Classroom Engagement Strategies and Academic Performance of Primary School Pupils: Evidence from Obuasi, Ghana

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Abstract: This study investigates the effect of classroom engagement strategies on the academic performance of primary school pupils in Obuasi Municipal, Ghana. Guided by constructivist learning theory, the study examined the role of three key engagement strategies: use of educational technology, teacher-student interaction, and peer collaboration. A cross-sectional survey design was employed, involving 317 pupils selected through purposive and random sampling. Data were collected using structured questionnaires and analyzed with SmartPLS. The findings revealed that all three engagement strategies positively and significantly influenced academic performance, with peer collaboration emerging as the most influential factor. The study underscores the importance of active and interactive learning environments in enhancing pupils' academic success.

Keywords: Classroom engagement strategies, Academic performance, Educational technology, Teacher-student interaction, Peer collaboration.

1. INTRODUCTION

Academic performance in primary education is widely recognized as the foundation for lifelong learning and personal development. In Ghana, improving pupils' performance has become a national priority, as quality education at the basic level is critical for achieving broader social and economic development goals (Buabeng & Amo-Darko, 2024). Despite reforms and interventions, disparities in learning outcomes remain, highlighting the need to examine classroom-level factors that influence performance. Among these factors, engagement strategies such as the use of educational technology, teacher-student interaction, and peer collaboration are increasingly acknowledged as central to improving academic achievement. The constructivist learning theory provides a useful framework for examining these strategies. It emphasizes that learners actively build knowledge through experiences, social interaction, and collaboration (Arkorful et al., 2020; Salifu & Kala, 2024). This perspective suggests that pupils learn more effectively when they are actively engaged with content, teachers, and peers in ways that encourage critical thinking and participation.

Educational technology has become a key driver of innovation in teaching and learning. Interactive tools such as digital applications, tablets, and online resources can make learning more engaging and accessible. Studies show that technology integration boosts motivation and understanding while supporting diverse learning needs (Owusu-Ansah, 2021; Tagoe et al., 2022). However, its impact is not automatic, as it relies on infrastructure availability and teacher readiness, challenges that remain widespread in many Ghanaian schools. Teacher-student interaction is equally vital, as effective communication and supportive relationships foster motivation, confidence, and academic involvement. Research shows that students who see their teachers as approachable and supportive are more likely to achieve better results (García-Moya et al., 2020; Kobiah, 2024). In Ghana, where classrooms often face resource and instructional difficulties, positive teacher-student interactions can serve as a buffer to enhance learning. Peer collaboration also plays a significant role in performance by encouraging cooperative learning, sharing ideas, and mutual support. Collaborative learning improves problem-solving skills and critical thinking, while also fostering social development (Bassachs et al., 2020; Hsia et al., 2021). In the Ghanaian context, this aligns with cultural traditions of communal learning, making peer engagement a particularly relevant strategy.

Despite the global recognition of these engagement practices, little empirical research has examined their combined influence on academic performance in Ghanaian primary schools. This study, therefore, investigates how the use of educational technology, teacher-student interaction, and peer collaboration affect the academic performance of primary school pupils in Obuasi Municipal. Findings will provide insights to guide policy, teaching practices, and interventions aimed at improving learning outcomes.

2. THEORY AND HYPOTHESES DEVELOPMENT

2.1 Constructivist Learning Theory

Constructivism maintains that learners actively develop their understanding and knowledge through experiences and interactions (Hein, 1991; Zajda, 2021). In the classroom, engagement strategies like using technology, teacher-student interaction, and peer collaboration align with constructivist ideas because they promote active participation, social interaction, and critical thinking. By incorporating technology, students are given experiential learning opportunities. Teacher-student interaction operates within Vygotsky's *zone of proximal development*, while peer collaboration fosters cooperative learning and knowledge building. These strategies collectively encourage deeper learning and are likely to positively impact academic performance. Therefore, the constructivist view offers a strong theoretical foundation for connecting engagement strategies to better learning outcomes.

