International Journal of Language and Literary Studies
Volume 7, Issue 3, 2025
Homepage : http://ijlls.org/index.php/ijlls

A Quasi-Experimental Examination of Learning Style-Based English Instruction and Its Influence on Academic Success

Mahmoud SEDDIK
Regional Centre for Educational and Training Professions, Fes, Morocco
mahmoud_sadik25@yahoo.com

DOI: http://doi.org/ 10.36892/ijlls.v7i3.2144
APA Citation: SEDDIK, M. (2025). A Quasi-Experimental Examination of Learning Style-Based English Instruction and Its Influence on Academic Success. *International Journal of Language and Literary Studies. 7*(3).248-259. http://doi.org/10.36892/ijlls.v7i3.2144

Received: *30/03/2025*

Accepted: *13/05/2025*

Keywords: *learning styles, language instruction, task performance, quasi-experimental design, teaching strategies.*

Abstract

This study explores whether matching English language instruction to students' preferred learning styles affects their performance in language tasks. Using a quantitative quasi-experimental design, two student groups were compared: one received instruction customized to their learning style preferences, while the other followed a standard, non-customized curriculum. Over 12 weeks, participants were evaluated on tasks targeting listening, speaking, and writing skills. Although learning style theories are widely embraced in education, the study found no statistically significant differences in performance between the two groups. Both sets of students achieved similar results, suggesting that aligning teaching methods with learning styles did not improve outcomes. These findings question the belief that tailoring instruction to individual preferences enhances learning. The study underscores the need for evidence-based teaching methods and recommends adopting flexible, adaptive instructional strategies that apply universally effective principles to support all learners, regardless of learning style.

1. INTRODUCTION

Over the last twenty years, there has been a significant increase in the adoption of teaching strategies aimed at addressing varied learning styles within public education systems. This instructional approach has become widely embraced by educators, parents, and the public, as supported by research like that of Pashler et al. (2009). Its prominence is particularly evident in teacher preparation programs and adult education, where it is often emphasized (Bishka, 2010). Consequently, school systems and universities dedicate substantial financial resources each year to support learning styles-based instruction, including assessments, teacher training, instructional materials, and guest lectures.

"Learning style" typically refers to the preferred ways individuals perceive, interpret, and remember new or complex information (Dunn, 1990, p. 353). Early advocates of this theory believed that learners possess innate preferences that, if matched with instructional methods, could enhance academic achievement. This belief has resonated with many students, teachers, and parents, helping to popularize the approach from early childhood through secondary education. The literature on learning styles is extensive, with a vast number of books and articles addressing the topic. This abundance is less surprising when considering that over 70 different learning style models have been identified across domains such as education, psychology, marketing, and human resource development (Coffield et al., 2004).

Despite the widespread acceptance of learning styles theory in Morocco—especially within educational discourse and training programs—empirical research on its actual impact at various educational levels remains limited. Merely recognizing learning style differences does not necessarily lead to better learning outcomes. The researchers, who also work as educators, have long attempted to tailor their lessons to suit students' preferred learning styles but found that such efforts did not consistently result in academic improvement. These experiences prompted a more rigorous investigation into whether aligning English language instruction with students' learning styles could lead to improved language performance.

Moreover, the literature review revealed a lack of empirical studies in Morocco that critically assess the reliability of the link between learning styles and academic achievement. Existing research often relies on self-reported questionnaires to identify learning preferences—tools that are vulnerable to biases such as social desirability, misinterpretation, and limited self-awareness, potentially compromising the accuracy and reliability of the findings. These limitations highlighted the need for a more objective and research-based inquiry.

To address this gap, the present study utilizes a quantitative quasi-experimental design with a structured sequential model to thoroughly explore the relationship between learning styles and student performance in English language tasks.

