A Triadic Approach to Learning

The Confluence of Study Habits, Learning Styles and Academic Performance on the Educational Landscape

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***Abstract*— Study habits and learning styles are pivotal variables influencing academic performance, particularly when pedagogical strategies are aligned with individual learner preferences. This study investigates the relationship between Study Habits and Academic Performance, with Learning Style Preference considered as a moderating factor. The research was conducted among a sample of 776 secondary school students from a private-aided English medium school in Mumbai. Employing Analysis of Covariance (ANCOVA), the study examined the degree of covariance between Study Habits and Academic Performance across different Learning Style groups. Results indicated a significant and positive covariation, suggesting that academic outcomes improve notably when students' learning styles, particularly visual, auditory, and kinesthetic modalities are effectively catered to in both instructional and self-regulated learning contexts. The findings contribute to the growing body of evidence supporting differentiated instructional approaches. This study offers critical educational implications for curriculum designers, school leaders, and educators aiming to enhance academic achievement through learner-responsive pedagogical practices.**

***Index Terms*—Study Habits, Academic Performance, Learning Styles**

I. INTRODUCTION

The pursuit of academic excellence necessitates a nuanced understanding of how individual differences in learning influence student performance. Among the most significant of these differences are students' Learning Styles which are distinct preferences for acquiring and processing information and their Study Habits, which reflect the behavioral strategies they employ to engage with academic content. A mismatch between these two elements can hinder effective learning and reduce academic outcomes. Conversely, when study habits are aligned with learners' cognitive and perceptual preferences, students are more likely to engage deeply, retain information effectively, and perform better academically.

The National Education Policy (NEP) 2020 has emphasized the imperative of differentiated instruction, advocating for pedagogical reforms that respond to the diverse abilities, interests, and learning styles of students. By promoting flexible teaching strategies and learner-centered environments, the NEP calls for a paradigm shift from standardized instruction to inclusive, adaptive learning experiences. Aligning Study Habits with Learning Styles, therefore, is not merely a pedagogical choice but a systemic necessity. Such an approach holds the potential to optimize Academic Performance and foster a more responsive and equitable educational ecosystem that empowers every learner to succeed.

The present study seeks to establish a statistically significant relationship between the three critical variables i.e. Learning Style Preference, Study Habits, and Academic Performance, with the aim of contributing to a deeper understanding of how their interplay can optimize learning outcomes and support the holistic development of learners within the educational continuum.

II. REVIEW OF LITERATURE

Early research by Pandey and Pal (2023) examined 200 secondary school students in Delhi, finding a significant positive correlation between learning styles (including perceptual and environmental preferences) and study habits, which together were linked to academic success. Similarly, Akuezuilo and Egenti (2024) applied regression analysis to a larger sample of 825 Nigerian secondary students and reported that both study habits and learning styles were low but positively predictive of English language achievement. Magulod's (2021) study of Filipino vocational students identified a significant positive relationship between study habits (especially time management and writing skills) and academic performance. It also demonstrated that learning styles (visual, group, kinesthetic) were significantly connected to both habits and outcomes. Bentil (2024) explored Ghanaian junior high populations and found that learning styles reinforced, rather than moderated, the strong positive effect of study habits on academic outcomes; visual, auditory, and kinesthetic styles each contributed uniquely to performance.

In contrast, Cabrera and Torres (2021) surveyed 102 Philippine college students using digital-textbook analytics and found no direct link between learning style or habits and grades. However, they noted better performance among reflective and visual learners through backtracking behaviors in digital textbooks. A meta-analytic review of active-learning strategies in STEM higher-education (e.g. PNAS studies) demonstrated that interactive instructional approaches consistently produced gains of 0.47 SD and reduced failure rates compared to traditional lectures, but did not directly address individual learning styles, instead showing that active engagement benefited all learners (Freeman etal., 2014). A quasi-experimental investigation by Taş and Minaz (2024) involving 62 fourth-grade primary students assessed the impact of differentiated instruction based on VARK learning styles. The experimental group received style-aligned lessons in social studies, while the control group did not. Results showed significantly higher academic achievement and learning retention in the experimental group, indicating that tailoring instruction to learning style enhanced both study habits and academic outcomes. Porta and Jha (2025) in their Pomodoro-style

focused study highlighted, elimination of distractions, and refreshment breaks, noting that students who structured their sessions in alignment with their learning style preferences (e.g., visual mapping, flashcards) showed improved retention and self-regulation.

