International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Relationship Between School Students' Learning Styles and Their Academic Achievement: A Meta-Analysis

Ujjal Tripura[1], Dr. Sashapra Chakrawarty[2]

[1]Research Scholar, Department of Education, Tezpur University
[2]Associate Professor, Department of Education, Tezpur University

Abstract

The objective of the present research is to study relationship between learning styles and academic achievement of school-going students. Meta-analysis was implemented during the execution of this study. This research design is exclusively quantitative. It includes twenty-two articles that are pertinent. They are gathered from a variety of electronic databases and subsequently analyzed using an Excel spreadsheet and JAMOVI software. The pooled effect size was 0.305, which is statistically significant and suggests a small-to-moderate positive relationship. On average, students whose preferred learning styles were targeted or aligned tended to have slightly higher academic outcomes. The educational relevance of the sample size is evidenced by the fact that the appropriateness of the material can be enhanced by considering the preferences of learners when combined with effective pedagogy.

Keywords: School students, Learning Styles, Academic Achievement, Meta-Analysis.

Introduction

Every human being learn from their life experiences, as learning is a fundamental cognitive process that influences how individuals interact with and interpret their surroundings (Clark & Harrelson, 2002; Kanaris & Mujtaba, 2023). According to Intzidis (2003) and Eshach (2007), learning is a universal activity that occurs informally or formally throughout childhood and maturity. It has an impact on academic performance, personal growth, professional development, and interpersonal interactions (Ullah & Wilson, 2007; Watson & McMahon, 2007). According to Rocca (2001), learning will remain a constant in our lives and pervade all stages of human growth. As a result, it would be quite wrong to downplay the importance of learning in any aspect of human growth.

However, learning is not a one-size-fits-all process. It is influenced by a myriad of factors, from an individual's innate cognitive abilities to external influences such as socioeconomic background and the availability of educational resources. Moreover, every individual learning takes place differently from one another. Some students may find certain subjects challenging not because of a lack of interest or effort but because their learning needs are not being adequately met. On the other hand, some may find it easier to learn than others. Therefore, understanding how to support different learners is an important aspect for teachers to facilitate and cater the needs of learners based on their individual capabilities and abilities.

All students must have the opportunity to learn from school subjects based on their learning preferences (Murphy et al., 2004; Herman et al., 2024; Niemi et al., 2024). Learning styles assume that each individual

has particular preferences for how they learn best. This concept gained popularity in the 1970s and 1980s, when scholars such as Dunn and Dunn, Kolb, and Gardner began investigating the various ways in which students receive information. Learning styles assume that knowing and paying attention to one's preference makes experiences more effective (Cabual, 2021; Clavido, 2024).

There are various learning style models, each of which focuses on a distinct feature. Several well-known learning styles begin with VARK, which stands for Visual, Auditory, Reading/Writing, and Kinesthetic (Hussain, 2017; Subagja & Rubini, 2023). According to the theory, visual learners prefer to learn from drawings or diagrams, auditory learners listen to information, reading/writing learners learn more from written language, and kinesthetic learners learn best by doing (Othman & Amiruddin, 2010). Another VARK, Kolb's Experiential Learning Theory asserts that people have distinct preferences for how they process and internalize new information, categorizing them as converging, diverging, assimilating, and accommodating learners (Akella, 2010; Idkhan & Idris, 2021). According to Howard Gardner's Theory of Multiple Intelligences, individuals have unique learning preferences based on their strengths (McClellan & Conti, 2008; Şener & Çokçaliskan, 2018).

Learning styles are appealing due of their intuitive rationale. If students learn best with visual assistance, it is expected that incorporating more visual content into the teaching technique will improve their learning (Wilinkiewicz-Górniak, 2019; Baskota, 2021). Nonetheless, there is inconsistent data about the efficacy of teaching based on one's learning style (Kahar et al., 2019; Kassim & Nordin, 2024). Other studies found that students performed better in classes taught in their preferred learning style (Mestre, 2010; Hativa & Birenbaum, 2000), whereas previous studies found no significant relationship between learning styles and academic outcomes (Gappi, 2013; Cimermanová, 2018). Many opponents also argue that so-called learning styles are unduly simplistic and that learning is a far more complex process influenced by considerably more than personal preferences (Feldman, 2003; Alkooheji and al-Hattami, 2018; Hidayati, 2019). Some designers propose that, rather than stacking education approaches based on individual student needs, all educators should be educated to employ instructional strategies that have been proved to benefit all learners (Torres et al., 2012; Mitchell & Sutherland, 2020).

