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INFLUENCE OF KOLB'S LEARNING STYLES ON STUDENTS' INTEREST IN BASIC SCIENCE IN WEST SENATORIAL ZONE OF NASARAWA STATE, NIGERIA

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Abstract

This study determined the influence of Kolb's learning cycle on students' interest in Basic Science in the Nasarawa-West Senatorial Zone of Nasarawa State, Nigeria. Guided by five research questions and five hypotheses tested at the 0.05 level of significance, the study adopted a descriptive research design. The population consisted of 13,290 Junior Secondary School students, from which a sample of 400 was selected. Two instruments were used for data collection: Kolb's Cycle Learning Inventory (KCLI) and the Basic Science Students' Interest Rating Scale (BASSIRS). Reliability coefficients were 0.86 (KCLI) and 0.81 (BASSIRS), determined using Cronbach Alpha. Data analysis employed means and standard deviations to answer the research questions, while independent t-test was used to test all the hypotheses. Findings revealed that there is no significant difference in the mean interest ratings of students with diverging, converging, accommodating, and assimilating Kolb's learning styles. The study also revealed gender-based differences in interest across the learning styles, with male students generally showing higher interest in diverging, assimilating, and accommodating learning styles, though only the difference in assimilating learning style was statistically significant. The study recommends that teachers adopt differentiated learning styles tailored to learners' preferences, including reflective and collaborative tasks, to foster students' interest in Basic Science in Secondary Schools.

Keywords: Kolb's Experiential Learning Theory, learning styles, students' interest, Basic Science, Junior secondary school, Learner-centered instruction.

Introduction

Education is a cornerstone of national development, driving human capital formation, strengthening institutions, and promoting socio-economic growth. Globally, education empowers individuals and serves as a strategic tool for nations to remain competitive in a knowledge-driven economy. Among educational disciplines, science

education is particularly crucial, fostering critical thinking, creativity, and technological innovation, all of which are essential in a digitally interconnected world (Udo & Udo, 2020; Eze & Obiekwe, 2021). In Nigeria, Basic Science occupies a pivotal role at the junior secondary school level, introducing students to core scientific principles and serving as a foundation for specialized subjects such as Biology, Chemistry, Physics, and Technology. Beyond preparing students for advanced studies, Basic Science equips learners with scientific literacy necessary to navigate complex societal and technological challenges (Lewinski, 2015).

Basic Science education in Nigeria is designed to be transformative, fostering inquiry, environmental awareness, and problem-solving skills (Abdullahi, 2015). It aligns with national development goals, including innovation, industrialization, and self-reliance. Recognizing its significance, the Federal Republic of Nigeria mandated compulsory science and technology education at all levels of basic education (FRN, 2014). In response, the Nigerian Educational Research and Development Council (NERDC) revised the Basic Science curriculum in 2019 to emphasize competencies such as observation, experimentation, logical reasoning, hypothesizing, and scientific communication. The curriculum also integrates global imperatives globalization, ICT, and entrepreneurship to prepare students for participation in the knowledge economy. Its objectives include cultivating scientific curiosity, exposing learners to STEM career opportunities, and producing scientifically literate citizens capable of contributing to national development (NERDC, 2019).

Despite these efforts, the implementation of Basic Science education faces significant challenges. Students' interest remains low, with external assessments such as the Basic Education Certificate Examination (BECE) revealing widespread underperformance. This trend threatens students' academic progression and Nigeria's broader scientific and technological agenda (Gambari & Yusuf, 2017). Research indicates that multiple factors contribute to this poor interest, including abstract scientific concepts, poorly resourced classrooms, and reliance on teacher-centered, didactic methods that fail to engage learners (Samba & Eriba, 2019; Samuel, 2017; Eriba & Samuel, 2018; Samuel, 2019).