These studies collectively supported the notion that Study Habits are consistently linked to academic outcomes, and that Learning Styles often reinforce, even if they do not independently predict, performance. Learning styles probably inform the design of study behaviors, and effective study behaviors consequently drive academic success. This body of work underscores the value of investigating the interplay of Learning Style Preference, Study Habits, and Academic Performance -an endeavor central to the present study's aim of deriving a predictive equation among the three variables.

III. OBJECTIVES OF THE STUDY

- To identify the Learning Style Preference of Secondary School Students
- To assess the Study Habits of Secondary School Students
- To categorise Secondary School students on the basis of their Academic Performance
- To investigate the interaction effect between Study Habits and Learning Style Preference on Academic Performance of Secondary School students

IV. HYPOTHESIS

To address the research objective, the following Null Hypothesis was tested:

- There is no significant interaction between Study Habits and Learning Style Preference on Academic Performance among Secondary School students.

V. RESEARCH METHODOLOGY

5.1 Design of the Study

The present study adopted a quantitative, non-experimental, correlational research design employing Analysis of Covariance (ANCOVA) to examine the relationship between Study Habits and Academic Performance of Secondary School students, with Learning Style Preference considered as a moderating variable. The design was chosen to statistically control for the influence of Study Habits while assessing whether the relationship between Study Habits and academic achievement varied across different learning style groups (visual, auditory, kinesthetic and multimodal).

5.2 Sample

The study utilized a sample of 776 Secondary School students drawn from a private-aided institution in Mumbai affiliated with the Maharashtra State Secondary School Certificate (S.S.C.) Board, selected to represent a typical urban student population within this educational framework. The Convenience Sampling Technique was used for selecting the pool of participants.

5.3 Materials used/ tools of the study

For the purpose of data collection, the following customized instruments were developed:

- **A Learning Style Inventory:** This consisted of 30 items designed to ascertain students' preferred learning styles. Each item described an academic scenario, requiring respondents to indicate their preferred approach to learning in that context. The response options reflected four distinct learning style modalities—visual, auditory, kinesthetic, and multimodal—allowing students to select the option that best aligned with their natural learning preference.
- **Students' Study Habits Scale**: A 3 point Likert scale comprising of 21 items related to students' behaviours and practices related to their learning was constructed.
- **Academic Achievement Test**: The total marks obtained by students in the First Semester Examination served as the Academic Performance score.

5.4 Theoretical framework

Academic Performance was the Dependent Variable, Learning Style Preference was the Independent Variable/grouping factor and Study Habits was the covariate. The following operational definitions have been established to ensure consistency in the interpretation of key variables throughout the study:

1. **Learning Style Preference:** A learner's distinctive way of receiving, organizing, and internalizing information, so as to promote better comprehension along with meaningful and effective learning.
2. **Study Habits:** Effective actions that students perform regularly and habitually in order to successfully accomplish the task of learning.
3. **Academic Performance:** The extent to which a student has achieved educational objectives, as evidenced by their Grade Point Averages in the First Semester Examination at school.
4. **Secondary School:** The academic setting comprising Grades V-X in which students are enrolled at the post-primary level as per the structure outlined by the Maharashtra State Secondary School Certificate (S.S.C.) Board.

5.5 Statistical Analysis

The data were subjected to the following descriptive and inferential statistical analyses:

5.5.1Descriptive Statistics

Descriptive analysis comprised a Percentage-wise summary of the Study Habits and Academic Performance of the Total Sample of students categorized on the basis of their Learning Style Preferences.

5.5.2 Inferential Statistics

ANCOVA (Analysis of Covariance) was employed to investigate the relationship between Study Habits, Academic Performance, and Learning Style Preference. This involved testing whether the adjusted means of Academic Performance differed significantly between the Learning Style groups after accounting for the linear influence of Study Habits. The F-statistic and corresponding P-value generated by the ANCOVA model were used to determine the significance of both the covariate (Study Habits) and the group effect (Learning Style Preference), thus allowing the researcher to infer whether observed differences in academic outcomes were attributable to Learning Style Preference independently of Study Habits. The difference was considered statistically significant when P value was less than 0.05, and highly significant when P-value was less than 0.01and 0.0001.

VI. RESULTS AND DISCUSSION

6.1 Results of Descriptive Statistics of Study Variables

Table 1 shows a Percentage-wise summary of the Study Habits and Academic Performance of the Total Sample of students categorized on the basis of their Learning Style Preferences.

