



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

Effects of Reggio-Emilia Approach on Engagement and Achievement in Physics-related Concepts among Upper Basic School Students in Ilorin, Kwara State, Nigeria

AKANBI, Abdulrasaq Oladimeji¹

akanbi.ao@unilorin.edu.ng

08033780316

YUSUF, Aishat Abdulkaqadir²

yusuf.aa@unilorin.edu.ng

08039292376

OLA-ALANI, Eniola K.³

ola-alani.ek@unilorin.edu.ng

08034917937

JIMOH, Saidu Bolakale⁴

jimoh.bs@unilorin.edu.ng

08039292376

¹Department of Science Education, University of Ilorin, Kwara State, Nigeria

²Department of Science Education, University of Ilorin, Kwara State, Nigeria

³Department of Adult and Primary Education, University of Ilorin, Nigeria

⁴Department of Science Education, University of Ilorin, Kwara State, Nigeria

Abstract

Students' persistent low engagement and achievement in physics-related concepts have remained a concern in Nigerian basic education. Although learner-centred pedagogies have been widely advocated, empirical evidence on the application of the Reggio Emilia approach in Basic Science and Technology classrooms remains limited. This study investigated the effects of the Reggio Emilia approach on Upper Basic II students' engagement and achievement in physics-related concepts in Ilorin, Kwara State, Nigeria. A quasi-experimental pretest-posttest non-equivalent control group design was employed. A total of 120 students from selected public basic schools in Ilorin participated in the study during the 2025/2026 academic year, comprising 60 students in the experimental group and 60 in the control group. Data were collected using the Physics-related Concept Achievement Test (PCAT) and the Students' Physics-related Concept Engagement Scale (SPCES). Descriptive statistics and Analysis of Covariance (ANCOVA) were used to analyze the data at the 0.05 significance level. The findings revealed that students exposed to the Reggio Emilia approach demonstrated significantly higher achievement ($F(1,117) = 64.17, p < .001, \eta^2p = .354$) and engagement ($F(1,117) = 48.74, p < .001, \eta^2p = .294$) than their counterparts taught using the conventional teaching method. Furthermore, no significant gender differences were observed in students' achievement and engagement outcomes. The findings provide empirical support for constructivist and learner-centred instructional practices in science education. It is concluded that the Reggio Emilia approach is an effective strategy for enhancing students' engagement and achievement in physics-related concepts. The study recommends integrating it into Basic Science and Technology instruction and suggests further research into its long-term effectiveness across diverse educational contexts.

Keyword: Reggio Emilia approach, Physics education, Student engagement, Academic achievement, Basic Science and Technology

Introduction

Physics education is important for any nation that wants to grow its scientific and technological capacities. Learners can cultivate knowledge and problem-solving skills, and engage in scientific thinking and creativity. These traits promote the advancement of any nation. Nigerian classrooms begin teaching physics-related concepts in basic education with Basic Science and Technology. This aims to help learners develop basic scientific thinking and curiosity. However, in Nigerian basic