Although interventions such as teacher training and provision of instructional materials have been implemented, their impact has been limited. In Nasarawa State, particularly within the Nasarawa-West Senatorial Zone, student performance in Basic Science continues to fall below acceptable standards, as reflected in recent BECE results. These challenges highlight the

urgent need for innovative, student-centered instructional strategies that consider learners' individual needs, learning preferences, and cognitive profiles to enhance engagement, interest, in Basic Science (Fatokun & Samuel, 2019; Samuel & Iliyasu, 2020).

More concerning is the imbalance in students' choice of science and non-science subjects, which is reflected in the low enrollment in science courses at secondary and higher education levels. This trend indicates that many students lack interest in science, often perceiving it as difficult and requiring high intellectual effort. A key challenge in Basic Science education in Nigeria is that conventional teaching methods fail to adequately stimulate learners' interest and cater to their diverse learning needs. The traditional teacher-centered approach, emphasizing rote memorization and passive reception of knowledge, often results in disengagement and lack of enthusiasm (Onasanya & Adegbija, 2019). In the West Senatorial Zone of Nasarawa State, anecdotal evidence and reports from educational stakeholders suggest that many students display low interest in Basic Science, highlighting the need for innovative, learner-centered teaching strategies that respond to individual differences in learning. One promising approach is Kolb's Experiential Learning Theory (ELT), which provides a framework for understanding and addressing variations in learners' styles. According to Kolb (1984), learning is a cyclical process involving four stages: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). These stages represent how learners perceive and transform experiences: engaging in new experiences (CE), reflecting on them (RO), forming or modifying ideas through logical reasoning (AC), and testing concepts in practical contexts (AE).

Kolb identified four primary learning styles arising from different combinations of these stages, each reflecting unique preferences for processing information:

1. **Diverging (CE + RO):** Learners observe and reflect, are imaginative, sensitive, and prefer collaborative activities and brainstorming (Kolb & Kolb, 2005).
2. **Assimilating (AC + RO):** Learners favor abstract reasoning, logical analysis, and structured environments such as lectures, readings, and analytical exercises (Sener & Cokacaliskan, 2018).
3. **Converging (AC + AE):** Learners enjoy applying theories to practical problems and working independently on task-oriented activities (Moser & Wilson, 2023).

4. **Accommodating (CE + AE):** Learners are intuitive, hands-on, action-oriented, and thrive in adaptive, experiential tasks that allow them to learn by doing (Kolb & Kolb, 2017).

Kolb's model provides valuable insights for aligning teaching methods with students' learning preferences, fostering greater engagement, curiosity, and sustained interest in Basic Science (Sener & Cokacaliskan, 2018; Moser & Wilson, 2023). In Nigerian secondary schools, particularly within the West Senatorial Zone of Nasarawa State, students often struggle with interest due to a mismatch between teaching methods and learning preferences. Conventional teacher-centered approaches neglect individual differences in cognition and engagement, limiting students' motivation and curiosity.

Research indicates that instruction aligned with learners' natural preferences enhances interest, making students more likely to engage with content and participate actively in learning (Kolb & Kolb, 2017; Adewale, 2022). Experiential learning principles, such as hands-on activities, reflections, and real-world applications, promote curiosity and stimulate deeper engagement in Basic Science (Ajaja & Eravwoke, 2021).

Despite its potential, empirical studies on the influence of Kolb's learning styles on students' interest in Basic Science remain limited, particularly in rural and semi-urban areas like the Nasarawa-West Senatorial Zone. This study, therefore, investigated the influence of Kolb's learning styles on students' interest in Basic Science, among junior secondary school learners in Nasarawa State.

