

EXPLORING LEARNING STYLES TO ACHIEVE ACADEMIC PERFORMANCE

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Abstract: *In education, adapting teaching methods to students' learning styles is a fundamental concern for improving academic performance. This study investigates the importance of identifying and adjusting teaching practices to students' learning styles to optimize academic outcomes. The data collected, both through online teacher questionnaires and literature review, highlight that adapting to individual student preferences can significantly improve academic performance. Teachers recognize that tailoring teaching methods to prevailing learning styles contributes to student success, emphasizing the need to understand the diversity of learning styles in the educational process. These findings underscore the importance of adapting the learning process to the individual needs of students to improve academic performance.*

Keywords: *learning styles; learning environments; teaching strategies;*

academic performance.

1. Introduction

In the field of educational sciences, a critical focus lies in understanding and optimizing learning styles to enhance students' academic performance. The adaptation of teaching methodologies to align with the individual learning styles of students significantly impacts the effectiveness of the educational process (Anca, 2022). Within this context, the present study addresses a crucial issue in modern education: the role of teachers in improving students' academic outcomes by tailoring their teaching strategies to accommodate the diverse learning styles prevalent in the classroom.

The central research question investigates the impact of teachers' identification of students' learning styles on academic performance. This inquiry aims to assess the importance of recognizing individual learning preferences as a means to enhance overall academic achievement. To achieve this objective, the study employs a mixed-method research design, exploring various learning styles, analysing coping strategies, and assessing the influence of learning styles on academic outcomes.

To test the hypothesis that teachers' identification of learning styles positively affects learners' academic results, several research tools were employed. These include direct observation, document analysis, an online questionnaire for academic teachers, and statistical data analysis. The questionnaire delves into teachers' experiences with students' learning styles and their influence on academic performance. Additionally, this study critically examines relevant academic papers authored by various experts in the field of education. All information collected will be treated confidentially, respecting the privacy of the respondents.

In the realm of educational research, a central objective revolves around identifying learners' individual learning styles to enhance students' academic performance (Beth A. R., et al., 2015). To achieve this aim, we will analyse data collected through an online questionnaire and relevant literature resources, paying particular attention to the specificity of participants and their educational backgrounds. This research seeks to make a valuable contribution by shedding light on the role that learning styles play in academic achievement. Additionally, it aims to provide practical recommendations for optimizing the educational process based on these diverse learning preferences.

Nonetheless, a notable limitation of this research lies in the restricted sample size of participants, potentially failing to offer a comprehensive representation of the entire academic population. Given the substantial variations in learning styles and educational contexts, a broader and

more diverse sample would provide a more comprehensive understanding of the topic under investigation.

2. Research methodology

2.1. Mixed research

For this research study, a mixed methods approach—also known as mixed methods research, integrative research, integrative research, multi-method research, pragmatist research, pragmatist research, mixed method, mixed method research, mixed method, multiple method or triangulated study—was applied. According to several authors, it refers to "the category of research in which the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or languages in a single study" (Johnson & Onwuegbuzie, 2004, p. 17). Blended research has been characterized by an integrated and interacting set of assumptions (epistemological, ontological, methodological, and rhetorical) that promote the compatibility thesis that "quantitative and qualitative approaches are neither mutually exclusive nor interchangeable" (Onwuegbuzie & Burgess, 2011, p. 397). The primary objective of employing a mixed-method research approach is to address the following question: "What methods and strategies can effectively identify diverse learning styles among students in relation to academic performance?" This method enables us to comprehensively explore various learning styles exhibited by learners, analyse coping strategies, and assess the impact of these learning preferences on academic outcomes from the perspective of educators.

2.2. Theoretical framework

To investigate the primary research objective of exploring students' diverse learning styles and their impact on academic performance, we employed a mixed-methods approach that integrates both quantitative and qualitative methods. This comprehensive approach allowed us to construct a detailed and nuanced understanding of the phenomenon under study.

To achieve our research objective, we utilized several research methods and tools. First, we observed educational phenomena in their natural context, capturing real-world interactions and behaviours related to learning styles. Additionally, we conducted an in-depth analysis of relevant documents, including academic articles, books, and other literary sources. These materials addressed key topics directly correlated with our research question (Pavel, M., Pavel, D., 2023).

Furthermore, we addressed qualitative research questions by leveraging insights from the literature and observational data. The qualitative component provided valuable context and depth to our investigation. Simultaneously, we employed a quantitative questionnaire survey method to collect specific data related to our study hypothesis (H1). This

survey allowed us to quantify and analyse patterns associated with learning styles and their impact on academic outcomes.

H1: Teachers' identification of learning styles is presumed to improve learners' academic outcomes.

To complete this approach, we conducted statistical analyses on the obtained results to facilitate a rigorous interpretation of our research methodology.