2. REVIEW OF LITERATURE

Pashler et al. (2009) trace the roots of learning styles theory to tools like the Myers–Briggs Type Indicator, initially used in business settings to assess personality fit for particular jobs. The desire to classify individuals into distinct types based on behavioral tendencies has since found its way into education. The works of Allcock and Hulme (2010) and Fridley (2010) suggest that Howard Gardner's theory of multiple intelligences (1991; 1993) has also contributed to this shift, reinforcing the belief that instruction should align with learners' preferred modalities. Teachers are thus often encouraged to design lessons that take into account a wide range of learning preferences.

At the core of the learning styles debate is a deeply human desire for individuality. People tend to see themselves as unique and expect that this individuality—especially in how they learn—should be acknowledged (Scott, 2010). The notion of having a personalized learning style caters to this psychological need, offering learners a sense of validation and the idea that their differences deserve tailored instructional responses.

Among the most recognized models is the Dunn and Dunn Learning-Styles Model (1990), which categorizes preferences based on environmental, emotional, sociological, physiological, and psychological variables. While influential, the model has faced criticism for potentially oversimplifying the complex and evolving nature of how individuals learn (Coffield et al., 2004). Thus, while the model offers a structured starting point, educators must remain wary of treating learning preferences as fixed or absolute.

Kolb's Learning Styles Inventory (1984) also remains widely cited, dividing learners into convergers, divergers, assimilators, and accommodators. This framework emphasizes adapting instruction to fit learners' approaches to knowledge and experience. Honey and Mumford (1992) simplified Kolb's categories into four styles—activist, reflector, theorist, and pragmatist—each emphasizing different ways of engaging with tasks. While such classifications provide useful insights, critics argue they may foster unhelpful stereotypes, limiting flexibility in both teaching and learning (Coffield et al., 2004).

Perhaps the most widely adopted model is Fleming's VARK (2001), which classifies learners as visual, auditory, read/write, or kinesthetic. Each type is associated with specific learning preferences—visual learners, for instance, may prefer diagrams, while kinesthetic learners benefit from hands-on tasks. These frameworks commonly claim that mismatched instruction reduces learning effectiveness, while aligned instruction enhances it.

However, this core claim has been repeatedly tested with little supporting evidence. Studies by Krätzig and Arbuthnott (2006), Massa and Mayer (2006), Pashler et al. (2008), Papanagnou et al. (2016), Aslaksen and Lorås (2019), and Rogowsky et al. (2020) consistently found no significant improvement in learning outcomes when instruction was matched to learning style. Additionally, the reliability of these supposed preferences is often weak (Coffield et al., 2004). For example, Massa and Mayer (2006) conducted a series of experiments using a computer-based electronics lesson with help screens tailored to verbal or visual learners. Despite using multiple measures to identify preferences, the study found no learning benefit from matching instructional formats to learning styles. Similarly, Husmann et al. (2023) found that students who were given study strategies aligned with their VARK-identified learning styles did not improve their test scores. In fact, most students continued to use familiar study habits, showing little motivation to change even when prompted. Those who did adapt their strategies showed no measurable academic gains.

Pashler et al. (2008) also found no correlation between preferred learning style and actual performance. Interestingly, visual learners outperformed others across the board, prompting the authors to caution against designing instruction solely around auditory learning styles. They argued that doing so might hinder development of other, more essential skills.

This misapplication of neuroscience to education has led many to label learning styles as a "neuromyth" (Dekker et al., 2012). It reflects a broader trend in educational practice, where intuitive but flawed ideas often take hold in the absence of rigorous scientific evidence. Educators and learners alike may gravitate toward such beliefs simply because they feel intuitively correct and are easy to grasp. A systematic review by Newton and Salvi (2020) revealed that 89% of educators believe that adapting teaching to learning styles improves outcomes, a striking figure that underscores how deeply embedded this belief is, despite the limited evidence supporting it.