Table 1 Percentage-wise summary of the Variables of the Study

Learning Style Preference	Academic Performance (% of learners)			Study Habits (% of learners)		
	High	***Medium***	***Low***	***Excellent***	***Average***	***Poor***
Auditory	24.71%	31.53%	1.29%	45.05%	12.48%	NIL
Visual	3.35%	6.69%	0.77%	7.08%	3.73%	NIL
Kinesthetic	3.6%	8.11%	0.64%	8.75%	3.6%	NIL
Multimodal	6.82%	11.71%	0.78%	13.13%	6.18%	NIL

The descriptive analysis summarised in Table 1 reveals notable variations in Academic Performance and Study Habits across the four Learning Styles i.e.Auditory, Visual, Kinesthetic, and Multimodal. Auditory learners emerged as the most dominant group, with the highest representation in both high Academic Performance (24.71%) and excellent Study Habits (45.05%), and virtually no presence in low performance (1.29%) or poor Study Habits (0%). This trend suggests that auditory learners are particularly well-suited to conventional classroom environments, which heavily rely on spoken instruction, lectures, and verbal interaction. Their strong performance may be attributed to their ability to process and retain auditory information effectively. As Pashler et al. (2009) explain, while the learning styles hypothesis is debated, auditory learners may thrive in environments where verbal input is central to the teaching process.

In contrast, Visual learners demonstrated comparatively modest outcomes, with medium Academic Performance (6.69%) being the highest, followed by high performance (3.35%) and excellent Study Habits (7.08%). Their performance appears to reflect a partial alignment with the instructional context, which may not be sufficiently enriched with visual aids such as diagrams, charts, or mind maps. Research by Fleming and Baume (2006) advocates for the VARK model, suggesting that instruction aligned with visual learners' preferences—using images, spatial understanding, and color cues, can enhance learning, which may explain the only moderate success observed here.

Kinesthetic learners displayed slightly stronger outcomes than visual learners in some areas, particularly in medium performance (8.11%) and excellent Study Habits (8.75%), with fewer learners achieving high academic levels (3.6%). This may be due to a mismatch between their preference for experiential, hands-on learning and the typical theoretical or abstract nature of classroom instruction. As Lujan and DiCarlo (2006) note, kinesthetic learners often benefit from movement, physical engagement, and practice-based learning, which are underutilized in many educational settings.

Multimodal learners showed a balanced and promising distribution, with 11.71% in medium Academic Performance and 13.13% in excellent Study Habits, along with a complete absence from the poor categories. While they do not match auditory learners in terms of top-level achievement, their performance suggests a stable and adaptable learning profile. Their ability to switch between auditory, visual, and kinesthetic modes may enhance their understanding and retention across varied teaching methods. Vasileva-Stojanovska et al. (2015) support this research finding, highlighting that multimodal learners are more flexible and resilient in diverse academic environments. Similarly, Dobson (2010) found that students using more than one learning mode tended to achieve better outcomes in demanding academic settings.

All-in-all it follows that, Auditory learners showed the highest performance and most disciplined study habits, possibly due to alignment with traditional teaching methods. Multimodal learners also exhibited strong, consistent outcomes likely tied to their flexible approach to information processing. In contrast, Visual and Kinesthetic learners demonstrated more moderate performance, potentially indicating that their learning needs are not fully met in the current instructional environment. This could be the existing reality in the State Board school setting where the present research was carried out, wherein due to a large number of students in classrooms as well as due to a limited time available to teachers to complete their syllabus, they probably seldom resorted to employing visual aids to enhance their teaching-learning activities or integrating activity-based learning into their classrooms.

These findings emphasize the importance of differentiated instruction to cater to diverse learner profiles and maximize academic outcomes.

Figure 1 provides a Graphical Representation of the Percentage-wise Summary of the Study Habits and Academic Performance of the Total Sample of students categorized on the basis of their Learning Style Preferences.