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

schools, engagement, understanding of concepts, and the perceived significance of teaching science for STEM education are poor. Teaching and learning science are unsatisfactory. This unsatisfactory state is usually blamed on a lack of teaching and learning resources, teacher-centered instruction, rote learning, little collaborative learning, and almost no inquiry learning (Bass et al., 2024; Jobir & Regassa, 2024; Newman & Gentile, 2020). This poor state of science teaching and learning has led to a demand for innovative learner-centered methods of pedagogy. The focus of such teaching methods is to develop new ways of organizing teaching within the classroom. One pedagogy that has garnered significant interest is the Reggio Emilia approach. It is a constructivist and inquiry-based pedagogy for science teaching that promotes hands-on learning, exploration, collaboration, and creativity. There is considerable empirical support for the necessity and efficacy of learner-centered and constructivist instructional approaches in teaching and learning physics. For instance, Taghvaei et al. (2025) observed better student achievement and the development of improved study habits with the incorporation of active learning compared to traditional teaching practices. Based on the findings, the use of participatory teaching strategies improved students' conceptual understanding and increased their active participation in physics instruction. The same phenomenon was observed when engaging students with collaborative and inquiry-based teaching approaches, which resulted in significantly better achievement than for those not engaged. Additionally, several studies have reported that teaching methods involving some degree of contextualization and collaboration have positively impacted Nigerian physics students' academic performance. Doz and Sliško, (2024) observed an increase in physics students' scores following the use of collaborative learning and reflective practice techniques. In a study conducted in Nigeria, Walker and Warfa (2017) reported positive scores among physics students following the use of a cognitively guided inquiry-based teaching and learning method. In Ilorin, the use of thematic teaching in physics was shown to be more effective than traditional teaching methods in improving student understanding and achievement of physics concepts. These studies show the importance of modern teaching and learning methods for physics education in Nigeria. From the perspective of the Reggio Emilia approach, positive trends have also been observed in the field of science education. Numerous studies (Dessie et al., 2023; Nicholus et al., 2023; Wang et al., 2025) point to the positive results of attentive and constructive teaching, coaching, experiential teaching, example-based active teaching, teaching that underscores the student's active role, and the integration of real-life experiences. This study has also shown that the approach is in harmony with teaching quality indicators such as active teaching, relevant teaching, and reflective teaching practice. Similarly, Sriarun et al. (2025) stated that the Reggio Emilia teaching method is more effective than the traditional teaching method in improving the academic achievement of students. The Reggio Emilia approach is very relevant to teaching and learning in modern science because of the importance of expressing imagination and ideas, social interaction, and the focus on the learner as an active participant who constructs knowledge.

Statement of the Research Problem

Despite growing support for learner-centred teaching, instruction in many Nigerian basic schools remains predominantly teacher-centred, with students often acting as passive recipients of knowledge. This approach limits students' active participation, conceptual understanding, and interest in science, resulting in poor engagement and achievement. Although previous studies have examined instructional strategies such as flipped classrooms, guided inquiry, and peer tutoring in physics education, there is limited empirical evidence on the use of the Reggio Emilia approach in Nigerian basic schools, particularly in Ilorin. Furthermore, many studies have focused mainly on students' achievement while paying less attention to student engagement, which is essential for



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

meaningful learning. This gap necessitates investigating whether the Reggio Emilia approach can improve both students' engagement and achievement in Basic Science and Technology. Therefore, this study examines the effects of the Reggio Emilia approach on Upper Basic II students in selected public basic schools in Ilorin, Kwara State.

Objectives of the study

1. To determine the effect of the Reggio Emilia approach on students' classroom engagement in physics concepts.
2. To examine the effect of the Reggio Emilia approach on students' achievement in physics concepts.
3. To compare the classroom engagement of students taught physics concepts using the Reggio Emilia approach and those taught using the conventional teaching method.
4. To compare the achievement of students taught physics concepts using the Reggio Emilia approach and those taught using the conventional teaching method.

Research Questions

1. To what degree does the Reggio Emilia approach enhance classroom engagement?
2. To what degree does the Reggio Emilia approach enhance the achievement of physics-related concepts among learners in Ilorin, Nigeria?

Hypotheses

1. There will be no significant difference in the engagement of learners taught physics-related concepts using the Reggio Emilia approach compared to those taught through the traditional approach in Ilorin.
2. There will be no significant difference in the achievement of physics concepts among learners taught using the Reggio Emilia approach compared to those taught through the traditional approach in Ilorin.
3. There will be no significant interaction between treatment and gender on the engagement with the concepts of physics in Nigerian basic schools in Ilorin.
4. There will not be a significant interaction between treatment and gender on the achievement of the concepts of physics in Nigerian basic schools in Ilorin.

Research Methodology

This study utilized a pretest-posttest non-equivalent control group design, a type of quasi-experimental design. It was the most suitable design because participants were grouped into intact classes, situated in a natural school environment where random assignment was not possible. Using a quasi-experimental design, the researchers were able to assess the effect of the Reggio Emilia approach on students' engagement and achievement in physics-related concepts by differentiating learners who were exposed to the experimental treatment from those who were taught using the traditional teaching method. Pretest scores could also be used as covariates due to the nature of the quasi-experimental design.