In conclusion, while the popularity of learning styles models can be attributed to a natural desire for personalized instruction and recognition of individuality, the empirical evidence casts serious doubt on their effectiveness. The continued reliance on such models risks promoting rigid classifications that oversimplify the learning process and may ultimately hinder more effective, evidence-based instructional practices. Moving forward, it is essential that educators critically evaluate such frameworks and prioritize approaches grounded in robust, replicable research

3. Methodology

3.1. Objective

The objective of this research is to assess the impact of customizing English language instruction according to students' learning styles on their language skills development. Specifically, the study investigates whether adapting instructional methods to match individual learning styles leads to improved performance in diverse language tasks. This inquiry is grounded in the hypothesis that personalized instruction may enhance engagement and facilitate deeper learning by aligning with students' cognitive preferences.

3.2.Research Design

This study employs a quasi-experimental design, which is suitable for educational contexts where random assignment is often impractical. This design allows for the examination of causal relationships between the independent variable (learning-style-tailored instruction) and the dependent variable (students' task performance), while maintaining the ecological validity of the classroom environment. The pre-existing group of A2-level students at an English language centre in Taza, Morocco, provided a real-world setting for the implementation of this intervention.

The study was structured in four key stages:

Stage 1 : Pre-test Phase
Stage 2 : Learning Style Identification Phase
Stage 3 : Differentiated Instruction Phase
Stage 4 : Testing the Meshing Hypothesis Phase

These stages provided a comprehensive framework to systematically assess the effects of differentiated instruction based on learning styles, ensuring both internal validity and pedagogical relevance.

3.3.Hypothesis

This study tests the following Null Hypothesis (H_0): There are no significant differences in task performance among students with different learning styles (visual, auditory, reading/writing, and kinaesthetic).

3.4.Research Questions

This study seeks to answer the following research questions:

1. How does English language instruction tailored to individual learning styles affect students' language skills improvement?
2. What are the differences in task performance across visual, auditory, reading/writing, and kinaesthetic learning style groups in English language tasks?
3. To what extent do the students' identified learning styles match their preferred instructional methods?
4. What insights can be gained from the statistical analysis of task performance scores in relation to learning styles?

3.5. Procedures

The study was conducted with 97 participants enrolled in an English language centre in Taza, Morocco. All participants had A2-level proficiency, ensuring a relatively homogeneous starting point. Participants were selected based on availability and voluntary participation, and informed consent was obtained before the start of the study.

Stage 1: Pre-test Phase

Before identifying learning styles or implementing differentiated instruction, a pre-test was administered to establish baseline proficiency in key language skills, listening, reading, writing, and speaking. This pre-test served as a control measure to ensure that any improvements in performance could be attributed to the instructional intervention rather than prior knowledge.

The pre-test included:

- A reading comprehension task featuring a short passage with five multiple-choice questions.
- A listening comprehension task, in which students listened to a brief dialogue and answered five follow-up questions.
- A short writing task asking students to describe a personal experience in 60–80 words.
- A speaking task, where students responded to three general questions in an oral interview format.

Scores were recorded out of 20 for each section, then averaged to determine the overall baseline performance. The average pre-test scores across all participants ranged between 9.8 and 12.7 out of 20, indicating relatively modest proficiency and highlighting the need for instructional enhancement.

Stage 2: Learning Style Identification Phase

In this phase, participants completed a Learning Style Questionnaire based on the VARK model (Visual, Auditory, Reading/Writing, Kinaesthetic), which identifies individual cognitive preferences in learning. The questionnaire contained 20 multiple-choice items, each designed to tap into how learners process and retain information. Based on response patterns, participants were assigned to the learning style with the highest corresponding score. For example, selecting a majority of 'A' responses placed the student in the Visual group.

The resulting distribution of learning styles is summarized below:

Learning Style	Number of Participants (N)
Visual	32
Auditory	23
Read/Write	17
Kinaesthetic	25
Total	**97**

This categorization enabled the tailoring of instructional content to match students' dominant learning preferences in the subsequent phase

Stage 3: Differentiated Instruction Phase

Participants were divided into four groups according to their identified learning styles. Each group received instruction adapted to their cognitive preferences during a 30-hour instructional

module spread over 12 weeks. To maintain instructional integrity, teachers were trained to implement specific strategies aligned with each learning style:

- Visual learners engaged with charts, infographics, diagrams, PowerPoint visuals, and color-coded notes. Lessons often included labeled images and graphic organizers.
- Auditory learners received content through oral explanations, group discussions, audio recordings, and echo-reading activities to reinforce auditory memory.
- Reading/Writing learners focused on written texts, handouts, summaries, note-taking exercises, and written instructions. They were also encouraged to reflect through journaling.
- Kinaesthetic learners participated in role-playing, hands-on tasks, interactive games, and physical movement activities, such as "grammar races" and TPR (Total Physical Response) drills.