2.3. Personal position

This article serves as an essential work assignment required for the completion of the Foundations of Pedagogy seminar. Within this context, both the teacher and the students meticulously examined the article's structure to fulfil the overarching purpose stated in the title.

2.4. Data collection and analysis

In the context of qualitative basic research, data collection methods included observation, document analysis, and a questionnaire, all rooted in the field of Educational Sciences (Merriam, 2009). The observation method facilitated an exploration of diverse learning styles exhibited by learners across various stages of the Romanian educational system. This exploration aimed to theoretically delineate the dimensions of the term "learning style" and illuminate learning and adaptation strategies.

By establishing a solid bibliographical foundation, this method informed the investigation of our research objective. Additionally, it guided the formulation of a targeted questionnaire comprising ten questions along a single axis. This online questionnaire was administered to academic teachers in Constanța County, involving a cohort of 28 educators representing different stages of Romanian education during the year 2024.

The questionnaire encompasses a comprehensive exploration of the following critical issues related to students' learning styles and their impact on academic performance:

- An assessment of students' learning preferences, observing whether they exhibit a preference for auditory or visual explanations, providing insights into their receptivity to different instructional approaches.
- To investigate whether the clarity and organization of tasks positively influence student performance.
- Identifying the learning strategies that students consistently employ, as observed by teachers.
- Determining students' preference for hands-on learning experiences, such as exercises and laboratory work.
- Observing the association between certain learning styles and higher academic performance.
- Exploring the association between specific learning styles (e.g., auditory, visual) and higher academic achievement.

- The adjustment of teaching methodologies to address the different learning styles of students.
- The need for teachers to adjust their teaching strategies to accommodate diverse learning styles (e.g., using the VARK model: Visual, Auditory, Reading/Writing, Kinesthetic).
- To assess the impact of teaching methods on academic performance. Specifically, we explore whether methods aligned with dominant learning styles contribute to improved student outcomes.
- Observing changes in student performance after implementing teaching methods adapted to individual learning styles.

The responses to these questions serve as an efficient means to gather essential data and acquire relevant information for our study. Additionally, insights extracted from academic papers and other authoritative resources will complement our research. Ultimately, our investigation aims to deepen our understanding of diverse learning styles and their impact on academic performance.

Research Methods: Observation; Theoretical data collection; Questionnaire and statistical data analysis through Google forms and "Jamovi".

In this study, we employed a mixed-methods research approach to investigate and comprehend students' diverse learning styles and their impact on academic performance. Our research methods encompassed observation, theoretical data collection, and a structured questionnaire, each contributing significantly to achieving our research objectives.

Observation is a qualitative research method that involves carefully and systematically observing behaviours and interactions in the participants' natural environment (Runcan, 2023). In our study, we employed observation to analyse the learning styles exhibited by learners across various stages of the Romanian educational system. Through this method, we directly identified several critical aspects:

- How students prefer to receive information—whether through visual, auditory, or kinesthetic channels.
- Insights into the learning strategies students consistently employ.
- Interactions between teachers and students during teaching activities.

Data collection is an essential process in any research study, involving gathering relevant information to answer the research questions (Mahmoudi, 2019). In our study, we employed the following methods to gather relevant information:

- Theoretical Document Analysis: We meticulously examined scholarly articles, books, and other pertinent literature related to learning styles and educational strategies.

- Questionnaire Survey: A pivotal tool for collecting quantitative data, the questionnaire survey involved a substantial sample of participants.
- Statistical Data Analysis: Using the statistical analysis program “Jamovi,” we rigorously analysed the collected data. The reliability coefficient ($\alpha = 0.828$), as indicated in Table 1, surpassed the acceptable threshold (> 0.5). Consequently, we deemed the questionnaire valid, enabling us to interpret the results. These findings were presented as percentages and visualized through graphs generated using the Google Forms questionnaire.

The questionnaire is a quantitative research method used to collect structured data from a large number of respondents (Bocoş, M.-D., et al., 2001). In this study, the questionnaire was purposefully crafted to elicit specific information regarding learning styles and perceptions of academic performance. The questionnaire, consisting of 10 questions, was distributed online and targeted:

- Academic teachers from Constanța County.
- 28 teachers from different stages of Romanian education.

The questionnaire played a pivotal role in our study by providing essential quantitative data to complement qualitative observations. Its purpose was to construct a comprehensive understanding of learning styles and their impact on academic performance. However, it is crucial to note that the questionnaire was not designed for broad generalization. The sample size of subjects was statistically insignificant, rendering it suitable for informational purposes only.

By integrating these research methods—qualitative observations and quantitative data collection—the study yielded detailed insights into how diverse learning styles influence students’ academic outcomes. Furthermore, it highlighted the importance of teachers adapting their teaching strategies to optimize educational success.