There has been extensive research into the relationship between students' learning styles and academic achievement. This relationship implies that students have preferred modes of perceiving and processing information, and that the more teaching strategies are tailored to those preferences, the more likely students will be successful in their learning (Oluremi, 2015; Jacobson, 2002; Wilson, 2011; Vizeshfar & Torabizadeh, 2018). This relationship, however, is far more difficult. While giving specific students with the ways of learning that they prefer will improve their academic performance, there are numerous other considerations to consider. Extrinsic factors include the nature of the material being taught and the environment in which learning occurs, while intrinsic factors include motivation, cognitive abilities, and prior knowledge (Pedaste et al., 2015; Sedaghat et al., 2011; Tarr et al., 2008; Nolen, 2003; Otieno, 2010). As a result, focusing simply on learning style may overlook numerous other aspects influencing a student's academic progress.

Research Questions

1. What are the sample size, instruments, research subjects, and statistics used in this meta-analysis?
2. What is the overall effect size of the relationship between school students' learning styles and academic achievement?

Research Objectives

1. To conduct a comprehensive literature review of studies on the relationship between school students' learning styles and academic achievement.
2. To explore the sample size, instruments, research subjects, and statistics used in this meta-analysis.
3. To synthesize and analyze the findings of these studies using meta-analysis techniques to determine the overall effect size on the relationship between school students' learning styles and academic achievement.

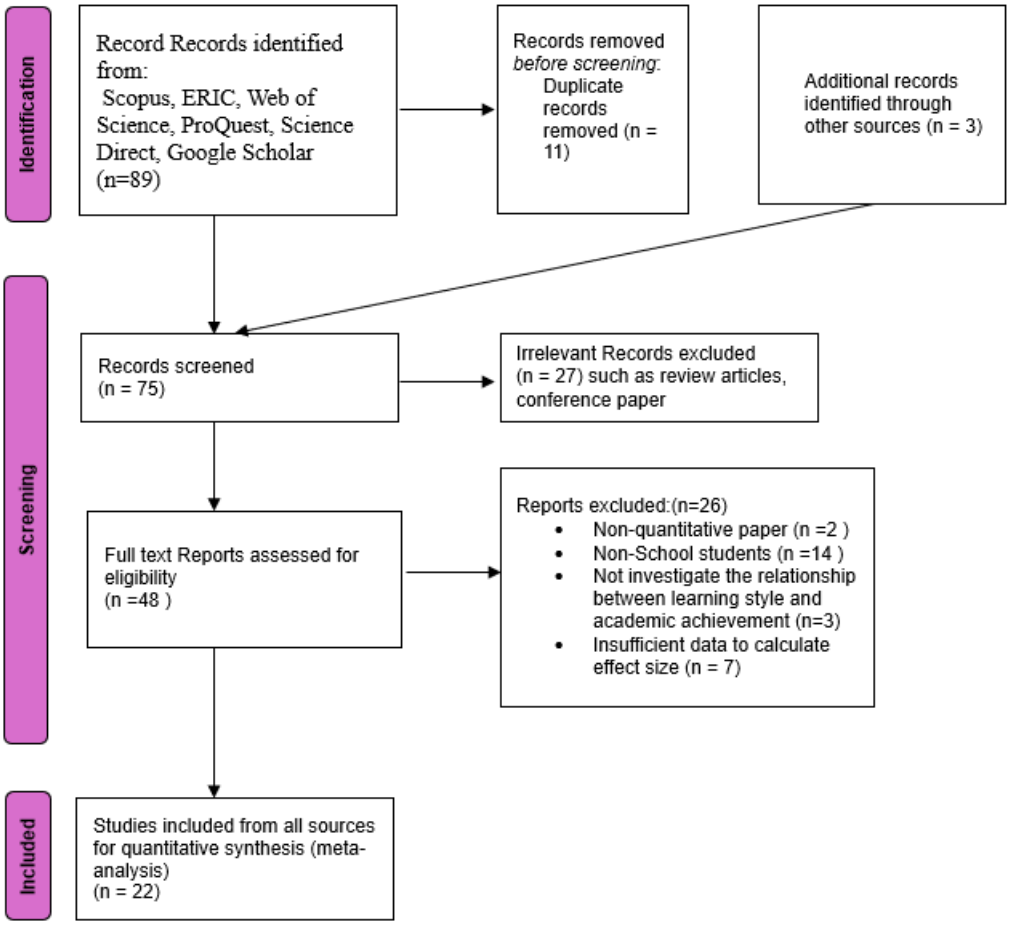


Figure 1. Flowchart process selection (source: PRISMA 2020 statement by Page et al)

Methodology

The research conducted a meta-analysis of studies published from 2014 to 2024 on 12th October on the relationship between school students' learning styles and academic achievement. The researchers used electronic databases such as Scopus, ERIC, Web of Science, ProQuest, Science Direct, Google Scholar, and other sources to search for relevant studies and obtained 200 papers. Data were collected search using keywords such as "academic achievement" OR "student achievement" OR "educational attainment" AND "learning styles" OR "learning preferences" AND "School Students". The researcher adopted inclusion criteria to select quantitative studies, articles, and only English language papers that explore the relationship between school students' learning styles and academic achievement. Non-quantitative papers, non-school students on the relationship between school students' learning styles and academic

achievement, and studies that did not report sufficient data for the calculation were excluded. As a result, 22 papers were selected for the final meta-analysis (Figure 1), which was conducted using an Excel sheet and JAMOVI software.