Statement of the Problem

Despite the importance of Basic Science in building scientific literacy and fostering interest in science-related careers, students at the junior secondary school level in Nigeria often show low engagement in the subject. In the Nasarawa-West Senatorial Zone of Nasarawa State, limited interest in Basic Science is particularly concerning, as it can affect progression into science-oriented disciplines and Nigeria's broader technological development goals. Factors contributing to low interest include abstract scientific concepts and teaching methods that do not align with students' preferred learning styles. When instructional approaches fail to match how students learn best, disengagement and reduced interest often occur, negatively affecting learning outcomes. The theory identifies four learning styles: Diverging, Assimilating, Converging, and Accommodating, each representing a unique way learners process and internalize information. However, the influence of these learning styles on students' interest in Basic Science, particularly in Nasarawa-West Senatorial Zone, with existing studies

showing mixed findings regarding gender differences and engagement. This study, therefore, investigated the influence of Kolb's learning styles on students' interest in Basic Science in the Nasarawa-West Senatorial Zone of Nasarawa State.

Objective of the Study

The purpose of this study was to investigate the influence of students' Kolb's learning styles on students' interest in Basic Science in junior secondary schools in Nasarawa State, Nigeria. The specific objectives of this study were to:

1. determine the influence of Kolb's learning styles on students' interest in Basic Science.
2. ascertain the influence of gender on students' interest in Basic Science Diverging learning style.
3. find out the influence of gender on students' interest in Basic Science Assimilating learning styles.
4. determine the influence of gender on students' interest in Basic Science Converging learning style.
5. ascertain the influence of gender on students' interest in Basic Science Accommodating learning style

Research Questions

The following research questions guided the study:

1. What are the mean interest ratings of students with Kolb's learning styles in Basic Science?
2. What are the mean interest ratings of male and female students with Diverging learning style?
3. What are the mean interest ratings of male and female students with Assimilating learning style?
4. What are the mean interest ratings of male and female students with Converging learning style?
5. What are the mean interest ratings of male and female students with Accommodating learning style?

Hypotheses

The following null hypotheses were formulated and tested at an alpha level of 0.05.

H_{01}: There is no significance difference in the mean interest ratings of students with diverging, assimilating, converging and accommodating Kolb's learning styles in Basic Science.

H_{O2}: There is no significance difference in the mean interest ratings of male and female students with Diverging learning style.

H_{O3}: There is no significance difference in the mean interest ratings of male and female students with Assimilating learning style.

H_{O4}: There is no significance difference in the mean interest ratings of male and female students with Converging learning style.

H_{O5}: There is no significance difference in the mean interest ratings of male and female students with Accommodating learning style.

Methodology

This study employed a descriptive survey research design to investigate the variables of interest among junior secondary school students. The design was considered appropriate because it enabled the collection of data from a representative sample of the population and allowed for generalization of findings without manipulation of the study variables. Descriptive surveys are particularly suitable for examining opinions, characteristics, and behaviours of large groups within their natural settings (Kothari, 2004).

The population for the study comprised 13,290 Junior Secondary School II (JS II) students in Nasarawa West Senatorial Zone of Nasarawa State, Nigeria. The senatorial zone is administratively organized into eight Area Inspectorate Zones spread across five Local Government Areas, namely Kokona, Keffi, Uke, Masaka, Karu, Nasarawa, Udege, and Toto, which collectively formed the sampling frame. To determine an appropriate sample size, Yamane's formula for finite populations was applied at a 0.05 level of significance, yielding a sample of approximately 400 students. A multi-stage sampling technique was adopted to ensure adequate representation of students across the senatorial zone. In the first stage, the Local Government Areas were stratified according to administrative divisions. Schools were subsequently selected proportionately within each Area Inspectorate Zone, after which students were randomly selected from the chosen schools to participate in the study.

Data were collected using three instruments: the Kolb's Cycle Learning Inventory (KCLI), and the Basic Science Students' Interest Rating Scale (BASSIRS). The BASAT consisted of 30 multiple-choice items with four response options and one correct answer, with each correct response awarded one mark. The test assessed students' knowledge, comprehension, and application of selected Basic Science concepts derived from topics covered in the Basic Education Certificate Examination between 2019 and 2023. The Kolb's Cycle Learning Inventory was a 40-item instrument designed to assess individual learning styles along four dimensions: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Responses were rated on a four-point scale, and scores were combined to categorize learners into

diverging, assimilating, converging, or accommodating learning styles. The Basic Science Students' Interest Rating Scale was a researcher-developed 20-item questionnaire designed to measure students' level of interest in Basic Science. The instrument utilized a four-point scale ranging from strongly agree to strongly disagree, with reverse scoring applied to negatively worded items.