2.5. Research ethics

Throughout our study, we adhered rigorously to ethical guidelines governing scientific research. We meticulously cited all bibliographical sources, ensuring transparency and intellectual integrity. Participants’ anonymity was strictly maintained; they were not required to disclose their names. This confidentiality safeguarded their privacy. Prior to data collection, we transparently communicated the research purpose and provided participants with a clear understanding of our objectives. These ethical considerations underscore our commitment to rigorous and responsible research practices.

3. Results

3.1. Theoretical-historical analysis of learning style theories

Learning styles encompass the diverse methods by which individuals prefer to acquire, process, and retain information and skills. Their significance within education stems from the fundamental premise that instructional strategies tailored to these preferences enhance student engagement and promote academic excellence (Dunn, R., Dunn, K. & Perrin, J., 1994). The hypothesis suggests that learning can be optimized if teachers deliver content in a manner that aligns with students' natural inclinations.

The concept of learning styles has intrigued researchers and educators since the early 20th century. Among the well-recognized models is the VARK model which identifies four primary learning preferences: visual learning, auditory learning, reading and writing preferences, and kinesthetic learning (Kendra C., 2023).

According to this model, visual learners' understanding is optimized through visual cues such as diagrams and spatial representations. Auditory learners thrive when information is conveyed through spoken language. Reading/writing learners engage most effectively with text-based input. Kinesthetic learners learn best through hands-on experiences and physical movement. These classifications underscore the uniqueness of each learner and offer valuable insights for educators. Recognizing this diversity, teachers should adopt a differentiated instructional approach—one that tailors methods to accommodate various learning styles. Departing from the traditional uniform approach, this shift allows educators to maximize educational success by reaching every student effectively (Raduan, 1982).

Howard Gardner's theory of multiple intelligences further extends this perspective, suggesting that there are many ways to demonstrate intellectual ability beyond conventional linguistic and logical-mathematical intelligence (Gardner, 1983). Understanding learning styles helps create favourable learning environments and supports students' self-awareness and the development of effective personal learning strategies. By recognizing the existence of different learning styles, educators can promote an atmosphere of respect and inclusiveness for diverse intelligences and learning methods (Silver, H., F., et al., 2000).

The concept of learning styles has garnered considerable attention, yet its empirical foundation remains a subject of scrutiny and debate. Critics contend that robust evidence supporting the effectiveness of tailoring instructional techniques to individual learning styles is lacking (Pashler et al., 2008). While the idea of accommodating learners' preferences may enhance motivation, it does not necessarily translate into improved academic performance. They caution against oversimplifying learning processes, suggesting that while adaptive preferences may boost motivation, this is not a guarantee for improved academic performance.

Despite the criticisms levelled against the concept of learning styles, one undeniable truth prevails: students exhibit diverse preferences and abilities. Consequently, the analysis and recognition of learning styles continue to hold significance within educational contexts. By acknowledging this diversity, educators can tailor their instructional approaches more effectively to meet the unique needs of each student. While the discussion surrounding learning styles remains nuanced and critical, embracing this concept can inspire innovative teaching practices that ultimately benefit all learners (Mulhayatiah, D., et al., 2024).

Learning style theories have evolved to become a fundamental component of educational discourse. These theories posit that individuals exhibit preferred modes of assimilating and processing information. Rooted in cognitive psychology and educational philosophy, learning style theory draws inspiration from early scholars like John Dewey, who championed the significance of customized education. At its essence, this theoretical framework advocates for a personalized approach to teaching—one that acknowledges the diverse cognitive profiles of learners and tailors instruction accordingly.

Throughout the 20th century, significant strides in psychology have given rise to diverse models for classifying learning styles. Among these, David Kolb's seminal work stands out. In the 1980s, Kolb introduced experiential learning theory, which remains influential. Central to this theory is Kolb's Learning Style Inventory (LSI), which categorizes learners into four distinct styles based on their information processing approaches: convergers, divergers, assimilators, and accommodators (Kolb, 1984). These styles are determined by the interaction between the perceptual continuum (concrete experience vs. abstract conceptualization) and the processing continuum (active experiencing vs. reflective observation).

Another prominent approach in the realm of learning styles, as previously discussed, is Fleming's VARK model, which emerged in the 1990s and focuses on sensory modalities as learning environments. Despite its widespread adoption in educational contexts, ongoing debates persist regarding the empirical evidence supporting the VARK model. Critics question its efficacy in significantly enhancing learning outcomes. Nevertheless, educators continue to utilize this framework to tailor teaching strategies to individual learner preferences, emphasizing the importance of accommodating diverse sensory modalities in the pursuit of effective education.

Howard Gardner's theory of multiple intelligences, introduced in his book "Frames of Mind" (1983), further diversified the concept of learning styles. Gardner proposed that intelligence is not a single general ability but a composite of multiple intelligences. His theory initially identified seven intelligences (later expanded to eight and potentially

more), each corresponding to a different domain of competence. This theory supported the concept that teaching could be adapted to capitalize on students' dominant intelligence.