2.2 Hypothesis development

2.2.1 Use of educational technology and academic performance

The integration of educational technology has become central to modern pedagogy, offering interactive platforms and digital resources that enhance student learning outcomes. Studies show that technology improves access to information, supports differentiated instruction, and fosters learner engagement (Sabri et al., 2024). Research further suggests that educational technology promotes higher-order thinking skills by enabling collaborative learning and self-directed study (Eden et al., 2024). In primary education, tools such as interactive whiteboards, tablets, and learning apps have been linked to improved motivation and academic achievement (Ayuningtyas et al., 2023). However, effectiveness depends on proper implementation, teacher competency, and student readiness.

H1: The use of educational technology has a positive and significant effect on the academic performance of primary school pupils.

2.2.1 Teacher-student interaction and academic performance

Teacher-student interaction plays a vital role in shaping learners' academic outcomes. Positive and supportive relationships foster student motivation, self-confidence, and willingness to participate in classroom activities (Mahfud & Riniati, 2023). Effective interaction also provides timely feedback, clarifies misunderstandings, and creates an emotionally safe learning environment, which enhances academic engagement (ROMANOVSKA & NOVAK, 2024). Research indicates that students who experience strong teacher support perform better academically because they develop stronger learning habits and a sense of belonging in the classroom (Imran et al., 2023). Conversely, poor teacher-student relationships may reduce interest and negatively affect performance.

H2: Teacher-student interaction has a positive and significant effect on the academic performance of primary school pupils.

2.2.3 Peer collaboration and academic performance

Peer collaboration is a key component of active learning, allowing students to engage in cooperative tasks, exchange ideas, and build knowledge together. Collaborative learning has been shown to enhance problem-solving skills, critical thinking, and academic achievement (Xu et al., 2023). Working in groups fosters communication, mutual support, and peer accountability, which motivate students to remain engaged (Warsah et al., 2021). In primary education, peer-assisted learning strategies help children learn from one another through scaffolding, reinforcing concepts, and promoting social development (Fungamwango, 2023). These interactions strengthen comprehension and contribute positively to academic performance.

H3: Peer collaboration has a positive and significant effect on the academic performance of primary school pupils.

Conceptual framework

The conceptual framework of this study illustrates the relationship between classroom engagement strategies and pupils' academic performance. Specifically, it focuses on three dimensions of engagement, use of educational technology, teacher-student interaction, and peer collaboration, as independent variables influencing academic performance as the dependent variable. Grounded in constructivist learning theory, the framework assumes that active participation, meaningful interaction, and collaborative learning enhance knowledge acquisition and overall achievement. Thus, the framework guides the study by showing how these key factors collectively contribute to improving learning outcomes among primary school pupils in Obuasi, Ghana.
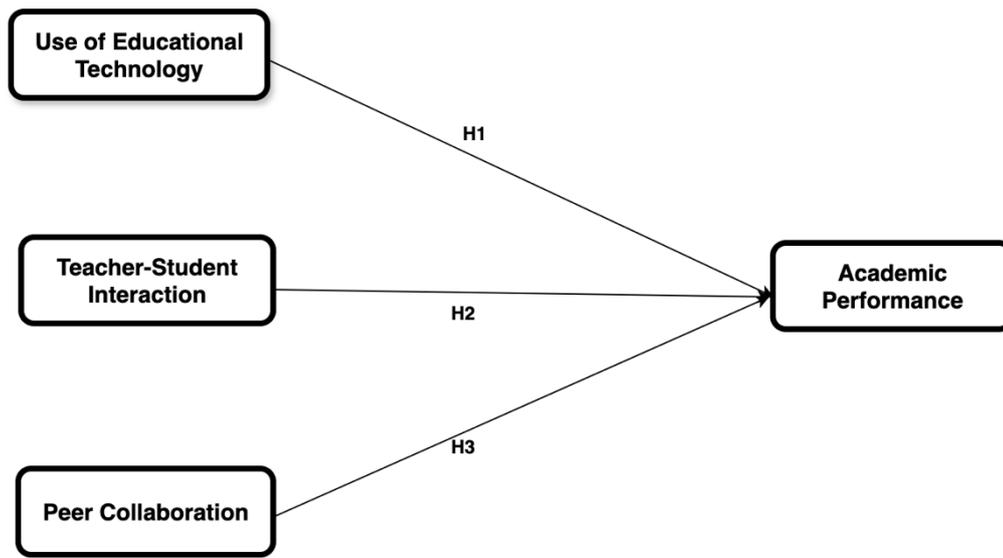