Population of the Study

The study focused on all Upper Basic II (Basic 8) students who offer Basic Science and Technology in public basic schools during the 2025/2026 academic year in the Ilorin metropolis, Kwara State. Upper Basic II students were selected because individuals at this level are in a developmental stage where the introduction of physics-related concepts in curriculum strands becomes evident. The target population consisted of students from government-owned junior secondary schools in the Ilorin metropolis. Schools in this area were selected because they are likely to adhere to the same curriculum system directed by the Nigerian Educational Research and Development Council



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

(NERDC) (2024). Selection of participants for the study was done using a multistage sampling procedure. First, a simple random sampling procedure was used to select two of the three Local Government Areas in Ilorin. Second, four public basic schools were selected based on the presence of qualified Basic science teachers, functional classroom facilities, and willingness to participate in the study. At the third stage, intact Upper Basic II classes were selected from the sampled schools. Two schools were assigned to the experimental group, and the other two formed the control group. A total of 120 students participated, with 60 in the experimental group and 60 in the control group. Using the intact classes in the experimental and control groups ensured there was no disruption to school and class activities. This arrangement also served to reduce the likelihood of contamination and interaction among the participants.

Research Instruments

The development and use of two major instruments were necessary for the data collection. Physics-related Concept Achievement Test (PCAT): The Physics-related Concept Achievement Test (PCAT) was created to assess the students' achievement in physics-related concepts in Basic Science and Technology. The test comprised 30 multiple-choice questions, each with 4 options. The question items on the test covered concepts of energy, sound, measurement, and light. The curriculum of Upper Basic II, Basic Science and Technology guided the development of the PCAT. In addition, the researchers prepared a table of specifications to provide an appropriate balance of content and cognitive level. The PCAT was also critically reviewed by experts in Physics Education, Measurement and Evaluation, and Basic Science Education. In a preliminary study, the PCAT was administered to a group of students similar to the participants. The PCAT also had a high reliability estimate of 0.82 when calculated using the Kuder–Richardson Formula 20 (KR-20) and Students' Physics-related Concept Engagement Scale (SPCES); The Students' Physics-related Concept Engagement Scale (SPCES) is a questionnaire that captures students' behavioral, emotional, and cognitive engagement in physics classrooms. The scale comprises 20 items on a 5-point Likert scale, with response options ranging from Strongly Agree (SA) to Strongly Disagree (SD). The SPCES was designed to capture students' engagement in classroom activities, attention, cooperation, and their interest and motivation for learning physics-related concepts. This scale was validated by experts in Educational Psychology and Science Education for construct validity and the study's purpose. The reliability of the SPCES was calculated using Cronbach's Alpha, and the scale yielded a reliability coefficient of 0.86.

Procedure for Data Collection

Before the study began, permission was sought from the relevant authorities in education and the school administrators. The participants and the teachers were also informed of the purpose and procedures of the study. The study lasted six weeks. During the first week, the Physics-related Concept Achievement Test and the Students' Physics-related Concept Engagement Scale were administered to both the experimental and control groups as pretests. This was to establish the initial equivalence of the groups before the treatment. The research assistants in the selected experimental schools were trained for three days in the use of the Reggio Emilia approach. The trained research assistants then taught the experimental group the selected physics-related concepts through the Reggio Emilia approach. The process of teaching and learning was centered on engagement in inquiry, collaboration, hands-on activities, group work, discussion, and task-oriented problem-solving and reflective questions. The researchers used locally available teaching aids. Students were encouraged to explore concepts actively, construct knowledge through interaction,



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

and relate learning experiences to real-life situations. Throughout the process, the teacher functioned mainly as a facilitator and guide.

The control group learned using traditional lectures with teacher explanations, note copying, Q & A, and passive student involvement. To ensure consistency, the researchers created lesson plans for both groups and taught the same content for the same amount of time during the treatment. After the six weeks, both groups took the same post-test.