Despite the widespread promotion of learning style theories in education, their empirical foundations have been contested. For example, Pashler (2008) has questioned the practical utility of adapting teaching methods to learning styles, citing a lack of rigorous evidence demonstrating improved student learning through this approach. (Pashler, et al., 2008). However, the appeal of learning styles lies primarily in their recognition of student diversity. They aim to create a more inclusive and responsive educational environment, acknowledging the multifaceted ways in which students learn (Fenwick, T. , J., Parsons, J., 2009).

The evolution of learning style theories signifies a continuous journey to understand and optimize the learning process. Their profound impact on educational strategies suggests a perpetual quest to match teaching techniques to the ways students learn most effectively. Consequently, these theories serve as historical benchmarks that inform contemporary educational practices and continue to be evaluated and refined in light of ongoing research and technological advances in education.

3.2. Appropriate methods to identify learning styles

In educational contexts, the identification of students' learning styles plays a pivotal role in customizing instruction to address their diverse needs. This practice significantly influences educational outcomes (Dunn, R., et al., 1999). Leveraging technological advancements, educators now have access to innovative tools and platforms that facilitate the adaptation of teaching methods to suit individual learning preferences.

Observation and assessment tools are essential strategies in identifying learning preferences. Observation, as a qualitative method, allows teachers to identify students' preferences by analysing their behaviour during learning activities (Fleming, N., D. & Mills, C., 1992)). Assessment tools, such as the VARK questionnaire and Gardner's Multiple Intelligences Theory, provide a quantitative approach (Gardner, 1983). However, Gardner has been criticized for the lack of empirical evidence to support his theory (Waterhouse, 2006).

Recent technological progress has significantly enhanced our ability to identify and accommodate diverse learning styles. Notably, learning management systems (LMSs) and intelligent educational software now leverage adaptive algorithms to discern patterns in student learning behaviours and preferences (Brusilovsky, 2001). These systems analyse vast volumes of student performance data, providing valuable insights into individual learning styles (Baker & Yacef, 2009).

Artificial intelligence (AI) and machine learning enable real-time

personalization. By adapting learning materials based on student interactions, AI enhances instructional effectiveness (Xie et al., 2019). Interactive software, such as simulations and educational games, serve as versatile platforms that simultaneously support multiple learning styles. These interactive tools dynamically recognize and adapt to learners' preferred strategies, fostering engagement and comprehension (Plass et al., 2013).

Upon identifying students' learning styles, curricular adaptations and personalized teaching strategies become imperative to align with their preferred cognitive processing methods. This alignment enhances student engagement and positively impacts academic achievement. Tomlinson (2001) introduced the concept of differentiation in education, which entails tailoring learning experiences by adjusting content, instructional processes, and learning products to match students' individual interests, readiness levels, and learning profiles.

In catering to students with visual learning preferences, educators can employ instructional strategies such as graphic organizers, visual aids, and concept maps (Gilakjani, 2012). Additionally, the integration of technology, such as interactive whiteboards, enables dynamic visual presentations. For auditory learners, fostering discussions, utilizing podcasts, and incorporating musical elements within lessons can effectively reinforce key concepts. Kinesthetic learners, on the other hand, benefit from active engagement through role-playing, hands-on experiments, and physical models. Finally, reading/writing learners can enhance their understanding through targeted note-taking techniques and text-based activities.

Gardner's Multiple Intelligences Theory (1983) argues for the need for curriculum activities that address diverse intelligences, reinforcing the call for multiple teaching strategies. Assessment plays a significant role in curricular adjustments. Assessment practices play a pivotal role in curricular adaptations. Formative assessments enable educators to collect data on students' preferences and strengths (Pashler et al., 2008). Furthermore, summative assessments should be differentiated to account for the varied competencies and learning modalities prevalent within a classroom.

Collaboration between educators is essential in developing a flexible curriculum responsive to learner diversity. Professional learning communities can help share strategies and experiences, supporting different learning styles (DuFour, 2004).

Adapted learning environments are essential in addressing the diverse needs of students and enhancing academic performance (Pashler et al., 2008). Their assessment involves analysing student learning outcomes, soliciting direct feedback from students, and considering evaluations by peers or other educators (Kolb, 1984). Longitudinal studies provide a

comprehensive perspective, shedding light on the enduring impact of these environments (Dweck, 2007). The integration of both quantitative and qualitative data is crucial for comprehending the efficacy of adapted learning environments and informing ongoing adjustments to educational strategies (Brusilovsky, P. & Peylo, C., 2001).

The process of tailoring educational content to accommodate students' diverse learning styles involves acknowledging variations in individual learning preferences and deploying personalized teaching approaches that foster comprehensive and effective learning. By engaging in ongoing self-reflection, rigorous assessment practices, and collaborative efforts, educators can establish an academic environment where each student is afforded the opportunity to thrive.

