

Diverse Teaching Styles and Classroom Environment as Predictors of Students' Motivation and Engagement in Physics

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Abstract

This study explored diverse teaching styles and classroom environment as predictors of students' motivation and engagement in Physics in secondary schools in Nigeria. The study adopts a correlational survey research design. The study population was 12,250 students. A sample of 1,210 Students was selected. The instruments for data collection are questionnaires designed by the researchers to assess students' sensitivity to teaching styles, classroom environment, motivation, and engagement in Physics. Pearson Product-Moment Correlation Coefficient was used for data analysis. The findings revealed a significant relationship between diverse teaching styles and students' motivation in physics. There was a significant relationship between the classroom environment and students' motivation in physics in secondary schools. There was a significant relationship between the classroom environment and students' engagement in physics in secondary schools. Based on the findings, it was recommended, among others, that school owners provide adequate school facilities, such as well-built classrooms, to enhance a conducive environment and increase students' willingness to engage in challenging physics tasks.

Keywords: diverse teaching styles, classroom environment, students' motivation, engagement, Physics

Introduction

One major issue in the teaching and learning of physics is the shortage of qualified, well-trained teachers. In many schools, particularly in developing countries, there is a shortage of physics teachers who possess both deep subject knowledge and effective pedagogical skills (Abdullahi, 2017). A teacher's ability to explain complex concepts using relatable examples and hands-on activities may depend significantly on the length of their training and the years of teaching experience in Physics.

Physics is a fundamental science subject that provides a crucial foundation for understanding the natural world. The teaching of Physics is expected to foster critical thinking and problem-solving skills. It is the study of matter, energy, and the fundamental forces that govern the universe. The concepts in physics help explain natural phenomena, from the motion of celestial bodies to the behavior of microscopic particles (Halliday et al., 2013). Physics serves as the backbone of technological advancements, influencing fields such as engineering, medicine, and information technology. Through the application of its principles, physics has contributed to the development of electricity, modern communication systems, transportation, and medical imaging techniques. Innovations such as X-rays, Magnetic Resonance Imaging (MRIs), and radiation therapy in medicine rely on physics to diagnose and treat various health conditions. Similarly,

advancements in computing and telecommunications, including fiber optics and semiconductors, are rooted in fundamental physical principles.

Moreso, physics plays a critical role in addressing global challenges such as climate change, energy production, and space exploration. Research into renewable energy sources, such as solar and wind power, is heavily dependent on understanding fundamental principles of physics, such as thermodynamics and electromagnetism. In the realm of astrophysics and space science, physics enables the study of the universe's origins, the possibility of extraterrestrial life, and the development of space travel technologies.

Beyond its scientific and technological applications, physics also fosters a logical, analytical mindset, helping individuals develop problem-solving skills that are valuable across disciplines. Its emphasis on empirical evidence and mathematical modeling strengthens scientific literacy, enabling individuals to make informed decisions in everyday life. Physics is essential for helping students develop the depth of knowledge and skills needed to ensure scientific and technological advancements. The application of Physics in industry and many other fields makes it crucial for practical living in the modern age of science and technology (Achor et al. 2022). In education, a strong foundation in physics equips students to analyze complex systems, think critically, and apply knowledge to real-world scenarios. As an

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ever-evolving field, the teaching and learning of physics continues to push the boundaries of human knowledge, unlocking discoveries that shape our understanding of the universe and drive innovation using diverse teaching styles.

Diverse teaching styles in physics education, as described by Mazur (1997), refer to the variety of instructional methods, strategies, and pedagogical approaches educators use to facilitate learning, taking into account students' different learning preferences, backgrounds, and abilities. Diverse teaching styles are flexible and adaptive approaches to education that incorporate various instructional techniques, tools, and methodologies to ensure that students with different learning preferences and backgrounds can effectively grasp and retain knowledge. The scope of diverse teaching styles in physics education is broad, as it encompasses various dimensions of learning and instructional delivery. These diverse teaching styles include traditional, student-centered, collaborative, technology-integrated, and specialized. The choice and use of teaching styles involve careful consideration of the pedagogical and psychological features of engagement to create a conducive classroom environment that boosts students' academic performance in Physics.

Classroom environment encompasses the physical, psychological, and instructional elements that shape students' learning experiences. The classroom environment includes factors such as seating arrangements, lighting, ventilation, availability of laboratory equipment and teaching aids, classroom discipline, teacher-student relationships, and the overall classroom atmosphere (Fraser, 2012). A positive classroom atmosphere is characterized by mutual respect, clear expectations, and teacher enthusiasm, which encourages students to take intellectual risks and sustain their interest in challenging subjects like physics (Wubbels, 2012). When students perceive their teacher as approachable and encouraging, they are more likely to attempt complex problem-solving tasks and persist through difficulties. Classroom environments that provide inclusive seating arrangements, diverse representation in learning materials, and explicit anti-bullying policies foster a sense of safety and motivation to learn.