Although instruction was mainly style-specific, teachers were encouraged to integrate varied methods to prevent fatigue and increase overall engagement. Instruction was carried out between October 02nd and December 23rd, 2023.

Stage 4: Testing the Meshing Hypothesis Phase

To test whether instruction that aligns with students' learning styles (the "Meshing Hypothesis") results in better performance, all participants were assessed through four tasks, each corresponding to one learning style. Importantly, each participant completed all four tasks, allowing researchers to compare performance within and across learning styles.

The tasks were as follows:

Task Type	Activity Description	Expected Outcome
Visual Task	Spot the difference between two images in 2 minutes	Visual learners expected to outperform others
Auditory Task	Listen to a short story and sequence five events within 1 minute	Auditory learners expected to demonstrate better sequencing
Reading/Writing Task	Read a short passage and write a summary paragraph in 5 minutes	Reading/Writing learners expected to summarize more clearly
Kinaesthetic Task	Interpret the meaning of a sentence using gestures and body movements within 30 seconds	Kinaesthetic learners expected to perform more expressively

This stage allowed for a comparative analysis of performance based on the interaction between instructional method and individual learning style.

3.6.Control Group and Group Equivalence

To validate the findings, a control group of A2-level students was also included. These students received standard instruction, uninformed by learning styles, throughout the same time period. The control group's results provided a baseline for evaluating whether differentiated instruction had a statistically significant effect. To ensure that both experimental and control groups were equivalent prior to the intervention, a one-way ANOVA was conducted on their pre-test scores. This analysis confirmed no significant difference between the groups at baseline, thereby strengthening the reliability of post-intervention comparisons.

3.7. Data Analysis

Quantitative data was analysed using SPSS software. The analysis addressed both within-group and between-group comparisons.

- Paired-sample t-tests were used to determine whether individual learning-style groups improved from pre-test to post-task performance.
- One-way ANOVA was employed to compare task performance across different learning styles.
- ANCOVA (Analysis of Covariance) was conducted to compare the post-task scores between the experimental and control groups while controlling for pre-test scores.
- Where relevant, post hoc pairwise comparisons were applied using Tukey's HSD to identify specific group differences.

Descriptive statistics such as means, standard deviations, and standard errors were also calculated for all groups across the four tasks, allowing for detailed interpretation of the impact of differentiated instruction. Graphical representations (bar charts, line graphs) were used in the Results section to visualize mean performance differences across learning styles and tasks. The combination of inferential and descriptive statistics ensured both precision and interpretability in the findings.

4. RESULTS AND INTERPRETATION

This study aimed to assess the impact of aligning instructional methods with students' self-reported learning styles (visual, auditory, read/write, and kinaesthetic) on their performance across four modality-specific tasks. To test this, the following null hypothesis (H_0) was formulated: there are no significant differences in task performance among students with different learning styles. The results are presented using descriptive statistics and multivariate analysis, supported by visual illustrations and detailed interpretations.

Table 1 summarizes the mean scores and standard deviations of each learning style group across the four task types.