3.2. The correlation between learning style identification and improving the quality of learning outcomes

Learning styles refer to individuals' preferred cognitive processes for acquiring information within an educational context. Four prominent models for classifying learning styles have been examined: VARK, Kolb, Gardner, and Felder-Silverman. Neil Fleming's VARK model categorizes learners based on their preferences for visual, auditory, reading/writing, or kinesthetic modes of learning (Kendra C., 2023).

Conversely, Kolb's inventory of learning styles delineates an approach to learning encompassing concrete experience, reflective observation, abstract conceptualization and active experimentation, identifying four distinct learning styles (Kolb & Kolb, 2005).

Gardner's (1983) theory of multiple intelligences postulates the existence of eight distinct forms of intelligence, offering a comprehensive framework for understanding differentiated learning (Gardner, 1983). By acknowledging these varied intelligences, educators can tailor instruction to align with the individual strengths of each learner.

The Felder-Silverman Learning Style Model (FSLSM) (1988) outlines a multidimensional approach to understanding learning preferences. It identifies learner preferences on four scales: active/reflective, sensory/intuitive, visual/verbal and sequential/global (Felder & Silverman, 1988). For instance, an active learner may thrive in collaborative group settings, while a reflective learner may excel when working independently. This model emphasizes that learners may exhibit traits along a continuum, rather than being rigidly confined to specific categories (Wanniarachchi, W. & Premadasa, H., 2024).

Beaudry and Klavas (1989) conducted a review of studies that demonstrated a positive relationship between tailoring teaching methods to students' learning styles and academic outcomes. Specifically, when instruction aligns with learners' preferred styles, students tend to achieve higher test scores and develop more positive attitudes toward learning.

Similarly, Dunn and Dunn (1978) advocate for an individualized approach to instruction based on students' learning preferences, emphasizing its potential to enhance academic achievement and maximize student success.

Empirical evidence substantiates this assertion, as depicted in figure 1, which captures teachers' responses to the question, "After applying these methods, have you noticed a change in student performance?". When queried about the impact of implementing tailored teaching methods, 71.4% of teachers reported observing enhanced student performance.

Katz (1990) contends that aligning instructional content and methods with students' preferred learning styles can enhance comprehension and information retention. This principle is grounded in the recognition that learners possess dominant or preferred styles, and tailoring instruction accordingly can positively influence learning outcomes (Fleming & Mills, 1992). Our survey results further corroborate this theory: 67.9% of teachers reported when asked the question, "During lectures, do you notice that some pupils/students prefer to receive auditory explanations while others are more receptive to visual information?" that some students favour auditory explanations, while 17.9% indicated a preference for visual information (Figure 2). Consequently, understanding and accommodating students' learning preferences significantly impact the educational process and academic achievement. Figure 3, which investigates the presence of dominant learning styles within a group of pupils or students, reveals that 71.4% of the teachers observed the existence of such styles, including auditory or visual preferences. This finding implies that discernible patterns in learning preferences emerge within specific student cohorts, offering valuable insights for tailoring instruction to individual needs (Sandu, 2023). The integration of learning style assessments can enhance the effectiveness of instructional design by aligning it more precisely with students' unique requirements. Consequently, understanding and applying these trends in teaching underscore the pivotal role of educators who adeptly identify and respond to students' learning styles, thereby fostering a more efficient and personalized educational experience (Mona B., H. & Costache, C., 2023).

Tokuhama-Espinosa (2010) argues that a comprehensive understanding of the neurological underpinnings of the learning process, coupled with an appreciation for students' unique cognitive profiles, can inform the development of personalized and effective teaching strategies. Analysing the questionnaire results pertaining to the query, "If you have identified your dominant learning style (VARK), have you constructed your teaching strategies in accordance with these styles?" (Figure 4), reveals that 53.6% of teachers indeed align their instructional approaches with identified learning styles. This finding suggests that

these teachers are aware of the intricate relationship between learning style and teaching methodology, emphasizing its significance in achieving high-quality academic results.

Gardner (1983) extended the conventional notion of intelligence by identifying eight distinct forms of intelligence, necessitating adaptive teaching strategies tailored to individual students. This proposition finds empirical support in the results of the questionnaire, specifically in response to the query: “Have you noticed that some pupils/students perform better when given clear and well-organized tasks?” As depicted in figure 5, a substantial 82.1% of pupils/students affirmed that they indeed perform better under such conditions. The clarity of instructional tasks assumes paramount importance in contemporary teaching approaches and assessments, enabling students to augment formal learning experiences through structured and purposeful tasks, ultimately contributing to enduring learning outcomes (Angelo, T. & Cross, K., P., 1993, p. 131).