Motivation is the inner drive or willingness of students to actively participate in learning activities and persist in the face of challenges. In physics classes, motivation enhances students' willingness to invest time and effort in developing problem-solving abilities and mastering complex concepts/contents. Students with high motivation tend to show curiosity, enthusiasm, and perseverance, which are necessary and meaningful ingredients for understanding abstract and mathematical concepts in physics. Students are often motivated when they perceive physics as intriguing and applicable to understanding the world around them. The natural curiosity to explore concepts such as gravity, electricity, and quantum mechanics can drive students to engage deeply with the subject. Also, Physics is fundamental to many high-demand careers in Science, Technology, Engineering, and Mathematics (STEM) fields. Students often engage with the subject due to its potential to open doors to lucrative professions (Barmby, 2008). Students can benefit from a teacher who motivates and possesses theoretical and pedagogical content knowledge from how he/she delivers instruction, which could boost their academic engagement in physics.

Students' academic engagement encompasses the behavioral, emotional and cognitive involvement in learning activities (Fredricks et al., 2004). In a physics classroom, engagement reflects the extent to which students are attentive, actively participate in class discussions, complete assignments, and collaborate with peers during experiments or problem-solving tasks. A high level of engagement has been linked to deeper learning, improved academic performance, and increased interest in STEM careers (Christenson, 2012). Academic engagement is defined as the time the learner spends on academic tasks, homework completion, participating in school and class activities, and developing a sense of belonging to school or activity groups (Achor et al., 2022). It is a multidimensional construct depicted by observable and internal activities. It is therefore necessary to find

ways to improve students' academic achievement through affective and behavioral factors. This is because the psychological feature of engagement tends to promote greater student effort and participation in learning difficult concepts when the teacher employs diverse teaching styles.

Theoretical Framework

This work is anchored on Deci and Ryan's (1985) Self-Determination Theory (SDT), which states that students exhibit higher levels of intrinsic motivation when their basic psychological needs for autonomy, competence, and relatedness are fulfilled within the learning environment. Autonomy refers to the sense of control over one's learning, competence pertains to the belief in one's ability to succeed, and relatedness involves the feeling of connection with others in the educational setting. When adequately supported, these needs foster a more engaged and self-motivated learner. The Self-Determination Theory (SDT) serves as a fundamental framework for understanding students' motivation and engagement in physics class.

Deci and Ryan (1985) emphasize that learning environments that nurture autonomy, competence, and relatedness contribute to higher motivation, engagement, and academic success. The authors argue that students are more engaged when they have control over their learning experiences, feel capable of mastering content, and establish meaningful connections with peers and teachers. Additionally, SDT highlights that externally controlled learning environments, in which students have little input, diminish intrinsic motivation, hinder engagement, and undermine learning outcomes.

Objectives

1. Determine the extent to which diverse teaching styles affect students' motivation in physics in secondary schools.
2. Determine the influence of diverse teaching styles on students' engagement in physics in secondary schools.
3. Determine the impact of the classroom environment on students' motivation in physics in secondary schools.
4. Determine the influence of the classroom environment on students' engagement in physics in secondary schools.

Methodology

The study adopts a correlational survey research design. This study was conducted in the Makurdi Local Government Area. The study population comprised 12,250 secondary school students in Makurdi Local Government. A sample of 1,210 Students was selected. The data collection instrument was a questionnaire designed by the researcher to assess students' sensitivity to teaching styles, classroom environment, levels of motivation, and engagement in Physics. The instrument was developed using several rating scales. Section A sought general background information from the respondents, including gender, registration number, and class level. Section B contained 53 items designed to form questionnaires based on the Diverse Teaching Styles inventory, the Supportive Classroom Environment scale, Students' Motivation in physics learning, and Students' Engagement in physics learning. A 4-point scale ranging from *strongly agree* to *strongly disagree* was used. Three experts validated the instrument's initial draft. One of the experts specialized in Measurement and Evaluation, while the other two experts specialized in Physics Education. The validated instrument was pilot-tested with 50 students to establish its reliability using Cronbach's Alpha. The reliability coefficients were 0.76 for the Diverse Teaching Styles inventory, 0.82 for the Supportive Classroom Environment scale, 0.77 for Students' Motivation in physics learning, and 0.66 for Students' Engagement in physics learning. The instrument's full-length reliability was 0.81.