Population and sample

Target population was school students (primary through secondary and k = 22 articles meeting inclusion criteria with 5379 sample size.

Result and interpretation

Table 1: Summary of Research Result

No.	Author (year)	Total Sample	Gender	Research Subject	Measuring Instrument of Learning Style/Preference	Measuring Instrument of Academic Achievement	r
1	Ocampo et al (2023)	120	Male and Female	High School Students	Kolb's Learning Style Questionnaire by McLeod (2010)	Average grades of the first and second grading periods	0.027
2	Rani (2016)	328	Male and Female	High School Students	The investigator developed Learning Styles Scale	Midterm marks from the examination conducted by the State Government	0.825
3	Sarican(2021)	163	Male and Female	Primary School Students	Marmara Learning Style Scale by Şimşek (2007)	Class teacher grading the average grade of each lesson	0.178
4	Swartz &Yan Ye (2018)	113	Male and Female	Middle School Students	Reid's Perceptual Learning Styles Questionnaire (1995)	Learning achievement.	0.113
5	Munir et al (2018)	745	Male and Female	High School Students	Learning Styles Inventory by Canfield (1992)	Previous year grade result	-0.117
6	Singh and Cutting (2018)	200	Male and Female	High School Students	VAK learning style inventory by Victoria	Academic achievement of students	0.356

					Chislett and Alan Chapman		
7	Umennuihe et al (2022)	229	Male and Female	Senior Secondary School Students	Barsch's Learning Style Inventory (BLSI)	Students' performance grades on English language and Mathematics	0.089
8	Harida et al (2017)	32	Male and Female	Senior Secondary School Students	Questionnaire for Learning Styles	Test for reading achievement	0.467
9	Maulidiyah (2020)	17	Male and Female	Junior high school Students	Students' Learning Style Questionnaire by Willing (1988)	English writing test	0.502
10	Villajuan (2019)	179	Male and Female	High School Students	Learning Styles Inventory of Kolb (2009)	Grade in Math	-0.171
11	Putri & Ayu (2023)	15	Male and Female	Primary School Students	Perceptual Learning Style Preference Survey by Joy Reid (1998)	Listening test	0.268
12	Zulianti & Asari (2022)	35	Male and Female	Primary School Students	Learning Style Questionnaires	English skills test	0.868
13	Ganesen et al (2020)	373	Male and Female	Lower Secondary School Students	Kolb's Learning Style Inventory	Algebraic problem-solving test	0.754
14	Yilmaz et al (2016)	652	Male and Female	Middle School Students	Perceptual Learning Style Preference Questionnaire by Reid (1987)	Mathematics achievement test	0.016
15	Abidoye & Olorundare (2020)	100	Male and Female	Senior Secondary School Students	Grasha and Reichmann's Students Learning Scale and VAK/VARK Learning Style	Biology test	-0.151

16	bin Ab Kadir et al (2022)	40	Male and Female	Primary School Students	Learning Styles Questionnaire	Jawi writing skills test	0.173
17	Jannah et al (2024)	43	Male and Female	Middle School Students	VARK Questionnaire	Speaking proficiency test	-0.12
18	Johari & Ahmad (2016)	244	Male and Female	Secondary School Students	Learning Style Questionnaires	History subject achievement	-0.016
19	Ishak & Awang (2017)	200	Male and Female	School Students	Grasha Learning Styles instrument (1996)	Achievement in History subject	0.068
20	Nurhayati & Penna (2023)	80	Male and Female	School Students	Learning Style Questionnaire by Maramis (2012)	Mid-term English grades	0.49
21	Meshanu & Esia-Donkor (2023)	230	Male and Female	Junior High School Students	Grasha-Riechmann (1982) Learning Style Questionnaire	Academic Achievement in Social Studies	0.785
22	Anyamene & Odalonu (2022)	1241	Male and Female	High School Students	Learning Style Questionnaire by O"Brien (1985)	Achievements in Mathematics	-0.018

Table-2: Random-Effects Model (k = 22)

	Estimate	Se	Z	p	CI Lower Bound	CI Upper Bound
Intercept	0.305	0.0979	3.12	0.002	0.113	0.497

Note. Tau² Estimator: Restricted Maximum-Likelihood

The results of the random-effects model in Table-2, based on 22 studies (k = 22), indicate a significant overall effect size of 0.305. This suggests a small to moderate positive effect in favor of the studied intervention or relationship. The standard error (Se = 0.0979) reflects the precision of the estimate, while the Z-value of 3.12 and p-value of 0.002 confirm that the effect is statistically significant, meaning it is unlikely to have occurred by chance. The fact that the 95% confidence interval (CI: 0.113 to 0.497) suggest the true effect size lies to the statistical significance, as the interval does not cross zero.