Facilitating long-term learning necessitates a profound understanding of students’ motivations and the adaptation of teaching practices to align with their individual needs and preferences (Urduan & Maehr, 1995). Analysing responses to the query, “Do you use appropriate methods to address students' different learning styles?”

” (Figure 6), reveals that 57.1% of teachers utilize such methods. This finding aligns with Claxton and Murrell’s (1987) assertion that recognizing multiple intelligences and incorporating them into lesson planning enhances engagement and learning outcomes. Consequently, customizing teaching approaches to accommodate predominant learning styles within the classroom, while also considering other modalities, emerges as a crucial strategy for fostering learning experiences in the long term (Mulhayatiah, D., et al., 2024).

An examination of responses to the question, “Do you consider that the use of teaching methods appropriate to the dominant learning style in the classroom contributes positively to student performance?” (Figure 7), reveals that a significant majority of teachers (75.0%) endorse this proposition. This consensus aligns with prevailing academic understanding, emphasizing that adapting instructional approaches to match prevailing learning styles positively influences academic outcomes. This trend underscores the growing emphasis on individualization and adaptive learning within education. Furthermore, it is plausible that this consensus arises from teachers’ firsthand experiences in the classroom, where they directly observe students’ responses to diverse teaching methodologies (Cojocar, 2022). Therefore, this finding underlines the contemporary shift toward personalized and effective educational approaches in modern education (Anca, 2022).

Pashler et al. (2008) argue the importance of exercising caution when applying learning style assessments in educational contexts, despite the substantial body of research supporting their use. The lack of conclusive evidence necessitates a critical and balanced approach to integrating these assessments into the educational process. Analysing the results from figure 8, which captures responses to the query, “Have you identified specific learning styles associated with higher academic performance?” reveals that 53.6% of teachers recognize a clear link between learning style and improved academic outcomes. Additionally, 25.0% of respondents occasionally identify such associations. However, the variability in teachers’ perceptions and experiences underscores the need for rigorous analysis, as advocated by Pashler et al. (2008). Consequently, continued and comprehensive research is essential to validate the efficacy of assessing and adapting learning styles across diverse educational context.

In figure 9, which captures teachers’ responses to the question, “Have you identified specific learning strategies that pupils/students use on a regular basis?” we explore whether educators have observed students employing particular learning strategies consistently. The results reveal that 53.6% of teachers indicated that learners indeed utilize such strategies, while 21.4% reported occasional usage, and another 21.4% noted sporadic implementation. This outcome suggests heightened awareness and active application of diverse learning strategies, indicative of a responsive approach tailored to students’ learning needs and preferences. Notably, these observations underscore the integration of learning strategies by students, reflecting an understanding of the necessity to adapt instructional methods for optimal academic performance. These findings emphasize the importance of fostering a flexible learning environment that accommodates the diversity of learners’ styles and strategies (Jonker, H., et al., 2020).

The detailed analysis of figures 2, 8, and 9 underlines the importance of comprehending and acknowledging the diversity of learning styles within educational settings. These figures provide a clear insight into how pupils and students adeptly tailor their learning strategies to align with their individual preferences. These results serve as valuable guidelines for enhancing the personalization of the learning process, taking into account the unique requirements of each student.

The correlation between the findings presented becomes evident when examining pupils’ and students’ inclinations toward practical learning methods. figure 10 represents a specific question related to the teacher's opportunity to identify how pupils and students prefer to engage with course content, emphasizing the significance of practical knowledge application. The results indicate that a substantial proportion—67.9%—of teachers have observed that pupils and students favour consolidating

their understanding through hands-on exercises and laboratory experiences (Sri Nopia, S., Juanda, A., Gloria, R., Y., 2022).

This correlation emphasizes the consistent alignment between students' learning preferences and behaviours. The information derived from this data can inform educators in adapting and diversifying teaching methods (Melissa, S., et al., 2017) to more effectively address the unique needs and preferences of individual students. By leveraging this knowledge, educators can create a personalized and efficient learning environment (Beth A. R., et al., 2015), ultimately enhancing student engagement and academic performance.

Consequently, the hypothesis that teachers' identification of learning styles can enhance learners' academic outcomes finds support in both empirical data and existing literature. This assertion gains further validation from the consensus among educators that aligning teaching methods with predominant learning styles within the classroom positively impacts student performance. Moreover, a substantial proportion of teachers actively employ appropriate strategies to accommodate diverse learning styles.

The detailed analysis of pupils' and students' learning preferences and behaviours, along with their integration into the educational process by teachers, underscores the critical importance of recognizing and adapting to the multifaceted spectrum of learning styles within the educational environment. These findings advocate for a personalized approach to learning—one that holds the potential to elevate academic achievement and foster heightened student engagement in learning activities. It is therefore essential that education must continue to champion practices that embrace diversity and adaptability in teaching and learning methodologies.

