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LEARNING STYLE PREFERENCES AND THEIR IMPACT ON STUDENT SUCCESS IN BIOLOGY EDUCATION IN PLATEAU STATE UNIVERSITY, BOKKOS, PLATEAU STATE, NIGERIA.

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Abstract

This study examined the influence of learning styles on academic success in biology among 258 SSII students in Jos North, Plateau State. Findings revealed that kinesthetic learning was the predominant style (34.11%), followed by visual (26.74%), auditory (21.32%), and read/write (17.83%). Analysis of academic performance showed kinesthetic learners achieved the highest mean score (18.0), followed by visual (17.1), auditory (16.0), and read/write learners (15.3), indicating a strong link between learning preferences and achievement. Students strongly supported tailoring instruction to individual styles (mean = 9.9) and using multisensory teaching methods (mean = 7.6) as effective strategies for improving biology learning. The results suggest that aligning teaching approaches with students' learning styles enhances understanding and performance. It is recommended that biology instruction incorporates differentiated, hands-on, and learner-centered strategies to accommodate diverse preferences and improve educational outcomes. This study underscores the importance of recognizing individual learning differences in science education.

Keywords: Learning styles, biology education, kinesthetic learning, academic performance, differentiated instruction.

Introduction

It is commonly believed that learning styles are not really concerned with "what" learners learn, but rather "how" they prefer to learn and it is also an important factor for students' academic achievement and attitudes (Murat, 2013). Students have different strengths and preferences in the ways they take in and process information which is to say, they have different learning styles (Murat, 2013).

According to Eden et al. (2014), individuals who converge in a school as students come from different environments and hence have different learning experiences. Such different experiences make them exhibit different personality traits, including ways of assimilating learning materials. When individuals become conscious of their learning style, and teachers become aware of the styles of their learners, learning motivation and effectiveness increase (Setiawan et al., 2020).

Moses (2024) defines learning styles as the preferred ways in which individuals process, retain, and apply information during the learning process. These styles are influenced by a complex interplay of cognitive, emotional, and environmental factors, and they play a crucial role in the effectiveness of educational practices. He further noted that understanding individual learning preferences is essential in education, as it allows teachers to design more effective instructional strategies, foster student engagement, and ultimately improve educational outcomes. By catering to the diverse learning styles present in a classroom, educators can create a more inclusive and enriching learning environment, where students feel empowered to reach their full potential.

Cecilia (2024) explains that "learning styles" is a term used to describe the various ways learners acquire knowledge. It seeks to explain how people learn. The issue of individual difference is very crucial in learning styles, as it works under the premise that no two persons learn in the same way. There is the understanding that every student learns differently. Learning styles, therefore, refer to an individual's unique way of absorbing, processing, comprehending, and retaining information.

The concept of learning styles has a rich history, with several prominent theorists and researchers contributing to the field over the past decades (Moses, 2024). Notable models include the VAK (Visual, Auditory, Kinesthetic) model, Kolb's Experiential Learning Theory, the VARK (Visual, Auditory, Read/Write, Kinesthetic) model, and the Multiple Intelligences Framework developed by Howard Gardner. These frameworks have helped educators better understand the diverse ways students learn and have emphasized the importance of tailoring teaching methods to meet the needs of individual learners.

Ishrat et al. (2024) emphasize that understanding the impact of learning styles on student achievement is a crucial aspect of educational research and practice. Their study explores the intricate relationship between individual learning preferences and academic success, aiming to unravel the nuances that contribute to or hinder a student's performance in various educational settings. As educators and policymakers strive to create inclusive and effective learning environments, recognizing the diverse ways in which students absorb and process information becomes paramount.

Biology is fundamentally the study of life. It encompasses the study of living organisms, including both plants and animals. It is an integral part of the science curriculum at both senior secondary

and university levels. As one of the important science subjects that enables learners to better understand the world, it is essential to provide effective learning activities for students. This will contribute significantly to the attainment of scientific and technological excellence (Adesoji & Olatunbosun, 2008).

The shift from traditional to progressive education has led to increased interest in learners' individual differences. The new paradigm is student-centered, emphasizing inclusiveness, cooperative learning, and the encouragement of diversity (Zywno, 2002). Increasing research indicates that the interactive process between individual students and teachers is vital in determining the nature and quality of learning outcomes (Nwagbo, 2001). Some scholars argue that it is the teaching method not the teacher that is crucial in science learning. Effective learning is most likely to occur when the teaching method aligns with the students' individual learning styles (Zywno, 2002).