The validity of the instruments was established through face and content validation by three experts in Science, Technology and Mathematics Education from Nasarawa State University, Keffi. Their reviews ensured that the items were relevant, clear, and aligned with the objectives of the study. Necessary modifications were made based on their suggestions. The average validation indices obtained were 0.80 for the BASAT, 0.81 for the KCLI, and 0.81 for the BASSIRS, indicating adequate validity. Reliability of the instruments was determined through a trial involving 20 students who were not included in the main sample. The Kuder–Richardson Formula 21 was used to estimate the internal consistency of the BASAT, yielding a reliability coefficient of 0.79, while Cronbach's alpha was employed for the KCLI and BASSIRS, producing coefficients of 0.86 and 0.81, respectively. These coefficients indicated satisfactory reliability.

Data collection was carried out by the researcher with the assistance of four trained research assistants who underwent orientation on the procedures for administering the instruments. The Kolb's Cycle Learning Inventory and the Interest Rating Scale were administered first and completed on-site to ensure a high return rate. All completed questionnaires and test scripts were collected immediately, scored, and collated to ensure completeness and accuracy of the data.

Results

Research Question One

What are the mean interest ratings of students Kolb's learning styles in Basic Science?

Table 1: Mean Interest Ratings of Students with Kolb's Learning Styles

Learning Styles	N	Mean	Std. Deviation	Std. Error
Diverging	104	53.84	6.177	0.606
Assimilating	96	54.77	7.749	0.791
Converging	116	55.78	7.266	0.675
Accommodating	84	55.61	6.546	0.714
Total	**400**	**55.00**	**6.993**	**0.350**

Table 1 gives a summary of the descriptive statistics of the students with their mean interest ratings, standard deviations and standard errors of the mean. From the results, the mean interest ratings of the students with diverging, assimilating, converging and accommodating learning styles are 53.84, 54.77, 55.78 and 55.61 respectively giving an average mean interest rating of 55.00. It can be seen from the table that the mean interest ratings of the students with the learning styles are at same level. Further analysis would reveal if the mean interest ratings are significant or not.

Hypothesis One

There is no significance difference in the mean interest ratings of students with diverging, assimilating, converging and accommodating Kolb's learning styles in Basic Science.

Table 2: Independent Sample t-test for Interest Ratings of Students with Kolb's Learning Styles

(I) LStyles	(J) LStyles	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Diverging	Assimilating	-0.934	0.987	1.000	-3.55	1.68
	Converging	-1.939	0.942	0.241	-4.44	0.56
	Accommodating	-1.771	1.023	0.506	-4.48	0.94
Assimilating	Diverging	0.934	0.987	1.000	-1.68	3.55
	Converging	-1.005	0.962	1.000	-3.56	1.55
	Accommodating	-0.836	1.042	1.000	-3.60	1.93
Converging	Diverging	1.939	0.942	0.241	-0.56	4.44
	Assimilating	1.005	0.962	1.000	-1.55	3.56
	Accommodating	0.169	0.999	1.000	-2.48	2.82
Accommodating	Diverging	1.771	1.023	0.506	-0.94	4.48
	Assimilating	0.836	1.042	1.000	-1.93	3.60
	Converging	-0.169	0.999	1.000	-2.82	2.48