4. Conclusions

Based on the findings from data analysis and a review of relevant literature, the significance of acknowledging and accommodating individual student preferences within the educational context becomes evident. This assertion gains further validation from the substantial percentage of teachers—75.0%—who recognize that aligning teaching methods with predominant learning styles in the classroom positively impacts student performance. This alignment resonates with Gardner's theory of multiple intelligences and underscores the imperative of comprehending the diverse array of learning styles in both teaching and learning.

The data also reveal that a significant proportion of teachers employ appropriate methods to address students' diverse learning styles, underscoring the importance of customizing instruction to individual student needs. This finding aligns with the 57.1% of teachers who adapt

their methods to accommodate pupils' varying learning styles. Furthermore, robust evidence supports the notion that adjusting teaching methods to align with students' learning styles enhances comprehension and information retention. Notably, students overwhelmingly favour auditory explanations. This alignment with established theories, such as Katz's work and Gardner's theory of multiple intelligences, reinforces the hypothesis that teachers' identification of learning styles can positively impact learners' academic outcomes. Thus, the hypothesis that the identification of learning styles by teachers can improve learners' academic outcomes is supported by both the data analysed and the literature. These findings emphasize the importance of tailoring the learning process to individual learners' needs to improve their academic performance and engagement in learning activities.

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Table 1. Questionnaire reliability coefficient

Statistical reliability scale	
	Cronbach's α
scale	0.827

Tabel 2. Questionnaire - Personalized approaches in education

Welcome to the questionnaire on "Exploring learning styles to achieve academic performance"!

The purpose of this questionnaire is to explore the relationship between teaching strategies and learners' learning styles in order to improve their academic performance, with a focus on your understanding and perceptions of the questionnaire topic.

Please be assured that all responses are anonymous and confidential, and we suggest you answer the questions honestly. It is important for us to understand your perspectives and beliefs as they will help to improve the learning process.

Personal data
Initial name

Nr.	Question	Yes	No	Frequently	Occasionally	Rarely	Never
1.	During lectures, do you notice that some pupils/students prefer auditory explanations, while others are more receptive to visual information.						
2.	Have you noticed that some pupils/students perform better when given clear and well-organized tasks?						
3.	Have you identified specific learning strategies that pupils/students use regularly?						
4.	During your courses, have you noticed that some pupils/students prefer to learn through practical application (exercises, laboratories)?						
5.	Have you identified specific learning styles that are associated with higher academic performance?						
6.	Have you noticed categories of dominant learning styles in your group, such as auditory or visual?						
7.	Do you use appropriate methods to address students' different learning styles?						
8.	If you have identified your dominant learning style (VARK), have you built your teaching strategies according to these styles?						
9.	Do you consider that the use of teaching methods appropriate to the dominant learning style in the classroom contributes positively to student performance?						
10.	After applying these methods, have you noticed a change in student performance?						

Teaching methods play an important role in student achievement. Teachers should be flexible, understand students' preferences and learning styles and adapt strategies to maximize learning success.

What level of education do you teach?	Primary	Secondary	Highschool	University
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Please be honest in choosing the answer that best represents you. Select only one answer for each question. Your answers will be used to analyse educational hypotheses and will be treated confidentially. Thank you!