The use of random effects suggests that the decision to assume heterogeneity in impact sizes across studies rather than a single fixed effect was made. This assumption should be used when there is study heterogeneity to ensure that the findings are more widely applicable. The Tau² estimator, computed using

the Restricted Maximum-Likelihood (REML) method, provides an unbiased estimate of between-study variance. All of this suggests that the studies included in the meta-analysis contain some degree of study variance. Thus, a random model is justified. Overall, the results indicate a statistically significant and favorable effect. However, further analysis of heterogeneity using measures like I^2 may reveal diversity in effect sizes across studies.

Heterogeneity Statistics

Table-3: Heterogeneity Statistics

Tau	Tau²	I²	H²	R²	df	Q	p
0.443	0.1965 (SE= 0.0649)	97.79%	45.286	.	21.000	978.179	< .001

This analysis revealed a significant heterogeneity of research. $\tau = 0.443$ and $\tau^2 = 0.1965$ (SE = 0.0649) indicated significant variance between experiments. $I^2 = 97.79\%$ indicates that the majority of the derivativeness is due to genuine data, rather than sampling. $H^2 = 45.286$ and $Q = 978.179$ ($df = 21$, $p < .001$) show a statistically significant inconsistency in effect sizes. Variations are likely to be taken into account by a random effects model and moderator analysis.

The forest plot displays individual estimates of impact sizes as well as their 95% confidence intervals based on data from many research. The overall effect size is 0.271 [0.114, 0.460], indicating a mild to moderate positive effect. Because the confidence interval does not include zero, the effect is statistically significant. The diversity between research supports the assumption of significant heterogeneity and thus the random-effects hypothesis.

Table 4: Publication Bias Assessment

Test Name	value	p
Fail-Safe N	2229.000	< .001
Begg and Mazumdar Rank Correlation	0.226	0.142
Egger's Regression	0.710	0.478

Note. Fail-safe N Calculation Using the Rosenthal Approach

Figure -2: Forest Plot

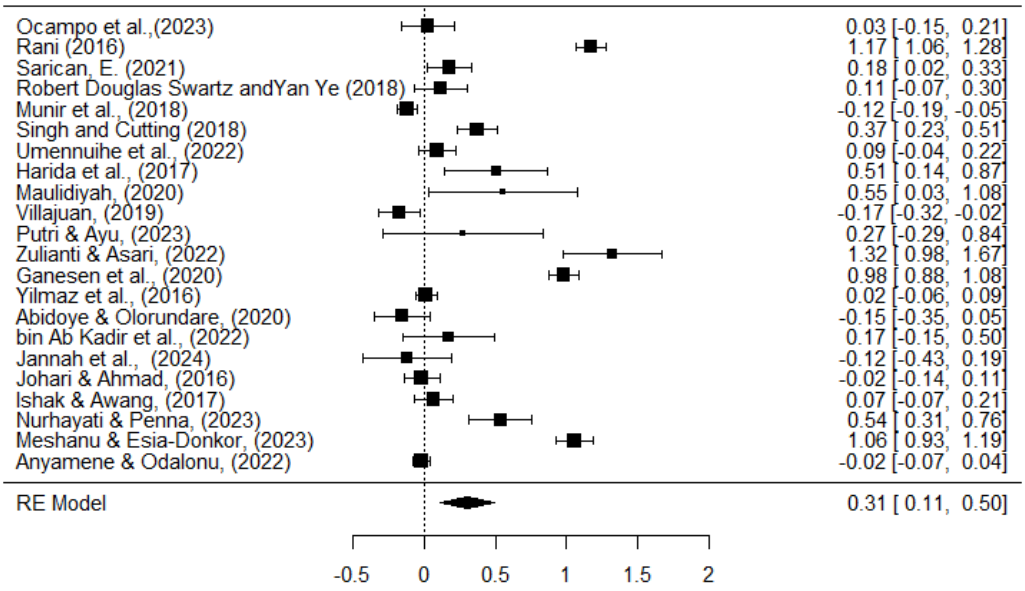
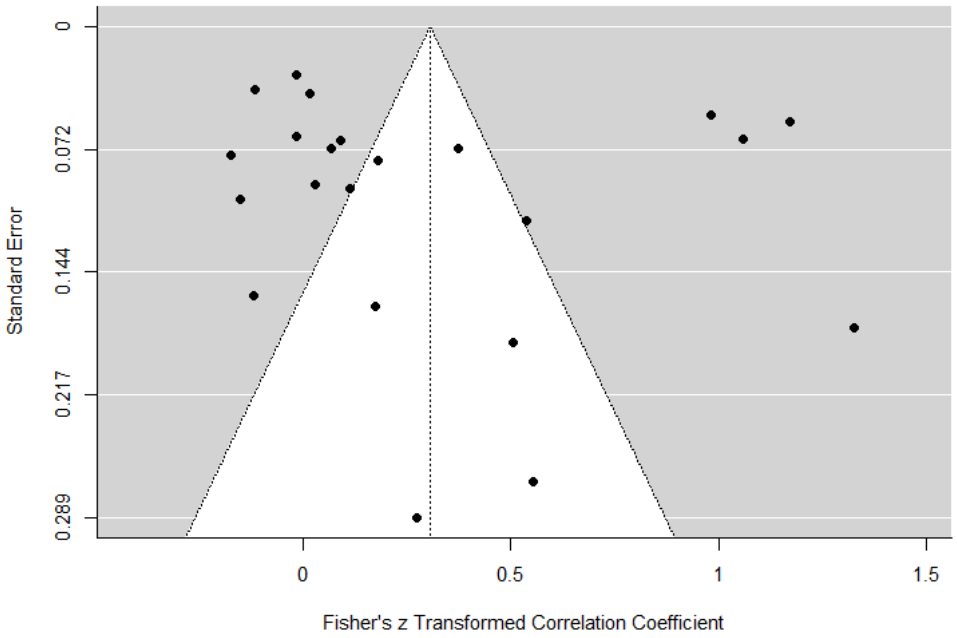