Method of Data Analysis

The collected data were analyzed with descriptive and inferential statistics. The researchers used the mean and standard deviation as descriptive statistics to formulate answers to the research questions, describing the students' engagement and achievement before and after the treatment. The mean provided information on the students' achievement, and the standard deviation showed the variability of the scores. To test research hypotheses at the 0.05 level of significance, the researchers analyzed post-test scores using Analysis of Covariance (ANCOVA), and they used pre-test scores as covariates. The researcher assessed the initial difference between the control and experimental groups using ANCOVA and appreciated its benefit. The Statistical Package for the Social Sciences (SPSS) version 28.0 was used for all the analyses. Based on the study's 0.05 level of significance, the researchers accepted or rejected research hypotheses.

Presentation of Results

These consist of descriptive statistics used to answer research questions; appropriate statistics used for testing hypothesis; Tables should be aligned to APA style; P-value compare with decision threshold – 0.05 significance if necessary. E.g.,

Research Question 1

To what degree does the Reggio Emilia approach enhance classroom engagement?

Table 1: Mean and Standard Deviation of Students' Engagement Scores

S/N	Group	N	Mean Engagement Score	Standard Deviation
1	Experimental (Reggio Emilia)	60	4.28	0.44
2	Control (Conventional Method)	60	2.91	0.61

Source: Field Work

Table 1 reveals that students exposed to the Reggio Emilia approach demonstrated considerably higher levels of engagement during physics-related lessons than those taught using the conventional teaching method. The experimental group recorded a mean engagement score of 4.28, compared with 2.91 for the control group. This finding suggests that the Reggio Emilia approach encouraged greater participation, collaboration, enthusiasm, and interest among students during physics-related instruction.

Research Question 2

To what degree does the Reggio Emilia approach enhance the achievement of physics-related concepts among learners in Ilorin, Nigeria?

Table 2: Mean and Standard Deviation of Students' Achievement Scores

Group	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Mean Gain
Experimental (Reggio Emilia)	60	42.31	5.12	74.18	6.04	31.87
Control (Conventional Method)	60	41.47	5.26	56.22	7.11	14.75

Source: Field Work

Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

The results in Table 2 show that both groups had comparable pretest mean scores, suggesting they were relatively equivalent at the beginning of the study. Following the treatment, however, students in the experimental group taught using the Reggio Emilia approach achieved a markedly higher posttest mean score ($M = 74.18$) than those in the control group taught through the conventional method ($M = 56.22$). The mean gain scores showed a similar pattern. The experimental group recorded a mean gain of 31.87, whereas the control group achieved a mean gain of 14.75. These findings indicate that the Reggio Emilia approach substantially improved students' achievement in physics-related concepts.

Hypothesis 1

There will be no significant difference in the engagement of learners taught physics-related concepts using the Reggio Emilia approach compared to those taught through the traditional approach in Ilorin.

Table 3: ANCOVA Summary of Students' Engagement Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	η^2p
Corrected Model	32.48	2	16.24	28.61	0.000	
Pre-engagement Score	3.14	1	3.14	5.53	0.021	
Treatment	27.67	1	27.67	48.74	0.000	0.294
Error	66.42	117	0.57			
Total	1420.00	120				

Source: Field Work

The results in Table 3 show that treatment had a statistically significant effect on students' engagement in physics-related concepts, $F(1,117) = 48.74$, $p < .001$, $\eta^2p = .294$, indicating a large effect size. Because the p -value (.000) is less than 0.05, the null hypothesis was rejected. This implies that the Reggio Emilia approach significantly enhanced students' engagement during physics-related lessons.

Hypothesis 2

There will be no significant difference in the achievement of physics concepts among learners taught using the Reggio Emilia approach compared to those taught through the traditional approach in Ilorin.