Table 1: Mean Scores and Standard Deviations by Learning Style and Task

Task	Learning Style	Mean	Std. Deviation	N
Visual Task	Visual	3.50	0.984	32
	Auditory	3.87	0.626	23
	Read/Write	4.00	1.061	17
	Kinesthetic	3.76	0.831	25
Auditory Task	Visual	3.72	0.888	32
	Auditory	3.52	1.201	23
	Read/Write	4.29	0.470	17
	Kinesthetic	3.80	0.707	25
Read/Write Task	Visual	3.69	0.738	32
	Auditory	3.83	0.576	23
	Read/Write	4.29	0.470	17
	Kinesthetic	4.08	0.277	25
Kinesthetic Task	Visual	3.81	0.738	32
	Auditory	3.39	1.158	23

	Read/Write	3.94	1.029	17
	Kinesthetic	3.68	1.030	25

Figure 1: Line Graph of Mean Scores by Learning Style Across Tasks

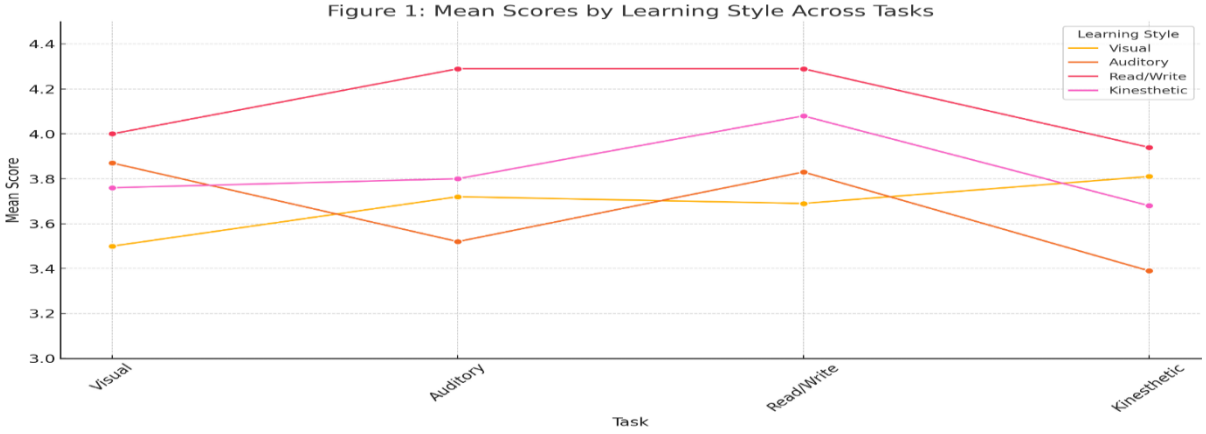
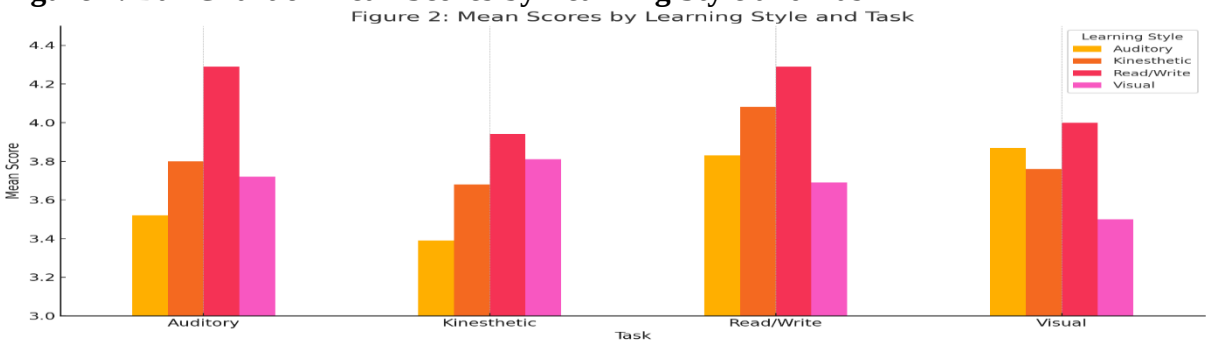