Table 4's examination of publication bias looked at how unpublished or overlooked research could have influenced the meta-analysis results. The Fail-Safe N value of 2,229 ($p < .001$) indicates that a large number of null studies (2,229) would be required to reduce the total effect size to insignificance. As a result, the results is relatively solid and must have been less influenced by publication bias. Begg and Mazumdar's correlation-based test compares effect sizes and standard errors to account for the same bias. The non-significant p value suggests that publication bias could not be identified as a major factor. Similarly, Egger's Regression test checks the funnel plot for asymmetry. The nonsignificant outcome suggests that small-study effects or publication bias had little or no influence on the meta-analysis's conclusions. Finally, the evidence implies that publication bias had no substantial impact on the study's conclusions about learning styles and academic accomplishment.

Figure-3: Funnel Plot



The researchers used a "funnel plot" to assess publication bias in the meta-analysis of academic achievement and learning styles among schoolchildren. The findings came from an examination of the relationship between academic achievement and learning styles. The plot points are symmetrically distributed throughout the triangle area, and there is no evident sign of bias; thus, the investigations produce believable and good results. Furthermore, it shows no skewed distribution, meaning that the analysis does not overlook smaller research that would produce more negative results. The findings are intriguing; nevertheless, further research is needed to better understand the elements that potentially link kids' academic achievement and learning patterns. The investigation found a clear link between students' academic achievement and learning styles, and this conclusion is unaffected by publication bias.

Discussion

This meta-analysis was designed to investigate the correlation between the academic performance of school pupils and their learning styles by combining data from prior studies. This research contributes to the existing body of empirical research by underscoring the robust correlation between these variables. Specifically, as anticipated, an examination of 22 studies, which span 22 effect sizes, demonstrated a moderate positive correlation between academic achievement and learning approaches. In addition, the findings bolster and expand upon previous empirical and theoretical research, thereby reaffirming the anticipated and significant correlation between academic achievement and the learning styles of school students. As found in previous studies, students' learning style can improve their academic achievement such as writing and writing skills, and problem-solving etc. (Singh and Cutting, 2018; Abidoye & Olorundare,2020; Anyamene & Odalonu,2022; bin Ab Kadir et al., 2022; Ganesen et al., 2020; Jannah et al., 2024). These findings are important, given how teachers understand, facilitate, and prioritize individual learning preferences during the teaching-learning process as well as in the assessment process (Rani, 2015; Abidoye & Olorundare, 2020; Ishak & Awang, 2017). They suggest that diverse learners' learning preferences should be given importance and organized classroom activities in an inclusive classroom setup (Ocampo et al., 2023; Swartz and Ye,2018; Jannah et al., 2024). They also indicated that pre-service teachers and in-service teachers training programs should put effort into organizing and sanitizing about diverse learners and their learning abilities, difficulties, and styles (bin Ab Kadir et al., 2022). Moreover, students need to be allowed to develop their learning methods, and the academic areas in which they excel vary depending on the method they prefer (Sarican, 2021; Anyamene & Odalonu, 2022; Ganesen et al., 2020).