Fig. 1 Conceptual framework

3. METHODOLOGY

3.1 Research design and study area

The study employed a quantitative research design using a cross-sectional survey approach. This design was chosen because it enables the collection of standardized data from a large number of participants at a single point in time, allowing for the examination of relationships between classroom engagement strategies (use of educational technology, teacher-student interaction, and peer collaboration) and academic performance among primary school pupils. The research was conducted in the Obuasi Municipal area in Ghana. Obuasi is well known for its educational and socio-economic diversity, making it a suitable location for examining factors influencing academic performance among primary school pupils.

3.2 Population, sample size, and technique

The target population comprised primary school pupils enrolled in schools within the Obuasi Municipality, Ghana. Using purposive and random sampling techniques, a total of 317 pupils were selected to participate in the study. The sample size was considered adequate to ensure representativeness and reliability of the findings, consistent with recommendations for educational research. A two-stage sampling procedure was adopted. First, schools within Obuasi were purposively selected to ensure accessibility and relevance to the study objectives. Second, pupils were randomly selected from the sampled schools to eliminate selection bias and give each pupil an equal chance of being included in the study.

3.3 Instrument and data collection procedure

A structured questionnaire was developed as the primary instrument for data collection. The questionnaire consisted of four main sections: demographic information, use of educational technology, teacher-student interaction, peer collaboration, and pupils' academic performance. Items were measured using a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5) (Kandasamy et al., 2020). The instrument was adapted from validated scales in previous studies, with minor modifications to suit the primary school context. Permission was first obtained from school authorities, and consent from guardians was obtained before administering the questionnaires. The questionnaires were administered in classrooms

under the supervision of the researcher and trained assistants to ensure clarity of instructions and completion. Pupils were assured of confidentiality and that their responses would be used solely for academic purposes.

3.4 Data analysis and ethical considerations

The collected data were coded with SPSS software and analyzed using SmartPLS for structural equation modeling. Descriptive statistics were used to summarize the demographic characteristics of respondents. Inferential statistics, particularly Partial Least Squares Structural Equation Modeling (PLS-SEM) (Hair & Alamer, 2022), were employed to test the hypothesized relationships between the independent variables and academic performance. Ethical approval was sought from the relevant educational authorities within the Obuasi Municipality. Participation in the study was voluntary, and informed consent was obtained from guardians and the pupils. Respondents were assured of anonymity, confidentiality, and the right to withdraw from the study at any point without penalty.

Table 1: Measurement model (N=317)

Items	Constructs	Loadings	Alpha	CR (rho_a)	CR (rho_c)	Average Variance Extracted (AVE)
Academic Performance	AP1	0.903	0.809	0.819	0.889	0.629
	AP2	0.907				
	AP3	0.741				
Use of Educational Technology	ET1	0.828	0.889	0.902	0.919	0.694
	ET2	0.799				
	ET3	0.760				
	ET4	0.896				
	ET5	0.875				
Peer Collaboration	PC1	0.811	0.910	0.918	0.930	0.691
	PC2	0.798				
	PC3	0.769				
	PC4	0.884				
	PC5	0.862				
	PC6	0.855				
Teacher-Student Interaction	TSI1	0.732	0.788	0.804	0.860	0.606
	TSI2	0.768				
	TSI3	0.821				
	TSI4	0.792				

Note: AVE should ideally be ≥0.50; CR is recommended to be ≥0.70.