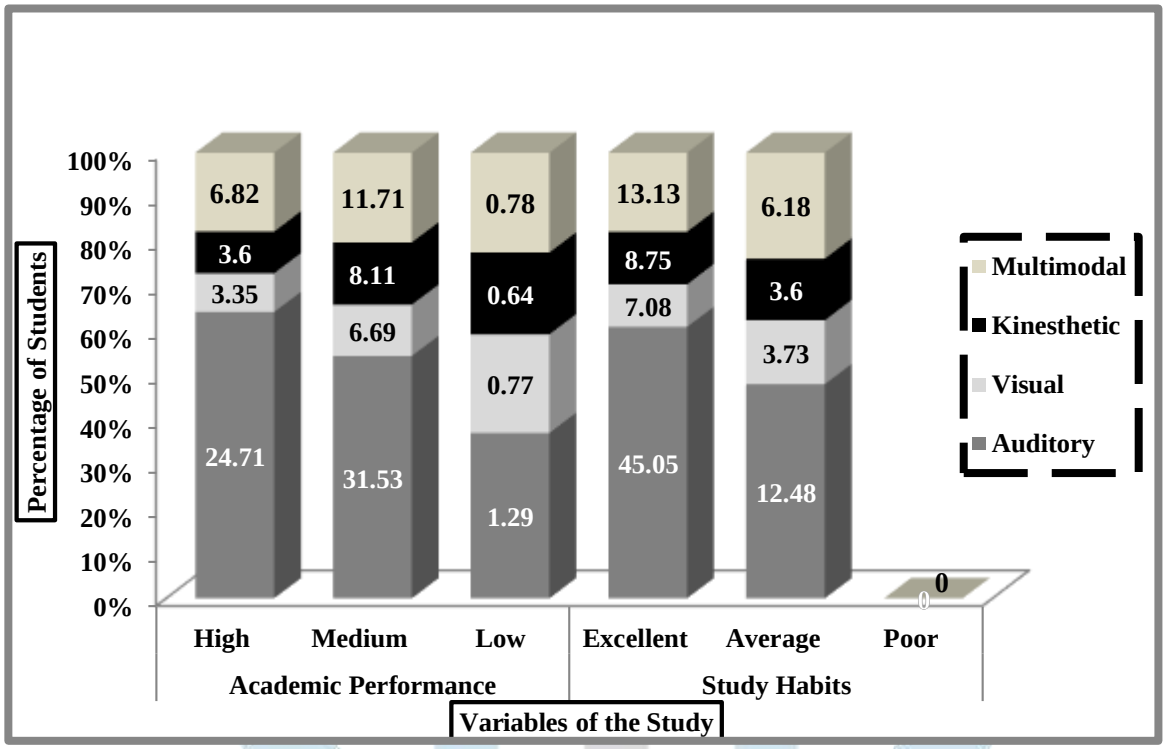

Figure1 Graphical Representation of the Percentage-wise Summary of the Variables of the Study

6.2 Results of Inferential Statistics of Study Variables

Testing the Null Hypothesis

The Null Hypothesis states that there is no significant interaction between Study Habits and Learning Style Preference on Academic Performance among Secondary School students. Table 2 presents the ANCOVA Summary. Academic Performance is the dependent variable, Learning Style Preference is the independent variable (grouping factor), and total Study Habits score is the covariate.

Table 2 Analysis of Covariance Summary

Source of Variation	SS (Sum of Squares)	df (Degrees of Freedom)	MS (Mean Square)	F	p-value
Learning Style	97336.07	3	32445.36	4.12	0.007
Study Habits (Covariate)	265116.23	1	265116.23	33.67	< .001
Error	6078436.80	772	7873.62	–	–
Total	6440889.10	776	–	–	–

Table 3 provides the Adjusted Means of Academic Performance across Learning Style Preferences.

Table 3 Adjusted Means

Learning Style	Adjusted Mean Score
Auditory	379.47
Kinesthetic	354.19
Multimodal	369.72
Visual	349.46

Table 4 shows the Post-hoc Comparisons (Tukey's HSD Test) for Adjusted Means.

Table 4 Post-hoc Comparisons (Tukey's HSD Test) for Adjusted Means

Comparison	Mean Difference	95% Confidence Interval	p-value	Significant
Kinesthetic v/s Auditory	-25.28	[-50.96, 0.40]	0.0556	No
Multimodal v/s Auditory	-9.76	[-31.30, 11.78]	0.6483	No
Visual v/s Auditory	-30.01	[-57.16, -2.86]	0.0235	Yes
Multimodal v/s Kinesthetic	15.52	[-14.32, 45.36]	0.5382	No
Visual v/s Kinesthetic	-4.73	[-38.84, 29.38]	0.9844	No
Visual v/s Multimodal	-20.25	[-51.37, 10.86]	0.3371	No

Table 5 summarises the Covariate Information and Effect Size.