This meta-analysis builds upon existing research about various learning styles and offers further quantitative evidence concerning the prioritization of these types in relation to the academic performance of students across different topics. This provides a useful knowledge base for reference in future research on early childhood care education and special need learners.

The analysis presented in this study was limited by the relatively small number of included studies (22). The application of stringent inclusion criteria and efforts to reduce the risk of publication bias were the primary causes of this limitation. The investigations that were chosen were conducted between 2014 and 2024. We may have missed the data studies conducted before 2014. The number of eligible studies reported in English was to be included and did not include conference and seminar papers. Although this meta-analysis was analysed only the overall effect sizes of the relationship between school students' learning styles and academic achievement, it could be possible for future studies to include moderators such as gender, level of schools, subjects wise, and country-wise.

Conclusion

The metanalysis reported here found that the overall average effect sizes indicate a moderate effect on the relationship between school students' learning styles and academic achievement. The implications are that teachers must recognize and act to facilitate diverse learners' learning style and their preferences for teaching any school subjects. In these connections, teachers must be prepared or trained from time to time with different skills and competencies to create learning environments more joyful and supportive. There intervention is needed to identify diverse learners' learning styles and prepare modules for teaching based on learners' learning abilities and abilities.

References

1. Abidoye, F. O., & Olorundare, A. S. (2020). The Correlation between Learning Styles and Biology Learning Performance of Nigerian Students. Journal of Biological Education Indonesia (Jurnal Pendidikan Biologi Indonesia), 6(1), 107-112.
2. Akella, D. (2010). Learning together: Kolb's experiential theory and its application. *Journal of Management & Organization*, *16*(1), 100-112.
3. Alkooheji, L., & Al-Hattami, A. (2018). Learning style preferences among college students. *International Education Studies*, *11*(10), 50-63.
4. Anyamene, A., & Odalonu, P. I. (2022). Relationship between learning styles and mathematics academic achievement of secondary school students in Awka education zone. International Journal of Research and Innovation in Social Science (IJRISS), 6(2), 614–619. https://www.rsisinternational.org
5. Baskota, P. (2021). *Teaching and Learning English Using Visual Aids in the Secondary School Classroom* (Doctoral dissertation, School of Education).
6. bin Ab Kadir, M. A., bin Muhammad, A., Yusoff, M. Z. B. M., Jaafar, M. A., Hassan, M. H., & Nordin, M. N. (2022). The Relationship Between Learning Style And Jawi Writing Skills Among Primary School Students. Journal of Pharmaceutical Negative Results, 5524-5534.
7. Cabual, R. A. (2021). Learning styles and preferred learning modalities in the new normal. *Open Access Library Journal*, *8*(4), 1-14.
8. Cimermanová, I. (2018). The Effect of Learning Styles on Academic Achievement in Different Forms of Teaching. *International Journal of Instruction*, *11*(3), 219-232.
9. Clark, R., & Harrelson, G. L. (2002). Designing instruction that supports cognitive learning processes. *Journal of athletic training*, *37*(4 suppl), S-152.
10. Clavido, G. (2024). Teaching Styles and Pupils' Learning Styles: Their Relationship with Pupils' Academic Performance. *Sprin Journal of Arts, Humanities and Social Sciences*, *3*(2), 11-15.
11. Eshach, H. (2007). Bridging in-school and out-of-school learning: Formal, non-formal, and informal education. *Journal of science education and technology*, *16*, 171-190.
12. Feldman, J. (2003). The simplicity principle in human concept learning. *Current directions in psychological science*, *12*(6), 227-232.
13. Ganesen, P., Osman, S., Abu, M. S., & Kumar, J. A. (2020). The relationship between learning styles and achievement of solving algebraic problems among lower secondary school students. International Journal of Advanced Science and Technology, 29(95), 2563-2574.
14. Gappi, L. L. (2013). Relationships between learning style preferences and academic performance of students. *International Journal of Educational Research and Technology*, *4*(2), 70-76.