Several studies have examined the relationship between learning styles and academic performance. Dalmolin et al. (2018) discovered a positive connection between learning styles and students' academic performance. Similarly, Magulod Jr. (2019) reported a significant relationship between learning styles and academic performance. Alavi and Toozandehjani (2017) revealed that learning styles can enhance students' learning. In the same vein, Barman et al. (2014) concluded that students' awareness of their learning styles can improve their academic performance.

VARK Theory of Learning

The VARK model of learning styles, as described by Desire (2019), identifies four primary types of learners: Visual, Auditory, Read/Write, and Kinesthetic.

Visual learners prefer to learn through sight. Charts, diagrams, graphs, maps, and other pictorial forms of communication are essential for them. Media such as movies, PowerPoint presentations, or videos can aid their learning.

Aural/Auditory learners prefer learning through hearing. Lectures, spoken word, discussions, and audio recordings are effective methods for this group.

Read/Write learners benefit most from reading and writing activities. Their preferred tools include dictionaries, the Internet, PowerPoint presentations, and written responses. Kinesthetic learners learn best through hands-on experiences. Instructional methods for this group include demonstrations, simulations, videos, and case studies.

According to Dunn and Dunn (1989), learning styles also include dimensions such as global versus analytical, impulsive versus reflective, and individual versus group learning preferences. The essential information provided by this study contributes significantly to the scientific understanding of variables influencing student performance. It offers valuable insights for educators in designing learning experiences, especially in the subject of Biology.

Statement of Problem

Despite various teaching strategies employed in biology education, many students continue to perform poorly or disengage from learning. This raises concerns about whether teaching methods

align with students' individual learning styles. There is a need to investigate the extent to which learning style preferences influence students' academic success in biology and how these preferences can be better accommodated in classroom instruction.

Population of the study

The population for the study comprised all the SSII biology students in Jos North local government Plateau State, which includes both public and private schools in the area. The sample comprised ten senior Secondary School from the tiger area with the sample size of 258 students both male and female.

Purpose of the study

The purpose of the study was to investigate students' learning style preferences and their impact on student success in biology education. Based on this purpose, the study sought to answer the following research questions:

1. What are the predominant learning style preferences among biology students in the target population?
2. Do learning style preferences play a significant role in determining academic success in biology education?
3. In what ways can the teaching and learning of biology be made more effective?

Research Questions one

What are the predominant learning style preferences among biology students?

Learning Styles	Number of Students (F)	Percentages
Visual Learners	69	26.74%
Auditory Learners	55	21.32%
Kinesthetic Learners	88	34.11%
Read/Write Learners	46	17.83%
Total	**258**	**100%**

Table 1 above shows that Kinesthetic learners represent the largest group at 34.11%, making it the predominant learning style within this specific sample. This is followed by Visual learners at 26.74%, Auditory learners at 21.32%, and Read/Write learners at 17.83%. The results clearly indicate that a significant proportion of students prefer a kinesthetic approach to learning. Kinesthetic learners typically engage best with physical activities such as hands-on experiments. Their preference for learning by doing aligns well with active, experiential learning environments, especially in practical subjects like science and biology (Rosita, 2021). Furthermore, understanding the distribution of learning style preferences can help educators adopt differentiated instruction to accommodate various learners, thereby enhancing inclusiveness and academic success across the board.

Research Question Two: Do learning styles preferences play a role in determining academic success in biology education?

Learning Preferences	**Number**	**Total**	**Mean**

	of Students	Scores	
Visual Learners	20	341	17.1
Auditory Learners	20	315	16
Kinesthetic Learners	20	357	18
Read/Write Learners	20	305	15.3

Table 2 reveals that Visual, Auditory, Kinesthetic, and Read/Write learners have mean scores of 17.1, 16.0, 18.0, and 15.3, respectively. This analysis highlights that Kinesthetic learners achieved the highest academic performance in biology, with a mean score of 18.0. This suggests that students who prefer hands-on, experiential learning tend to perform better in subjects like biology, which often involve practical activities such as experiments, dissections, and real-life applications. They are followed by the Visual learners, who achieved a mean score of 17.1, indicating that students who benefit from diagrams, charts, videos, and other visual aids also perform relatively well. Auditory learners recorded a mean score of 16.0, while Read/Write learners had the lowest performance with a mean of 15.3. The lower mean for Read/Write learners may be attributed to the fact that biology, as a science subject, relies heavily on practical understanding and visual interpretation, which may not align well with purely text-based or note-taking approaches. This pattern of results underscores the importance of aligning teaching strategies with students' learning preferences. However, while kinesthetic learners outperformed others, the differences in mean scores are not drastically wide, which may imply that a blended instructional approach incorporating visual, auditory, and tactile elements could benefit all learners regardless of their dominant learning style.