Figure 2: Bar Chart of Mean Scores by Learning Style and Task



From the descriptive statistics and visualizations, it was observed that Read/Write learners consistently scored higher across all four tasks (means: 4.00, 4.29, 4.29, and 3.94, respectively), regardless of the task modality. Visual learners showed moderate performance overall, without excelling in the visual task as might have been expected (mean = 3.50). Similarly, auditory learners did not achieve their highest performance on the auditory task (mean = 3.52), which suggests that matching instruction to their reported learning style did not result in better outcomes. Interestingly, kinaesthetic learners scored highest not on the kinaesthetic task (mean = 3.68) but on the Read/Write task (mean = 4.08). These trends challenge the "meshing hypothesis," which claims that learners benefit more when instructional methods align with their preferred learning styles. Instead, the results suggest that some groups, particularly Read/Write learners, may perform consistently well across modalities, indicating that factors other than learning style alignment—such as general academic habits or cognitive strengths—may play a more significant role in learning outcomes.

To statistically examine the effect of learning style and task type on performance, a MANOVA was performed.

Table 2: Multivariate Tests of Effects for Learning Styles and Task Performance

Effect	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Task Effect	0.941	1.446	3	91	0.187	0.059

Task × Learning Style	0.911	1.196	9	221.621	0.298	0.038

The results of the Multivariate Analysis of Variance (MANOVA) further support the patterns observed in the descriptive statistics, revealing no statistically significant impact of either task type or the interaction between learning style and task on student performance. Specifically, the main effect of task type was not significant (Wilks' Lambda = 0.941, F(3, 91) = 1.446, p = 0.187), suggesting that the nature of the task alone did not meaningfully influence outcomes. Additionally, the interaction effect between learning style and task was also non-significant (Wilks' Lambda = 0.911, F(9, 221.621) = 1.196, p = 0.298), indicating no reliable advantage for students when the instructional method matched their self-identified learning style. The corresponding effect sizes were small, with only 5.9% of the variance explained by task type and 3.8% by the interaction, reinforcing the conclusion that these factors played a minimal role in determining academic performance. These findings align with broader empirical evidence that questions the practical value of the learning styles theory, suggesting that instructional alignment with learning styles may not be a meaningful or effective strategy for enhancing educational outcomes.

4.1. Summary of Findings

The integration of descriptive, visual, and inferential analyses leads to a clear conclusion: matching instructional modalities to students' self-identified learning styles did not significantly enhance academic performance.

- The Read/Write group outperformed others across all tasks, suggesting they may benefit from more text-based approaches, regardless of task design.
- No other group showed a consistent advantage on their "matched" task.
- Statistical analyses confirmed that any observed differences were not statistically significant, casting further doubt on the efficacy of learning styles-based instruction.

These findings contribute to the broader debate on the utility of learning styles in educational design and suggest that educators might better invest in evidence-based, universally effective strategies rather than attempting to match lessons to perceived learner preferences.

5. DISCUSSION

This study set out to put the "meshing hypothesis" to the test—the popular idea that students learn better when teaching matches their self-identified learning style. Using a quasi-experimental design, we identified participants' VARK styles, tailored instruction accordingly, and then assessed their performance across tasks designed to align with each modality. Despite these efforts, our results did not support the hypothesis. Surprisingly, Read/Write learners consistently outperformed other groups—not only on reading-based tasks, but across the board. No group showed a significant edge on the task meant to match their preferred style (e.g., Auditory learners did not perform better on the listening task). Our MANOVA results confirmed this lack of statistical significance, with small effect sizes to match (η^2 = 5.9% and 3.8%). These findings align with Pashler et al.'s (2008) assertion that learning-styles matching may be more myth than reality (Dekker et al., 2012).

These results are part of a growing body of evidence calling the learning styles theory into question. For nearly two decades, studies, from Massa and Mayer's multimedia experiments (2006) to Husmann et al.'s VARK-based interventions (2023), have repeatedly shown that aligning instruction with learning style does not significantly improve learning outcomes. Reviews, such as those by Coffield et al. (2004), have pointed out that many learning style models lack both theoretical coherence and psychometric reliability. Still, the myth persists. As Newton and Salvi (2020) observed, nearly 9 in 10 educators still believe in learning styles despite the weak research base supporting them.