The researchers personally administered the instruments to students in the selected 15 secondary schools within Makurdi Local Government Area. Before administration, the researchers obtained official permission from school authorities and

explained the study's purpose to both staff and students to secure their cooperation. The questionnaire was distributed to the selected 1,838 students during normal school hours in their classrooms. Adequate time was given for respondents to read and complete the questionnaire independently. The researchers, with the assistance of a physics teacher, ensured that students completed the questionnaire under their supervision. All responses were kept confidential and used strictly for research purposes. The collected data were analyzed using the Pearson Product-Moment Correlation Coefficient (r) to answer the research questions and test the null hypotheses at the 0.05 level of significance.

Results

Table 1

Pearson Correlation of Diverse Teaching Styles and Student Motivation in Physics

Variables	1	2
Diverse teaching styles	-	.940*
Students' motivation in Physics	.940*	-

Note. $N = 1,210$. $p = .010$ (2-tailed). * $p < .05$.

Table 1 shows the relationship between diverse teaching styles and students' motivation in physics. The table shows a strong positive linear relationship between diverse teaching styles and students' motivation in physics. The relationship between diverse teaching styles and students' motivation in physics in secondary schools is .940. Table 1 further reveals that $r = .940$, $N = 1210$, $p = .010 < .05$. This implies a significant relationship between diverse teaching styles and students' motivation in physics.

Table 2

Pearson Correlation of Diverse Teaching Styles and Engagement in Physics

Variables	1	2
Diverse teaching styles	-	.661*
Students' motivation in Physics	.661*	-

Note. $N = 1,210$. $p = .010$ (2-tailed). * $p < .05$.

Table 2 presents the Pearson product-moment correlation coefficients for diverse teaching styles and students' engagement in physics in secondary schools. The analysis shows a strong positive linear relationship between diverse teaching styles and students' engagement. Therefore, the relationship between diverse teaching styles and students' engagement in physics in secondary schools is .661. Table 2 further reveals that $r = .661$, $N = 1210$, $p = .001 < .05$. This implies a significant relationship between diverse teaching styles and students' engagement in physics.

Table 3

Pearson Correlation of Classroom Environment and Students' Motivation in Physics

Variables	1	2
Diverse teaching styles	-	.709*
Students' motivation in Physics	.709*	-

Note. $N = 1,210$. $p = .010$ (2-tailed). * $p < .05$.

Table 3 shows the Pearson product-moment correlation coefficient between classroom environment and students' motivation in physics in secondary schools. The analysis shows a strong positive linear relationship between classroom environments and students' motivation in physics. The table shows that the relationship between classroom environment and students' motivation in physics in secondary schools is .709. Table 3 further reveals that $r = .709$, $N = 1210$, $p = .030 < .05$. This indicates a significant relationship between the classroom environment and students' motivation in physics in secondary schools.

Table 4

Pearson Correlation of Classroom Environment and Students' Engagement in Physics

Variables	1	2
Diverse teaching styles	-	.819*
Students' motivation in Physics	.819*	-

Note. $N = 1,210$. $p = .010$ (2-tailed). * $p < .05$.

Table 4 shows the Pearson product-moment correlation coefficient between classroom environment and students' engagement in physics in secondary schools. The analysis shows a strong positive linear relationship between classroom environment and students' engagement in physics in secondary schools. The table shows that the relationship between classroom environment and students' engagement in physics in secondary schools is .819. Table 4 further reveals that $r = .819$, $N = 1210$, $p = .008 < .05$. This implies that there is a significant relationship between the classroom environment and students' engagement in physics in secondary schools.

Discussion

The focus of the current study is the inclusion of the measure of teachers' diverse teaching styles and classroom environment alongside students' motivation and engagement in Physics. This allows for a more in-depth investigation of how different facets of teachers' diverse teaching styles and classroom environments contribute to students' motivation and engagement in Physics.

The relationship between diverse teaching styles and students' motivation in physics in secondary schools was statistically significant. This implies that diverse teaching styles have a meaningful influence on students' motivation in physics classes. Overall, the results indicate that varied instructional approaches enhance students' motivation to learn physics at the secondary school level. The finding aligns with Okebukola and Jegede (2019), who found that students taught using inquiry-based and cooperative learning approaches demonstrated higher levels of intrinsic motivation than those taught with traditional lecture methods. The finding concurs with Achor et al. (2024), who found that students exposed to these diverse strategies and higher motivation scores performed better academically than those in the control group. The research attributed this to the interactive and flexible nature of the teaching styles, which encouraged active involvement in learning physics. The finding also aligns with Achor et al. (2022), who found that the difficulty levels of Physics concepts significantly predicted academic engagement. The study's findings revealed a strong, positive linear relationship between diverse teaching styles and students' motivation in physics. The correlation coefficient ($r = 0.940$) indicates a very strong association between the two variables. This suggests that as teachers employ more diverse teaching styles, students' motivation in physics correspondingly increases.