Question Three: How can biology learning be improved?

Frequency of Responses and Calculated Means on Possible Ways of Improving The Learning of Biology Students

In what ways can the teaching and learning of biology be made more effective?

S/N	POSSIBL WAYS	F	Mean
1	Use of Models, Relics and Instructional Materials	24	2.4
2	Giving out Projects to Students	4	0.4
3	Tailor Learning to Individual Styles	99	0.9
4	Using differentiated Instruction	10	1.0

5	Use of Varied Teaching Styles which Stimulate the Five Senses	76	7.6
6	The Use of Audio-Visual Aids	29	2.9
7	The Use of Resources Personnel	2	0.2
8	Structured Study Plans and Regular Revision	1	0.1
9	Encourage students to teach concepts to others to reinforce understanding	4	0.4
10	Provide regular formative assessments and constructive feedback.	9	0.9
TOTAL		**258**	**25.8**

The results show that Tailor Learning to Individual Styles had the highest level of agreement among respondents (frequency = 99, mean = 9.9), highlighting the importance placed on adapting teaching methods to suit diverse learner needs. This was closely followed by Use of Varied Teaching Styles Which Stimulate the Five Senses (frequency = 76, mean = 7.6), reflecting a strong preference for multisensory instructional approaches that can enhance comprehension and retention. Moderate support was given to The Use of Audio-Visual Aids (frequency = 29, mean = 2.9) and Use of Models, Relics and Instructional Materials (frequency = 24, mean = 2.4), suggesting that while these strategies are valuable, they are not viewed as the most critical. On the other hand, Structured Study Plans and Regular Revision (frequency = 1, mean = 0.1) and Use of Resources Personnel (frequency = 2, mean = 0.2) were the least favored, which may be due to challenges in implementation or perceived lower impact. Overall, the findings emphasize a clear preference for interactive and learner-centered strategies over those that are rigid or resource-dependent.

Discussion of Findings

The findings of this study align with existing literature on learning styles and academic performance. The predominance of kinesthetic learners (34.11%) suggests that students in the study population prefer active, hands-on learning experiences consistent with the practical nature

of biology. This finding supports Ismi Rosita (2021), who notes that kinesthetic learners thrive in experiential environments, particularly in science education. The high academic performance of kinesthetic learners (mean = 18.0) reinforces the idea that alignment between teaching methods and learning preferences enhances understanding and retention. Visual learners also performed well (mean = 17.1), likely due to the use of diagrams, models, and videos in biology instruction. In contrast, read/write learners had the lowest mean score (15.3), possibly because biology emphasizes conceptual and practical understanding over rote textual learning. This supports Cecilia (2024), who argues that learning styles significantly affect how students process information. The strong preference for tailoring instruction to individual styles and using multisensory methods highlights students' desire for inclusive, engaging pedagogy. These findings support Moses (2024) and Setiawan et al. (2020), who emphasize that awareness of learning styles boosts motivation and achievement.

Conclusion

This study concludes that learning style preferences significantly influence biology students' academic success. Kinesthetic and visual learners appear to perform better due to the practical and visual nature of the subject. Effective teaching in biology therefore requires learner-centered approaches that acknowledge individual differences. Teachers should integrate hands-on, visual, and auditory strategies while minimizing overreliance on text-based methods.

Recommendations

Teachers should adopt differentiated instructional strategies that accommodate visual, auditory, kinesthetic, and read/write learners to ensure inclusiveness in the classroom. Biology lessons should be designed to incorporate hands-on experiments, models, and simulations that align with the preferences of kinesthetic learners, while also providing visual aids such as charts, diagrams, and videos to support visual learners. The use of multisensory approaches, including audio-visual resources, collaborative discussions, and practical demonstrations, should be encouraged to stimulate deeper understanding and retention. Teacher training programs should emphasize the importance of recognizing and applying learning styles in instructional planning, while schools should provide adequate laboratory facilities and instructional materials to support experiential learning. By embracing these strategies, biology teachers can create an engaging and learner-centered environment that enhances student motivation, participation, and academic performance.

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