One interesting pattern that emerged from our data was the consistent success of Read/Write learners—even on tasks that did not involve reading or writing. This raises the question: Are learning style assessments actually measuring how students prefer to learn, or are they capturing something deeper, such as general academic skills or long-standing study habits? Perhaps Read/Write learners have developed strategies—such as note-taking, paraphrasing, and synthesising information — that can be transferred across different task types. In that case, their success isn't about style alignment at all; it's about having a well-stocked academic toolbox.

This idea points to something broader. It is possible that what matters more than style preference is a combination of cognitive abilities—like verbal reasoning, working memory, and the ability to regulate one's learning. According to cognitive load theory (Sweller, 1988), learners process information more effectively when it is presented in a manner that aligns with their existing schemas. Therefore, students who already have strong literacy skills are likely to succeed regardless of how the material is delivered. Similarly, learners who use metacognitive strategies—planning, monitoring, and evaluating their own progress—tend to engage more deeply with the content and retain it better (Schraw & Moshman, 1995). Our study didn't directly assess these factors, but future research should take them into account.

It would also be worth exploring how other variables, like academic background, reading habits, and beliefs about learning—factor into performance. Students who gravitate toward reading and writing might also be those who read more outside of school or come from environments where literacy is highly valued. These background influences could help explain their across-the-board success and might offer more practical insights for teaching than focusing on style preferences alone.

Given the lack of support for matching instruction to learning styles, it is time to reconsider how much weight we give to these diagnostics in educational settings. Instead, we should focus on approaches that are both inclusive and backed by solid evidence. Universal Design for Learning (CAST, 2018) promotes offering information in multiple ways—through text, visuals, audio, and interaction—so that all students have more than one route to engage with the content. This kind of flexibility supports a wider range of learners and fosters adaptable thinking. Evidence-based strategies, such as spaced repetition, interleaving, and elaborative interrogation (Dunlosky et al., 2013), have consistently shown benefits and should be central to how we design our lessons.

Crucially, embracing multimodal instruction does not mean ignoring learner differences. It means supporting them better. Rather than limiting students to a single preferred mode, we can help them build the skills to process information in multiple formats. This is especially important in multilingual or English as a Foreign Language (EFL) contexts, where cognitive flexibility is crucial. The goal should be to expand students' learning repertoires, not constrain them with labels.

So why does the learning style idea remain so appealing? In part, it taps into our natural desire to see ourselves as unique. Like personality quizzes or horoscopes, learning style labels offer a neat and comforting sense of identity. However, as Kahneman (2011) explains, our minds often prefer fast, intuitive thinking (System 1) over slower, more analytical reasoning (System 2), even when the latter is more accurate. The persistence of the learning styles myth underscores the importance of helping educators and learners move beyond intuition and embrace what the evidence truly reveals.

6. CONCLUSION

This study set out to explore whether adapting English language instruction to students' preferred learning styles could lead to measurable improvements in their language performance. Building on a quasi-experimental methodology and a solid foundation of existing literature, the research examined the actual impact of tailoring instruction to visual, auditory, or kinaesthetic preferences. While the idea of matching teaching methods to learning styles has long been promoted in educational settings, the findings of this study align with a growing body of research that questions the effectiveness of this approach. Much like the results reported by Pashler et al. (2008) and Husmann et al. (2023), this study found no statistically significant advantage for students who received instruction in line with their declared learning style. These results suggest that the widespread belief in learning style-based teaching may be more grounded in educational tradition than in solid empirical evidence.

Given the strong influence learning style theory still holds in classrooms and teacher education, especially in contexts like Morocco, where little critical research has been done, these findings invite reflection. While it is essential to acknowledge the appeal of personalising instruction, the evidence suggests that rigidly applying learning styles may not consistently improve learning outcomes as commonly believed. Instead, educators may benefit more from focusing on flexible, evidence-informed strategies that respond to the nature of the content, the cognitive processes involved, and the needs of the entire group. Future research should continue to investigate how learners engage with content in diverse ways, with a focus on approaches grounded in learning science. In doing so, we may shift the focus from categorising learners to truly supporting them through more responsive and inclusive teaching practices.