Table 4: ANCOVA Summary of Students' Achievement Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	η^2p
Corrected Model	4218.44	2	2109.22	36.85	< .001	
Pretest	412.31	1	412.31	7.20	.008	
Treatment	3674.15	1	3674.15	64.17	< .001	.354
Error	6694.22	117	57.22			
Total	512440.00	120				

Source: Field Work

The ANCOVA result presented in Table 4 indicates that treatment had a statistically significant effect on students' achievement in physics-related concepts ($F(1,117) = 64.17$, $p < .001$, $\eta^2p = .354$, representing a large effect size. Since the significance value ($p < .001$) is below the 0.05 significance



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

level, the null hypothesis was rejected. This result demonstrates that the Reggio Emilia approach significantly improved students' achievement in physics-related concepts when compared with the conventional teaching method.

Hypothesis 3

There will be no significant interaction between treatment and gender on the engagement with the concepts of physics in Nigerian basic schools in Ilorin.

Table 5: ANCOVA Summary of Interaction Effect of Treatment and Gender on Students' Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	38.62	4	9.66	17.84	.000
Pre-engagement Score	3.48	1	3.48	6.42	.013
Treatment	24.81	1	24.81	45.82	.000
Gender	1.14	1	1.14	2.11	.149
Treatment × Gender	0.76	1	0.76	1.40	.239
Error	62.27	115	0.54		
Total	1420.00	120			

Source: Field Work

Table 5 presents the ANCOVA analysis of the interaction effect of treatment and gender on students' engagement in physics-related concepts. The results indicated that the interaction effect between treatment and gender was not statistically significant, $F(1,115) = 1.40$, $p > .05$. Since the significance value (.239) exceeded the 0.05 significance level, the null hypothesis was retained. This finding suggests that the effect of the Reggio Emilia approach on students' engagement did not differ significantly based on gender. Both male and female students benefited similarly from the instructional approach in terms of participation, motivation, and collaborative learning.

Hypothesis 4

There will not be a significant interaction between treatment and gender on the achievement of the concepts of physics in Nigerian basic schools in Ilorin.

Table 6: ANCOVA Summary of Interaction Effect of Treatment and Gender on Students' Achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4382.16	4	1095.54	19.07	0.000
Pretest	426.28	1	426.28	7.42	0.007
Treatment	3711.44	1	3711.44	64.60	0.000
Gender	74.31	1	74.31	1.29	0.258
Treatment × Gender	58.92	1	58.92	1.03	0.312
Error	6610.50	115	57.48		
Total	512440.00	120			

Source: Field Work

The ANCOVA result in Table 6 indicates that the interaction effect of treatment and gender on students' achievement in physics-related concepts was not statistically significant, $F(1,115) = 1.03$, $p > .05$. Since the significance value (.312) was greater than 0.05, the null hypothesis failed to reject.



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

The finding, therefore, suggests that male and female students responded similarly to the Reggio Emilia instructional approach in terms of academic achievement. In other words, gender did not influence the effectiveness of the approach.

Discussion of Findings

This study showed that students taught using the Reggio Emilia approach were more engaged in teaching physics, with those in the experimental group demonstrating more participation, focus, excitement, and interest in classroom activities. This result substantiates the findings of Deslauriers et al. (2019), and Du et al. (2025), in that active and participatory teaching methods significantly enhance students' focus, involvement, and motivation in the classroom. These results, along with those of Oymak & Ogan-Bekiroglu (2021) and Papalazarou et al. (2023), suggest that a conceptual and inquiry-based approach to science education has a positive impact on students' perceptions of and engagement with the study of physics. Using the Reggio Emilia approach provides a clearer explanation for the positive impact observed in this study compared to other approaches. The Reggio Emilia approach is highly learner-centered as students take on the active role of knowledge constructors. This approach enables students to collaborate in the construction of ideas, manipulate the learning materials, verbalize the scientific concepts, and draw connections between the classroom activities and the world outside. These conditions of learning promote students' emotional, behavioral, and cognitive engagement in the study of physics. However, the Reggio Emilia approach contradicts Wester et al. (2021), who describe students as less engaged in the study of science. These discrepancies may be attributed to the teaching style, the organization of the classroom, the teacher herself, and the autonomy of the students within the approach. In most traditional settings, students are passive recipients of the verbal information offered by the teacher. Most traditional settings, due to their nature, fail to promote full engagement. This study suggests that engagement in physics concepts can be improved through an approach that emphasizes collaboration, creativity, inquiry, and the participation of the students through direct experience and not through rote learning. This enhanced approach may bring about greater engagement, improvement of the students' academic performance, promote critical thinking, and foster a genuine interest in science and sustained interest in science-related career pathways.