Table 2 presents the results of t-test for equality of mean interest ratings of students with Kolb's learning styles. From the table it can be seen that the t-values of t-test of the diverging learning style versus the other three learning styles (assimilating, converging, accommodating) are respectively 1.000, 0.241, 0.506; greater than the set significant value of 0.05. That of assimilating learning style versus diverging, converging, accommodating learning styles are respectively 1.000, 1.000, 1.000 also greater than 0.05; converging learning style versus diverging, assimilating, accommodating learning styles are respectively 0.241, 1.000, 1.000 and the t-values of accommodating learning style versus diverging, assimilating, converging are 0.506, 1.000, 1.000 respectively. Thus, Table 4.2 reveals that in each pairing of the learning styles the t-values are greater than the set significant value of 0.05 ($p > 0.05$), signifying that the hypothesis of no significant difference in the mean interest ratings of the students with the Kolb's learning styles would not be rejected. The conclusion follows that there are no significant differences in the mean interest ratings of students with diverging, converging, accommodating and assimilating Kolb's learning styles.

Research Question Two

What are the mean interest ratings of male and female students with Diverging learning style?

Table 3: Mean Interest Ratings Male and Female Students with Diverging Learning Style

	Gender	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Interest Div	Male	41	54.15	6.299	0.984
	Female	63	53.63	6.139	0.773
MD			**0.52**		

Table 3 provides a summary of the descriptive statistics for both groups, including their mean interest scores, standard deviations, and standard errors of the mean. From the results, the mean interest ratings for male students with a Diverging learning style is 54.15, while that of female students is 53.63. The mean difference between the male and female students is 0.52 in favour of the male students. Further analysis would determine if the difference is significant or not.

Hypothesis Two

There is no significance difference in the mean interest ratings of male and female students with Diverging learning style.

Table 4 Independent Samples t-test for Interest Ratings of Male and Female Students with Diverging Learning Style

	Gender	N	Mean	Std. Deviation	t-test for Equality of Means t	df	Sig. (2-tailed)
Interest Div	Male	41	54.15	6.299			
	Female	63	53.63	6.139	0.411	102	0.682

Table 4 presents the summary of the independent t-test. The results from the table show a t-value of 0.411 with a degree of freedom (df) of 102. The corresponding p-value (Sig. 2-tailed) is 0.682, which is greater than the conventional significance level of 0.05. This indicates that the difference in mean interest ratings between male and female students with an Assimilating learning style is statistically not significant. The conclusion is the there is no significance difference in the mean interest ratings of male and female students with Diverging learning style.

Research Question Three

What are the mean interest ratings male and female students with Assimilating learning style?

Table 5: Mean Interest Ratings Male and Female Students with Assimilating Learning Style

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Interest Assim	Male	58	57.12	8.129	1.067
	Female	38	51.18	5.526	0.896
MD			**5.94**		

Table 5 presents the descriptive statistics for both groups, including the number of participants (N), mean interest ratings, standard deviation, and standard error of the mean. From the table, the mean interest ratings for male students with an Assimilating learning style is 57.12, while the mean interest ratings for female students is 51.18. The mean difference between the male and female students is 5.94 in favour of

the male students. Further analysis would be done to ascertain the significance of the difference.

Hypothesis Three

There is no significance difference in the mean interest ratings scores of male and female students with Assimilating learning style.

Table 6: Independent Samples t-test for Interest Ratings of Male and Female Students with Assimilating Learning Style

	Gender	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Interest Ass	Male	58	57.12	8.129	3.941	94	0.000
	Female	38	51.18	5.526			

Table 6 provides statistical data, including the mean, standard deviation, and results of the independent samples t-test. The table reveals a t-value of 3.941 with 94 degrees of freedom (df), and a significance (p-value) of 0.000. Since the p-value is less than the conventional alpha level of 0.05, the null hypothesis is rejected. This means there is a statistically significant difference in the mean interest rating scores between male and female students with an Assimilating learning style.

Research Question Four

What are the mean interest ratings of male and female students with Converging learning style?

Table7: Mean Interest Ratings Male and Female Students with Converging Learning Style

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Interest Con	Male	64	56.77	8.035	1.004
	Female	52	54.56	6.047	0.839
MD			**2.21**		

Table 7 presents the descriptive statistics for both groups, including the number of students (N), mean scores, standard deviation, and standard error of the mean. From the table, the mean interest ratings for male students with a Converging learning

style is 56.77, while for female students, it is 54.56. The mean difference between the male and female students is 2.21 in favour of the male students. Further analysis would be done to ascertain the significance of the difference.