REFERENCES

Allcock, S. J., & Hulme, J. A. (2010). Learning styles in the classroom: Educational benefit or planning exercise? *Psychology Teaching Review*, *16*(2), 67–79.

Aslaksen, K. M., & Lorås, H. (2019). VARK learning styles and evidence-based educational practices: A review. *Advances in Physiology Education*, *43*(2), 183–186. https://doi.org/10.1152/advan.00137.2018

Bishka, A. (2010). *The myth of learning styles: Igniting debates and initiating improvements*. Routledge.

Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning: A systematic and critical review*. Learning and Skills Research Centre. https://dera.ioe.ac.uk/id/eprint/12973

Dekker, S., Lee, N. C., Howard-Jones, P., & Jolles, J. (2012). Neuromyths in education: Prevalence and predictors of misconceptions among teachers. *Frontiers in Psychology*, *3*, 429. https://doi.org/10.3389/fpsyg.2012.00429

Dunn, R. (1990). Understanding the Dunn and Dunn Learning Styles Model and the need for individual diagnosis and prescription. *Reading, Writing, and Learning Disabilities*, *6*(4), 353–364. https://doi.org/10.1080/0748763900060404

Fleming, N. D. (2001). *Teaching and learning styles: VARK strategies*. Christchurch, New Zealand: Neil Fleming.

Fridley, W. L. (2010). Multiple intelligences and education. In S. Tozer, B. Gallegos, & A. Henry (Eds.), *Handbook of research in the social foundations of education* (pp. 122–132). Routledge.

Gardner, H. (1991). *The unschooled mind: How children think and how schools should teach*. Basic Books.

Gardner, H. (1993). *Multiple intelligences: The theory in practice*. Basic Books.

Honey, P., & Mumford, A. (1992). *The manual of learning styles* (3rd ed.). Peter Honey Publications.

Husmann, P. R., O'Loughlin, V. D., & Braun, M. W. (2023). The enduring myth of learning styles: A survey of evidence-based study strategies and learner beliefs. *Advances in Health Sciences Education*, *28*, 153–170. https://doi.org/10.1007/s10459-022-10115-6

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

Krätzig, G. P., & Arbuthnott, K. D. (2006). Perceptual learning style and learning proficiency: A test of the hypothesis. *Journal of Educational Psychology*, *98*(1), 238–246. https://doi.org/10.1037/0022-0663.98.1.238

Massa, L. J., & Mayer, R. E. (2006). Testing the ATI hypothesis: Should multimedia instruction accommodate verbalizer-visualizer cognitive style? *Learning and Individual Differences*, *16*(4), 321–336. https://doi.org/10.1016/j.lindif.2006.10.001

Newton, P. M., & Salvi, A. (2020). How common is belief in the learning styles neuromyth, and does it matter? A pragmatic systematic review. *Frontiers in Education*, *5*, 602451. https://doi.org/10.3389/feduc.2020.602451

Papanagnou, D., Jones, D., & Fitzgerald, M. (2016). Does tailoring instruction to learning style improve student performance in general surgery clerkship? *Surgery*, *159*(2), 591–598. https://doi.org/10.1016/j.surg.2015.08.016

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest*, *9*(3), 105–119. https://doi.org/10.1111/j.1539-6053.2009.01038.x

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2009). *Learning styles: Concepts and evidence*. Psychological Science in the Public Interest, 9(3), 105–119.

Rogowsky, B. A., Calhoun, B. M., & Tallal, P. (2020). Matching learning style to instructional method: Effects on comprehension. *Journal of Educational Psychology*, *112*(3), 498–511. https://doi.org/10.1037/edu0000383

Scott, C. (2010). The enduring appeal of "learning styles." *Australian Journal of Education*, *54*(1), 5–17. https://doi.org/10.1177/000494411005400102