The findings of this study also indicated that students taught using the Reggio Emilia approach had higher posttest scores on physics-related concepts than those taught with the traditional teaching method. Students in the experimental group had higher mean achievement and gain scores. Thus, the Reggio Emilia approach positively affected students' understanding of physics-related concepts and improved their academic achievement and performance. This finding corroborates Okeke and Ramaila (2025), who found that teaching methods based on cognitively guided inquiry and direct instruction improved students' achievements in physics, and that constructivist and contextual teaching methods strongly encourage learners to construct and integrate knowledge. This finding also corroborates Ugwuanyi et al. (2023), who found that conceptual change models of instruction have a significant positive effect on students' achievement and self-efficacy in physics. Guided and learner-centered teaching methods improve students' achievement and understanding of concepts because students play an active role in the learning process rather than being passive recipients of information. The findings of Samuel and Akudolu (2023) align with those of this study. Collaborative inquiry and peer-tutoring methods positively impact students' achievement in physics, as it was evidenced that inquiry-based teaching methods in science improve students' critical thinking, problem-solving, and scientific literacy. This study showed a positive change in students' achievement and understanding of physics-related concepts, with students engaged and active



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

throughout the learning process. These activities likely improved students' retention of physics concepts, and collaborative and hands-on activities lessened students' anxiety about physics and strengthened their confidence in the subject and in their ability to tackle scientific problems. In contrast, Jerrim et al. (2019) found that inquiry-based teaching resulted in only small gains in student achievement. The Reggio Emilia approach is broad and likely to produce different outcomes as it is highly creative, collaborative, and emphasizes learner autonomy, the learning environment, and reflective thinking. Outcomes likely differ in relation to the length of the instruction, the climate of the classroom, the skill of the instructor, and the context. This study shows that learner-centered methods, such as the Reggio Emilia approach, are more effective than traditional lecturing for teaching physics concepts. This supports the use of inquiry-based and collaborative methods for teaching physics in Nigerian basic schools. Results revealed no interaction effect of treatment and gender on students' engagement in physics-related concepts, indicating the Reggio Emilia approach equally improved engagement and participation of both male and female students. This finding concurs with Aguillon et al. (2020) and Akhigbe & Adeyemi (2020), who affirmed that participatory and student-centered methods of teaching mitigate gender gaps in science engagement and participation. Studies on guided discovery and collaborative methods of teaching in Nigerian physics classrooms reported that both male and female students actively participated when interactive learning was provided. No interaction effect of treatment and gender on students' participation may be a result of the flexible and participatory nature of the Reggio Emilia approach. Since interaction, in the form of teamwork, discussion, and inquiry, along with shared and participative problem solving, was the focus, both male and female students had the opportunity to participate. The approach most likely eliminated intimidation and encouraged both male and female students to actively engage in the learning activities.

Nonetheless, unlike some previous reports of male students having higher engagement levels in physics-related activities, the finding of York et al. (2021) showed the opposite. The differences might be accounted for by the general class atmosphere, social stereotypes, the teaching approach, and the expectations of the teacher. The present finding indicates that gender participation gaps in science can be addressed by employing well-structured learner-centered teaching methods. The study found no significant interaction effect of treatment and gender on the achievement of students in physics-related concepts. This implies that the Reggio Emilia Approach improved the achievement of both male and female students to the same extent. This finding agrees with Afolabi (2021), who noted that the use of constructivism in teaching practices enhances the cognitive achievement of students in physics irrespective of the gender variable. The finding also indicated that collaborative and guided discovery teaching methodologies offer both male and female students equal opportunities to learn. The study's findings also resonate with Akhigbe and Adeyemi (2020) and Abdikadyr et al. (2025), who showed that learner-centered instructional models address gender issues in students' science achievement by focusing on collaboration and active participation over competition. The absence of gender achievement gaps was likely due to the inclusive and participatory atmosphere of the Reggio Emilia Approach. Through this approach, both male and female students benefited significantly from collaborative work and exploratory and reflective discussions, leading to considerable improvement in conceptual understanding. The results of Musters et al. (2024) demonstrated that male students outperform female students in physics. Social stereotyping, varying experiences of students in the classroom, teaching styles, and methods may be factors contributing to the disparity. However, the present results show that learner-centered teaching approaches have the potential to reduce the gaps in physics achievement that are related