Table 2: Discriminant validity

Heterotrait-Monotrait Ratio Criterion				
	Academic Performance	Peer Collaboration	Teacher-Student Interaction	Use of Educational Technology
Academic Performance				
Peer Collaboration	0.810			
Teacher-Student Interaction	0.804	0.706		
Use of Educational Technology	0.713	0.603	0.614	
Fornell-Larcker Criterion				
	Academic Performance	Peer Collaboration	Teacher-Student Interaction	Use of Educational Technology
Academic Performance	**0.793**			
Peer Collaboration	0.787	**0.831**		
Teacher-Student Interaction	0.659	0.775	**0.779**	
Use of Educational Technology	0.641	0.692	0.773	**0.833**

Note: HTMT should be <0.85.

4. RESULTS

Based on the data provided, the results of the study on the effect of classroom engagement strategies on the academic performance of primary school pupils in Obuasi, Ghana, are presented as follows. The measurement model was first assessed for reliability and validity. The constructs demonstrated strong internal consistency, with all Cronbach's Alpha and Composite Reliability values exceeding the recommended threshold of 0.70. Convergent validity was also established, as the Average Variance Extracted (AVE) for each construct was above 0.50. Specifically, Academic Performance had an AVE of 0.629, Use of Educational Technology 0.694, Peer Collaboration 0.691, and Teacher-Student Interaction 0.606. Moreover, discriminant validity was confirmed using two methods. The Heterotrait-Monotrait (HTMT) ratios were all below the conservative threshold of 0.85 (Henseler et al., 2015). Furthermore, according Fornell and Larcker (1981), the square root of the AVE for each construct was greater than its correlations with other constructs, confirming that the constructs are distinct from one another. Furthermore, the structural model was evaluated to test the hypotheses. The results indicate that all three hypothesized relationships were supported. The Use of Educational Technology had a positive and statistically significant effect on Academic Performance ($\beta = 0.087$, p = 0.005). Similarly, Teacher-Student Interaction also had a positive and significant effect ($\beta = 0.129$, p = 0.027). Most notably, Peer Collaboration demonstrated a strong, positive, and highly significant effect on Academic Performance ($\beta = 0.813$, p = 0.000). The study found that the classroom engagement strategies, namely the use of educational technology, teacher-student interaction, and peer collaboration, all have a significant positive impact on the academic performance of primary school pupils in Obuasi, Ghana. Among these strategies, peer collaboration was identified as the most influential factor.

Table 3: **Structural evaluation**

Hypotheses	Relationships	Beta (β)	Standard Deviation	T Statistics	P Values	Decision
H1	ET → AP	0.087	0.189	0.461	0.005	Supported
H2	TSI → AP	0.129	0.058	2.217	0.027	Supported
H3	PC → AP	0.813	0.188	4.315	0.000	Supported

