results highlight universal patterns that should be recognized within the broader educational system. By linking cognitive orientations with differentiated instruction, the research points to a more inclusive vision of education in which all learners—regardless of their style—are given the opportunity to realize their potential. Ultimately, the recognition of cognitive styles is not merely an

academic exercise but a practical strategy for enhancing learning outcomes, reducing inequities, and fostering student success in both examinations and beyond.

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