The study found a statistically significant relationship between diverse teaching styles and students' engagement in physics. This implies that diverse instructional approaches meaningfully influence students' level of participation, attention, and involvement during physics lessons. The finding agrees with Adeyemo (2017), who found that methods such as group discussions, the flipped classroom, and hands-on experiments increased behavioral and cognitive engagement. The finding concurs with Nwagbo and Okoro (2018), who found that students taught with guided inquiry were more likely to ask questions, participate in classroom discussions, and demonstrate critical thinking.

The strong, positive linear relationship between diverse teaching styles and students' engagement in physics in secondary schools indicates that adopting varied teaching strategies enhances students' engagement in physics at the secondary school level. The correlation coefficient ($r = 0.661$) indicates a substantial degree of association between the two variables. This suggests that diverse teaching styles are associated with increased student engagement in physics classes.

The study found a statistically significant relationship between the classroom environment and students' motivation in physics in secondary schools. This implies that the classroom environment meaningfully influences students' motivation during physics lessons. The positive linear relationship found between classroom environment and students' motivation in physics in secondary schools indicates that creating a positive, well-structured classroom environment enhances students' motivation to learn physics at the secondary school level. The correlation coefficient ($r = 0.709$) indicates a strong degree of association between the two variables. This suggests that a more supportive and conducive classroom environment is associated with higher student motivation in physics.

The study found a statistically significant relationship between the classroom environment and students' engagement in physics in secondary schools. This implies that the classroom environment meaningfully influences students' participation, attention, and active involvement during physics classes. The finding aligns with Ogunleye and Babajide (2016), who found that students in classrooms with positive peer interaction, respectful teacher behavior, and clear rules were more attentive, involved, and persistent in completing tasks. The finding is consistent with Obomanu and Akinbobola (2020), who found that the availability of instructional materials, conducive seating arrangements, and the use of visual aids led to increased student participation, collaboration, and sustained attention in physics classes. The finding concurs with Ajayi and Ogunyemi (2021), who found that students who perceived their classroom as supportive and encouraging were more willing to engage in challenging physics tasks.

The strong positive linear relationship found between classroom environment and students' engagement in physics in secondary schools indicates that improving the classroom environment enhances students' engagement in physics at the secondary school level. The correlation coefficient ($r = 0.819$) indicates a very strong degree of association between the two variables. This suggests that a supportive, well-organized classroom environment is associated with higher student engagement in physics lessons.

Conclusion

Based on this study's findings, it was concluded that diverse teaching styles are significant determinants of students' motivation and engagement in physics in secondary schools. This is because the availability of instructional materials, conducive seating arrangements, and the use of visual aids promote increased student participation, collaboration, and sustained attention during physics lessons, thereby enhancing a deeper understanding of physics concepts. The study also concluded that the classroom environment is a significant determinant of students' motivation and engagement in physics in secondary schools. Classrooms that are interactive, supportive, and well-resourced enhance both students' physical and psychological involvement in learning activities. Such environments foster greater behavioral and cognitive engagement, which, in turn, strengthens students' motivation and active participation in physics classes. The study affirms that both diverse teaching styles and a conducive classroom environment play crucial roles in improving students' motivation and engagement in physics at the secondary school level.

Recommendation

Based on the findings of this study, the following recommendations are made:

1. School owners should provide adequate school facilities, such as well-built classrooms, to create a conducive environment that fosters greater willingness to engage in challenging physics tasks.
2. The Parent Teacher Association (PTA), philanthropists, and other charitable organizations should donate materials such as books, desks, whiteboards, and computers to modernize

secondary school learning infrastructure, enhance teaching practices, and optimize engagement in Physics classes.

3. School authorities should ensure that only qualified and well-trained teachers are employed, as incompetence among teachers can undermine students' motivation in physics class.
4. State Governments should provide funds for continuous professional development programmes for physics teachers to upgrade their pedagogical skills and become more competent in their jobs.
5. Physics teachers should adopt a variety of teaching styles to make physics learning interactive and engaging, boosting students' motivation.

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