15. Harida, E. S., Siregar, F. R., & Rina, R. (2017). The Correlation Between Learning Style and Students' Achievement in Reading Comprehension at Grade XI SMA N Tambangan. English Education: English Journal for Teaching and Learning, 5(1), 126-139.
16. Hativa, N., & Birenbaum, M. (2000). Who prefers what? Disciplinary differences in students' preferred approaches to teaching and learning styles. *Research in Higher Education*, *41*, 209-236.
17. Herman, M., Regina, R., & Yuliana, Y. G. S. (2024). Students' Needs and Preferences for Digital EFL Learning Materials. *Jurnal Riset dan Inovasi Pembelajaran*, *4*(2), 1414-1425.
18. Hidayati, A. (2019, April). The analysis of influencing factors of learning styles, teacher's perceptions and the availability of learning resources in elementary schools in Padang, West Sumatra. In *Journal of Physics: Conference Series* (Vol. 1185, p. 012149). IOP Publishing.
19. Hussain, I. (2017). Pedagogical implications of VARK model of learning. *Journal of Literature, Languages and Linguistics*, *38*(2422-8435), 5.
20. Idkhan, A. M., & Idris, M. M. (2021). Dimensions of students' learning styles at the university with the kolb learning model. *International Journal of Environment, Engineering & Education*, *3*(2), 75-82.
21. Intzidis, E. (2003). Lifelong learning: Seeking constants for changing societies. *Lifelong Learning Discourses in Europe. Hamburg: UNESCO*, 37-50.
22. Ishak, N. B., & Awang, M. M. (2017). The relationship of student learning styles and achievement in history subject. The International Journal of Social Sciences and Humanities Invention, 4(3), 3372-3377.
23. Jacobson, M. H. (2002). How Law Students Absorb Information: Determining Modality in Learning Style. *Legal Writing: J. Legal Writing Inst.*, *8*, 175.
24. Jannah, F., Asari, S., & Maruf, N. (2024). The Correlation Between Students' Learning Styles And Students' Speaking Achievement. PROGRESIF, 2(1), 9-19.
25. Johari, A. S., & Ahmad, A. (2016). The relationship between learning style and student achievement in history subject. IOSR Journal of Humanities and Social Science, 21(7), 07-14.
26. Kahar, A., Joshi, J., Chahande, J., Kolte, V., & Radke, U. (2019). Assessment of performance of dental students of different learning styles using different teaching aids. *Indian Journal of Multidisciplinary Dentistry*, *9*(1), 40-44.
27. Kanaris, M. E., & Mujtaba, B. G. (2023). Trust shaping the social relationship of diverse learners in the online education environment. *Environment and Social Psychology*, *9*(2).
28. Kassim, A., & Nordin, M. N. (2024). An Effective Teaching Aids Using Visual, Auditory and Kinesthetics Learning Styles For Students With Special Needs. *Special Education [SE]*, *2*(1), e0009-e0009.
29. Maulidiyah, N. A. (2020). The Correlation Between Students' Learning Style and English Achievement at SMP Muhammadiyah 1 Gresik. Journal of English Teaching, Literature, and Applied Linguistics, 4(2), 84-101.
30. McClellan, J. A., & Conti, G. J. (2008). Identifying the multiple intelligences of your students. *Journal of Adult Education*, *37*(1), 13-32.
31. Meshanu, H. K., & Esia-Donkor, K. (2023). Public junior high school pupils' perceptions of their learning style preferences and their relationship with academic achievement in social studies in East Mamprusi Municipality, Ghana. International Journal of Research and Innovation in Social Science (IJRISS), VII(X), 1693. https://doi.org/10.47772/IJRISS.2023.701130