Hypothesis Four

There is no significance difference in the mean interest ratings of male and female students with Converging learning style.

Table 8: Independent Samples t-test for Interest Ratings of Male and Female Students with Converging Learning Style

	Gender	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Interest Con	Male	64	56.77	8.035	1.639	114	0.104
	Female	52	54.56	6.047			

Table 8 shows of the summary of the independent samples t-test computed and associated with the study conducted. The t-value obtained is 1.639, with the degree of freedom of 114. The significance level of t-test (Sig. 2-tailed) is 0.104, which is greater than the conventional threshold significant value of 0.05. Since the p-value exceeds 0.05, the hypothesis of no significant difference in the mean interest ratings with converging learning style would not be rejected. This implies that the observed difference in mean interest ratings between male and female students with a Converging learning style is not statistically significant. The conclusion is that there is no significant difference in the mean interest ratings between the male and female students with converging Kolb's learning style.

Research Question Five

What are the mean interest ratings of male and female students with Accommodating learning style?

Table 9: Mean Interest Ratings Male and Female Students with Accommodating Learning Style

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Interest Acc	Male	59	56.24	7.135	0.929
	Female	25	54.12	4.675	0.935
MD			**2.12**		

Table 9 shows that male students (N = 59) have a mean interest rating of 56.24 with a standard deviation of 7.135, while female students (N = 25) have a mean interest rating of 54.12 with a standard deviation of 4.675. The standard deviations suggest that male students' interest ratings are more varied compared to female students, whose responses are more closely clustered around the mean. It can also be seen from the table that the mean difference (MD) between the gender is 2.12 in favour of the male students; further analysis would determine whether the observed difference is statistically significant or not.

Hypothesis Five

There is no significance difference in the mean interest ratings of male and female students with Accommodating learning style.

Table 4.10: Independent Samples t-test for Interest Ratings of Male and Female Students with Accommodating Learning Style

	Gender	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Interest Acc	Male	59	56.24	7.135	1.362	82	0.177
	Female	25	54.12	4.675			

Table 10 shows the t-test for equality of means as: t-value = 1.362 with 82 degrees of freedom and a significance (2-tailed) value of 0.177. Since the significance value (p = 0.177) is greater than the set significant alpha level of 0.05, the hypothesis of no significant difference in the mean interest rating is not rejected. This means that there is no statistically significant difference in the mean interest ratings of male and female students with an Accommodating learning style.

Discussion of Findings

This study investigated how Kolb's learning styles (Diverging, Assimilating, Converging, and Accommodating) influenced students' interest in Basic Science in Secondary Schools. The findings are interpreted through the lens of Kolb's Experiential Learning Theory (1984), which posits that individuals learn best when learning processes align with their preferred ways of processing and internalizing information. The results are further contextualized by contemporary empirical research that supports the Kolb's learning styles in Basic Science Education.

The result of the study does not reveal a significant difference in the mean interest rating of the students with the Kolb's learning styles because the mean interest ratings of the students were similar. The study established that there is no significant difference in the mean interest ratings of the students with diverging, converging, accommodating and assimilating Kolb's learning styles. This result is in agreement with Umar and Ibrahim (2023) who asserted that equal exposure to learning situation is significant and could create good leveling grounds for students to express interest at the same level. Thus, the Kolb's learning styles provide avenues to experience learning of Basic Science with similar focus which would adversely influence their learning outcomes.

Diverging learners, characterized by a preference for observation, reflection, and gathering diverse perspectives, exhibited a pattern where male students reported increased interest in leaning Basic Science. However, the difference was not statistically significant, indicating that both genders responded similarly to the instructional methods employed. This outcome agrees with the findings of Umar and Ibrahim (2023; Nwachukwu and Etim (2020) who support studies that Kolb's learning cycles significantly enhances students' engagement and learning.