Note: *p*-values below 0.05 will indicate statistical significance.
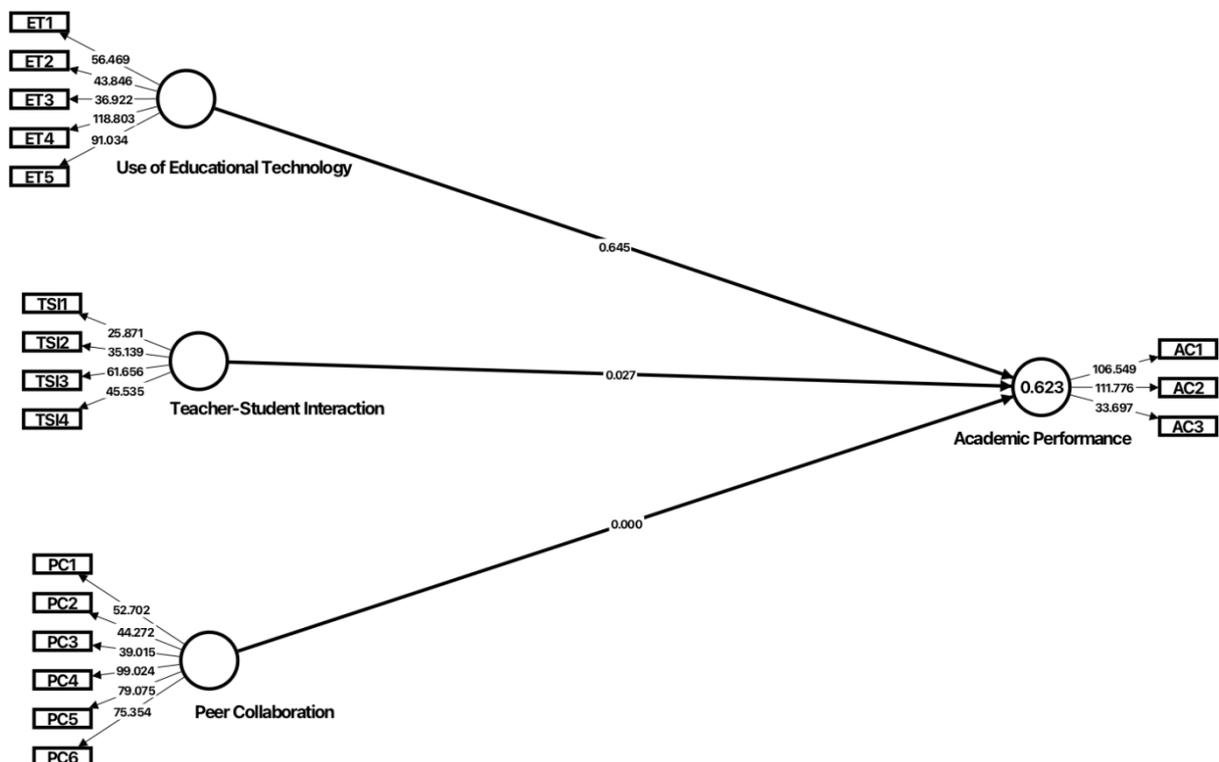

Fig. 2 Structure model

5. DISCUSSION

The findings indicate that all three engagement strategies significantly improved academic performance, supporting earlier studies (Tao et al., 2022; Waheed et al., 2020). Among these, peer collaboration demonstrated the strongest effect, suggesting that collective learning and group support are particularly effective in the Ghanaian primary school context. This may be attributed to cultural orientations toward communal learning and the tendency of pupils to learn effectively from peers within familiar environments. The positive effect of teacher-student interaction also highlights the central role of teacher support in motivating and guiding learners. This aligns with Ellikkal and Rajamohan (2025), who emphasized, that strong teacher relationships foster a safe learning climate and academic confidence. Similarly, educational technology positively influenced performance, though its effect was relatively weaker compared to peer collaboration. This finding suggests that while technology enhances access to resources, its effectiveness depends on infrastructure availability and teachers' digital competence.

5.1 Policy and Practical Implications

The study offers several implications. To begin with, policymakers should prioritize collaborative learning approaches in curriculum design, as peer engagement demonstrated the strongest influence on academic performance. Moreover, practical implications for teachers - teachers should strengthen interactive teaching practices, integrating both technology and supportive teacher-student relationships to maximize learning outcomes. Finally, educational technology - investments in teacher training for effective technology use can enhance the value of digital tools in classrooms.

5.2 Limitations and future research directions

While the study provides valuable insights, certain limitations exist. First, the use of a cross-sectional design limits causal inference between engagement strategies and performance. Second, data were self-reported, which may introduce response bias. Third, the study was limited to one city, Obuasi, which may restrict the generalizability of the findings to other regions of Ghana.

Future research could address these limitations by adopting experimental designs to establish causality between engagement strategies and performance. Expanding the study to multiple regions across Ghana would enhance generalizability. Additionally, exploring moderating factors such as socioeconomic status, school infrastructure, and teacher competence would provide deeper insights into the conditions under which engagement strategies are most effective.

Declaration of Competing Interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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