Figure 1. Change in student performance after applying the methods

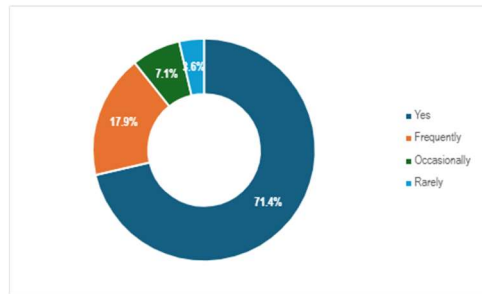


Figure 2. Learning preferences

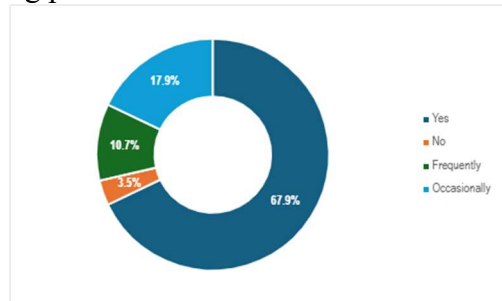


Figure 3. Dominant learning styles

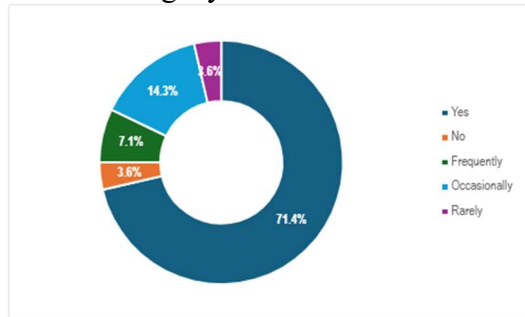


Figure 4. Teaching strategies according to learning styles

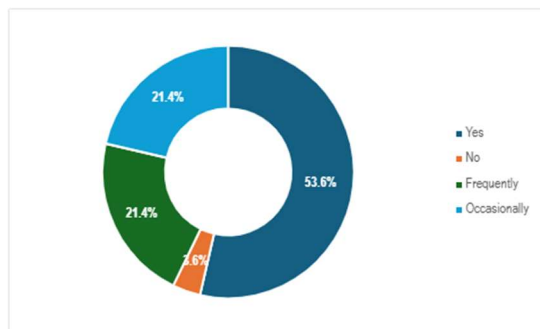


Figure 5. Clear and organized tasks

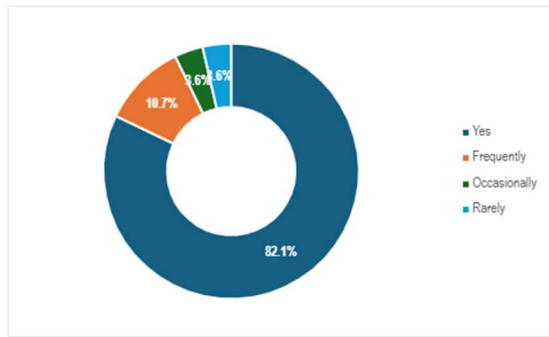


Figure 6. Suitable methods for different learning styles

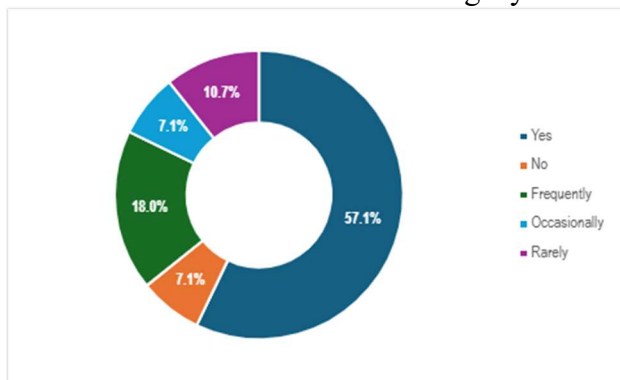


Figure 7. Impact of using appropriate methods

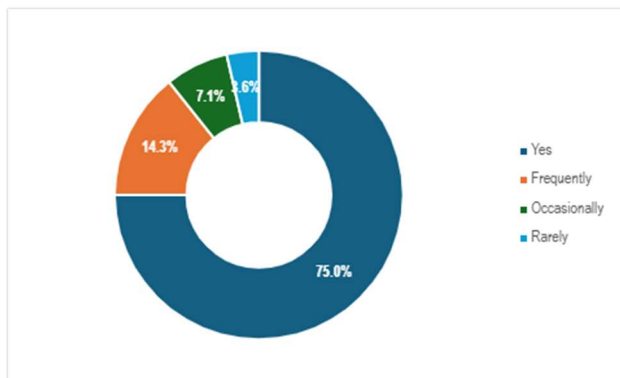


Figure 8. Learning styles associated with higher academic performance

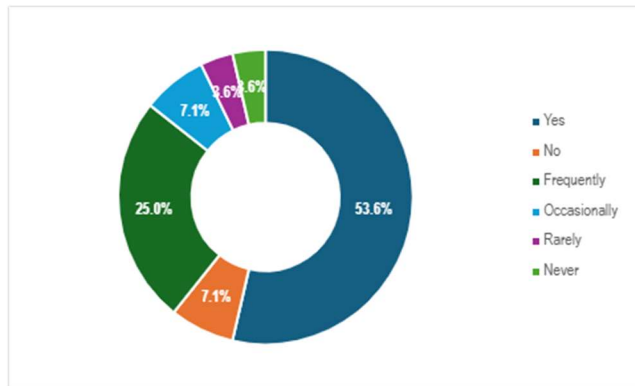


Figure 9. Learning strategies

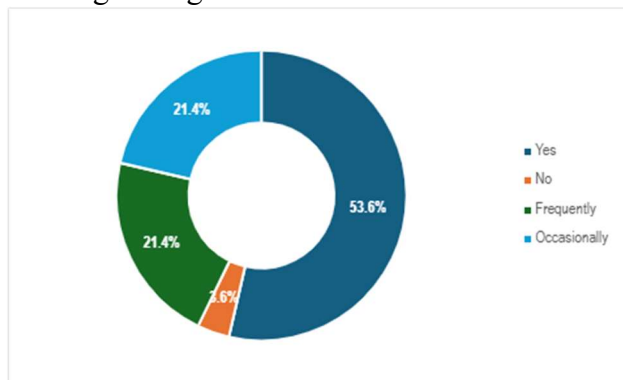


Figure 10. Learning by doing