In contrast, assimilating learners, who prefer logical reasoning, organized information, and theoretical models, showed a significant gender difference in interest, with male students demonstrating better interest scores than females. This is in agreement with prior research (Abdullahi and Aremu, 2024) indicating that male students often show heightened engagement in STEM subjects when teaching methods emphasize structured, analytic, and interactive approaches. This finding may reflect broader trends observed in STEM education, where males often gravitate towards logical and systematic learning environments. It also underscores the need to explore how instructional designs might better support female Assimilating learners to close interest gaps.

For Converging learners, who favour practical application, problem-solving, and hands-on experimentation, no significant gender differences in interest were found. This suggests that both male and female students equally benefited from the active learning styles involved in this study, such as observation, simulations, and problem-solving tasks. This finding resonates with research by Al-Harthy and Al-Abri (2021); Onwuakpa and Chinwe (2022), who found that learning styles with enhanced classroom activities reduce gender disparities in Basic Science interest. The practical, action-oriented nature of Converging learning would inherently appeal across genders by offering tangible, real-world contexts for scientific concepts.

Similarly, accommodating learners, who prefer learning through experience, trial-and-error, and adapting to new situations, exhibited no significant gender difference in interest levels. This suggests that the hands-on, participatory learning styles adopted were effective for both male and female students. This supports Ojo and Ajayi's (2021) conclusion that when teaching and learning are well structured with learners' preferences, gender-based differences in interest and engagement tend to diminish. Given that Accommodating learners thrive in flexible and dynamic environments, incorporating project-based learning and collaborative activities would continue to promote equitable interest among all students.

Conclusion

The findings of this study indicate that Kolb's learning styles play an important role in shaping students' interest in Basic Science, although overall interest levels did not differ significantly across the four learning styles. Diverging learners exhibited similar interest across genders, suggesting that observation and reflection-based approaches appeal equally to male and female students. In contrast, assimilating learners showed a significant gender difference in interest, with male students demonstrating higher engagement, highlighting the need for instructional strategies that support female learners who prefer structured and theoretical learning approaches. For converging and accommodating learners, no significant gender differences in interest were observed, indicating that practical, problem-solving, and hands-on learning strategies are effective in promoting equitable interest among both male and female students. Overall, the study underscores that recognizing and integrating students' preferred learning styles into Basic Science instruction can enhance engagement while also addressing gender-specific needs. These insights can guide educators in designing inclusive teaching strategies that

optimize students' interest and participation across diverse learning preferences.

Recommendations

Based on the findings of this study, the following recommendations are made to enhance students' interest in thermal energy aligned with Kolb's learning styles:

1. Teachers should adopt different learning styles that cater to the diverse learning preferences of students. Diverging learners, who prefer observation and reflection, should be engaged with multimedia content, reflective discussions, and collaborative activities. Assimilating learners, who excel in logical reasoning and structured environments, should be provided with well-organized lessons, clear explanations, and problem-solving exercises. Converging learners, who are hands-on problem solvers, should participate in experiments and real-world applications of scientific concepts, while Accommodating learners, who learn best through experience, should engage in simulations, project-based activities, and interactive learning experiences.
2. The use of technology-enhanced learning styles should be encouraged. Computer animations and flipped classroom learning styles have potential to increase students' interest in Basic Science learning.
3. Gender differences in interest were observed across different learning styles, emphasizing the need for gender-inclusive teaching and learning styles. Teachers should encourage female students to engage more actively in hands-on and problem-solving activities in the learning processes.
4. Professional development programmes for Basic Science teachers are crucial in implementing these learning styles effectively. Teachers should receive training on identifying students' learning styles and applying appropriate learning techniques.
5. Workshops and training schedules should be organized and focused on integrating Kolb's Learning styles into Science Education, utilizing flipped classrooms and computer animations and adopting interactive and gender-sensitive learning approaches.

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