32. Mestre, L. S. (2010). Matching up learning styles with learning objects: What's effective?. *Journal of Library Administration*, *50*(7-8), 808-829.
33. Mitchell, D., & Sutherland, D. (2020). *What really works in special and inclusive education: Using evidence-based teaching strategies*. Routledge.
34. Munir, N., Ahmad, N., Hussain, S., & Ghani, U. (2018). Relationship of learning styles and academic performance of secondary school students. Rawal Medical Journal, 43(3), 421-424.
35. Murphy, R. J., Gray, S. A., Straja, S. R., & Bogert, M. C. (2004). Student learning preferences and teaching implications. *Journal of dental education*, *68*(8), 859-866.
36. Niemi, K., Minkkinen, J., & Poikkeus, A. M. (2024). Opening up learning environments: liking school among students in reformed learning spaces. *Educational Review*, *76*(5), 1191-1208.
37. Nolen, S. B. (2003). Learning environment, motivation, and achievement in high school science. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *40*(4), 347-368.
38. Nurhayati, N., & Penna, H. T. D. (2023). The Correlation between Students Learning Styles and Their English Academic Achievement. SUMIKOLAH: Jurnal Ilmu Pendidikan, 1(1), 39-48.
39. Ocampo, E. N., Mobo, F., & Cutillas, A. L. (2023). Exploring the Relationship Between Mathematics Performance and Learning Style Among Grade 8 Students. International Journal of Multidisciplinary: Applied Business and Education Research. 4(4), 1165 – 1172. doi: 10.11594/ijmaber.04.04.14
40. Oluremi, F. D. (2015). Learning styles among college students. *International Journal for Cross-Disciplinary Subjects in Education*, *5*(4), 2631-2640.
41. Othman, N., & Amiruddin, M. H. (2010). Different perspectives of learning styles from VARK model. *Procedia-Social and Behavioral Sciences*, *7*, 652-660.
42. Otieno, K. O. (2010). Teaching/learning resources and academic performance in mathematics in secondary schools in Bondo District of Kenya. *Asian social science*, *6*(12), 126.
43. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
44. Pedaste, M., Must, O., Silm, G., Täht, K., Kori, K., Leijen, Ä., & Mägi, M. L. (2015). How do cognitive ability and study motivation predict the academic performance of IT students?. In *ICERI2015 Proceedings* (pp. 7167-7176). IATED.
45. Putri, A. T., & Ayu, M. (2023). The Correlation Between Learning Style and Students' Listening Skills in Fifth-Grade Students at Sd Negeri 1 Gedung Meneng. Journal of English Language Teaching and Learning, 4(1), 26-33.
46. Rani, K. V. (2016). Relationship of Perceptual Learning Styles and Academic Achievement among High School Students. Journal on School Educational Technology, 11(3), 10-17.
47. Sarican, E. (2021). Are the learning styles of elementary school students related to their academic success? A study of mixed research methods. International Journal of Psychology and Educational Studies, 8(4), 110-124.
48. Sedaghat, M., Abedin, A., Hejazi, E., & Hassanabadi, H. (2011). Motivation, cognitive engagement, and academic achievement. *Procedia-Social and Behavioral Sciences*, *15*, 2406-2410.
49. Sener, S., & Çokçaliskan, A. (2018). An investigation between multiple intelligences and learning styles. *Journal of Education and Training Studies*, *6*(2), 125-132.

50. Subagja, S., & Rubini, B. (2023). Analysis of Student Learning Styles Using Fleming's VARK Model in Science Subject. *Jurnal Pembelajaran Dan Biologi Nukleus (JPBN)*, *9*(1), 31-39.
51. Swartz, R. D., & Ye, Y. (2018). A Comparative Correlational Study of Grades Six To Eight Students' Perceptual Learning Style Preference And Their Learning Achievement At Pan-Asia International School, Thailand. Scholar: Human Sciences, 10(1), 99-99.
52. Tarr, J. E., Reys, R. E., Reys, B. J., Chávez, Ó., Shih, J., & Osterlind, S. J. (2008). The impact of middle-grades mathematics curricula and the classroom learning environment on student achievement. *Journal for research in mathematics education*, *39*(3), 247-280.
53. Torres, C., Farley, C. A., & Cook, B. G. (2012). A special educator's guide to successfully implementing evidence-based practices. *Teaching exceptional children*, *45*(1), 64-73.
54. Ullah, H., & Wilson, M. A. (2007). Students' academic success and its association to student involvement with learning and relationships with faculty and peers. *College student journal*, *41*(4), 1192-1203.
55. Umennuihe, C. L., Nnubia, U. I., Eya, D. N., & Alutu, C. C. (2022). Relationship between Learning Style and Academic Performance of Senior Secondary School Students in Igbo-Etiti Local Government Area, Enugu State. Journal For Family & Society Research, 1(1).
56. Villajuan, A. (2019). Relationship between learning styles & academic achievement in mathematics of grade 8 students. International Journal of English, Literature and Social Science, 4(4).
57. Vizeshfar, F., & Torabizadeh, C. (2018). The effect of teaching based on dominant learning style on nursing students' academic achievement. Nurse education in practice, 28, 103-108.
58. Watson, M., & McMahon, M. (2007). Children's career development learning: A foundation for lifelong career development. In *Career development in childhood and adolescence* (pp. 29-45). Brill
59. Wilinkiewicz-Górniak, L. (2019). The Use of Visuals and Visual Aids for More Effective Language and Skills Teaching. In *Conference: 27th International IATEFL Poland Conference at Wrocław*.
60. Wilson, M. L. (2011). Students' learning style preferences and teachers' instructional strategies: Correlations between matched styles and academic achievement. Liberty University.
61. Yilmaz, G. K., Koparan, T., & Hanci, A. (2016). Determination of the Relationship between 8th Grade Students Learning Styles and TIMSS Mathematics Achievement. Online Submission, 11(1), 35-58.
62. Zulianti, A., & Asari, S. (2022). Student English achievement and their learning style: A correlation study on English learners exposure. English Language in Focus (ELIF), 4(2), 107-116.