Table 5 Covariate Information and Effect Size

Metric	Value
Regression Coefficient (Study Habits)	3.44
Correlation with Academic Performance	0.22
Partial Eta Squared (Learning Style)	0.0158 (small)

The small effect size observed in Table 5 suggests that while statistically significant, the differences may have limited practical significance.

Interpretation

Tables 2, 3, 4 and 5 imply that there is a statistically significant effect of the factor (Learning Style Preference) on the dependent variable after controlling for the covariate (0.007). The covariate (Study Habits Score) has a significant relationship with the dependent variable Academic Performance (< .001). The treatment explains 1.6% of the variance in the dependent variable, after accounting for the covariate. The covariate shows a moderate correlation (r = 0.2166) with the dependent variable. Group Auditory shows the highest adjusted mean (379.47), followed by Group Multimodal (369.72), followed by Group Kinesthetic (354.19) and Group Visual the lowest (349.46).

Discussion

The present study employed an Analysis of Covariance (ANCOVA) to examine the influence of students' Learning Style Preference on Academic Performance, controlling for the effect of Study Habits. The results revealed that both the independent variable (Learning Style) and the covariate (total Study Habits score) had statistically significant effects on Academic Performance, although with differing magnitudes of practical significance.

The ANCOVA results highlighted that Study Habits significantly predicted Academic Performance, with a substantial F-value ($F(1, 772) = 33.67$, $p < .001$) and a regression coefficient of 3.4382. Although the correlation between Study Habits and Academic Performance was modest ($r = .2166$), it was robust enough to exert a consistent influence across Learning Styles. This finding affirms a large body of literature positioning Study Habits as a core determinant of academic success. Credé and Kuncel (2008), in their meta-analysis of over 160 studies, concluded that study habits were more predictive of academic performance than standardized test scores or IQ. Furthermore, Robbins et al. (2004) emphasized that behavioral and motivational factors, including effective study strategies, self-discipline, and time management, significantly mediate learning outcomes, even when controlling for cognitive ability. Therefore, the significance of the covariate here substantiates the argument that academic interventions should focus not only on what is taught but also on how students regulate and manage their own learning processes.

The primary independent variable, Learning Style, also had a statistically significant influence on Academic Performance ($F(3, 772) = 4.12$, $p = .007$), though the effect size was small (partial $\eta^2 = .016$). The adjusted means indicate that Auditory learners ($M = 379.47$) outperformed all other groups, followed by Multimodal ($M = 369.72$), Kinesthetic ($M = 354.19$), and Visual learners ($M = 349.46$). The pairwise comparison between auditory and visual learners reached statistical significance ($p = .0235$), suggesting a meaningful difference in learning outcomes attributable to learning preference, even after accounting for study behavior. These results echo prior findings that teaching methods more aligned with auditory input tend to yield higher student performance. This may not necessarily validate the "learning styles hypothesis" in the strongest form (i.e., instruction should always match style), but it suggests that environments heavily reliant on verbal instruction, lectures, and discussions may naturally favor auditory learners. Riding and Rayner (2001) observed that auditory learners tend to excel in traditional academic settings where verbal reasoning and lecture-based formats dominate. Likewise, Dobson (2010) found that auditory learners in a structured Physiology course consistently achieved higher grades, which was attributed to the alignment between teaching methods and auditory preferences.

Multimodal learners, who performed second-best in the study, benefited from the ability to process information through various channels (visual, auditory, reading/writing, and kinesthetic). Their adaptability may be advantageous in classrooms employing mixed or eclectic pedagogies. Lujan and DiCarlo (2006) found that most medical students identified themselves as multimodal, preferring a combination of styles to grasp complex material. Similarly, Ojeh et al. (2017) reported that students using multiple learning modalities were more engaged and better able to adjust to course demands across different disciplines. As Fleming and Baume (2006) argue, learners exposed to multiple modes of instruction are more likely to find at least one mode that resonates,

improving engagement and academic outcomes. Their ability to learn through multiple channels probably makes them more adaptable to a variety of instructional methods, which is beneficial in diverse educational settings. Vasileva-Stojanovska et al. (2015) noted that multimodal learners can adjust more effectively to different pedagogical styles, potentially reducing the negative impact of mismatched teaching-learning environments. However, the pairwise comparisons did not find statistically significant differences between multimodal learners and other groups, suggesting a more stable but not superior performance.

The relatively lower scores of kinesthetic and visual learners may reflect a systemic underrepresentation of tactile and visually enriched instruction in the current educational framework. Kinesthetic learners often benefit from hands-on learning, physical manipulation, and movement-based activities-elements that are rarely emphasized in traditional didactic formats. Dunn and Dunn (2003) emphasized that students with strong kinesthetic preferences often disengage when confined to passive listening or rote memorization tasks. Similarly, visual learners may underperform if instructional material lacks visual aids such as charts, mind maps, and spatial organizers. Miller (2001) found that visual learners showed enhanced performance when lessons incorporated diagrams, videos, or visual analogies, yet such resources are inconsistently used in many classrooms. These findings suggest a gap between learner needs and instructional delivery, and support calls for more differentiated, multimodal teaching practices (Vasileva-Stojanovska et al., 2015).The underperformance of these groups may be attributed to an instructional mismatch between curricula and assessments which often favor auditory and reading/writing learning modes, offering limited support for hands-on, movement-based, or visually enhanced learning. This echoes the findings of Lujan and DiCarlo (2006), who emphasized that kinesthetic learners need active engagement to thrive academically, a factor often neglected in traditional classrooms.

While the effect of Learning Style on Academic Performance was statistically significant, the small effect size indicates limited practical significance on its own. However, combined with the substantial influence of Study Habits, this finding reinforces the need for holistic educational strategies. Curriculum developers and instructors should consider:

- ✓ Incorporating multi-sensory learning activities,
- ✓ Offering choice and flexibility in how content is presented,
- ✓ Explicitly teaching study strategies aligned with different learner profiles.

Moreover, rather than treating learning styles as fixed traits to be matched rigidly, educators should foster adaptive learning, where students are equipped to use multiple modes depending on context; a skill increasingly critical in complex, real-world problem solving.

The findings from this study offer several actionable insights for educators, curriculum designers, and institutional policymakers:

1. Promote Multimodal Instructional Design

Given the variability in performance across learning styles and the relative success of multimodal learners, educators should aim to deliver content through a blend of auditory, visual, kinesthetic, and textual methods. Incorporating lectures, diagrams, hands-on activities, and digital media can create richer learning environments that engage multiple modalities and reduce the risk of style-instruction mismatch.

2. Teach and Reinforce Effective Study Habits

With Study Habits emerging as a strong predictor of Academic Performance, it is essential to explicitly teach students how to learn, including time management, note-taking, self-monitoring, and metacognitive strategies. Institutions might consider embedding study skills training within the curriculum or offering dedicated workshops and mentorship programs.

3. Avoid Overreliance on Learning Style Labeling

While Learning Preferences can inform instructional planning, rigidly categorizing students by style may be counterproductive. Instead, educators should focus on developing learning flexibility, helping students become more comfortable operating across modalities. Encouraging students to adapt strategies based on task demands fosters resilience and deeper learning.

4. Leverage Technology to Support Differentiated Learning

Digital platforms can provide adaptive learning experiences tailored to individual strengths. For example, educational software can offer students choices in how content is presented, promote interactive engagement, and allow self-pacing, aligning with both multimodal instruction and personalized learning principles.

5. Professional Development for Teachers

Institutions should invest in on-going professional development focused on inclusive pedagogies, instructional differentiation, and learning strategy integration. Teachers equipped with knowledge of cognitive and behavioral learning science are better positioned to address diverse learner needs effectively.

Conclusion

While this research suggests that Learning Styles do play a role in shaping academic outcomes, the limited practical significance of this variable in isolation highlights a crucial insight: educational success cannot be attributed to any single factor. More notably, the analysis revealed that Study Habits exert a far more substantial influence on performance, underscoring the need to prioritize strategies that cultivate effective learning behaviors. These findings support the argument for a more nuanced and integrative approach to education, one that considers both cognitive preferences and behavioral practices. In this context, tailoring instruction solely based on Learning Styles may not yield significant gains unless paired with the development of strong, consistent Study Habits. The interplay between these variables calls for a pedagogical model that is both inclusive and adaptive.
In line with the National Education Policy (NEP), which emphasizes learner-centric and flexible education systems, the evidence presented here reinforces the call for diverse instructional and assessment practices that honor individual differences while fostering core academic competencies. As the NEP aptly puts it, "No one size fits all in education; diversity and flexibility are not options, but necessities."

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