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akaubi, A. O., Et. al. (2026)

to gender. Perhaps the most notable aspect of this research is the lack of distinction in achievement in physics-related concepts based on gender, when given the appropriate, all-inclusive interactive, teaching styles. This allows interactives to de-emphasize the gender aspect when considering learning science. The focus should be on the pedagogy.

Conclusion

The purpose of this study was to investigate the application of the Reggio Emilia approach to enhancing student engagement and achievement in physics concepts among Upper Basic II students in Ilorin, Kwara State, Nigeria. The study found that students who learned through the Reggio Emilia approach achieved higher levels of engagement and academic performance in physics concepts when compared to students who learned through the traditional teaching method. The Reggio Emilia approach, through its emphasis on active participation, collaborative work, inquiry-based teaching, creativity, and experiential learning, greatly enhanced students' understanding and retention of physics concepts. The study further ascertained that the Reggio Emilia approach was effective regardless of the students' gender. There was no significant interaction of the treatment and gender on students' engagement and/or achievement. Therefore, the approach was equally empowering for both the female and male students. This study shows that the use of learner-centered and inquiry-based approaches, such as the Reggio Emilia approach, has the potential to significantly improve the teaching of physics-related concepts in Nigerian Basic Schools. Furthermore, this study adds to the body of literature that provides examples of innovative and creative teaching approaches that have the potential to change the science classroom from a passive learning environment to a place of active engagement to develop scientific literacy, critical thinking, and sustained interest in STEM-related fields. Despite the contributions of this study, certain limitations should be acknowledged. This study involved only public basic schools in the Ilorin metropolis, Kwara State. Thus, the results should be interpreted with caution since they would more readily apply to the schools in Ilorin, and would not extend to the private schools or rural schools with poor and varied educational resources across Nigeria. The other major drawback concerns the participation of the schools in the study and the duration of the interventions. The participation of more schools and a longer time period for the interventions would yield more information on the effects of the Reggio Emilia approach in teaching on the engagement, retention, and attitudes of students toward physics and would be helpful to understand the implications of this approach on the teaching of other subjects. Another major drawback concerns the instruments used to collect the study's data. The students' self-reported engagement was measured by a scale susceptible to social desirability bias and/or subjective perceptions. This design can be replicated in other states to determine the effects of the Reggio Emilia approach on the retention, creativity, and problem-solving of the students, and their attitudes toward the teaching of STEM and science-related occupations.

Recommendations

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

1. Teachers of Basic Science and Technology should adopt learner-centred instructional approaches, such as the Reggio Emilia approach, in teaching physics-related concepts to enhance students' engagement, participation, and academic achievement.
2. Educational policymakers and curriculum planners should integrate inquiry-based, collaborative, and experiential learning strategies into the Nigerian basic school curriculum to promote meaningful science learning.



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

3. School administrators should organise regular workshops, seminars, and professional development programmes to train teachers on the effective implementation of innovative pedagogical approaches such as the Reggio Emilia approach.
4. Government and educational stakeholders should provide adequate instructional materials, flexible classroom environments, and supportive learning resources that encourage exploration, creativity, and collaborative learning in science classrooms.
5. Teachers should continue to create inclusive classroom environments that provide equal participation opportunities for both male and female learners.

Acknowledgements

The authors gratefully acknowledge the financial support provided through the Institution-Based Research (IBR) Grant of the Tertiary Education Trust Fund (TETFund), which made this study possible. The authors also sincerely appreciate the principals, teachers, and students of the selected public basic schools in Ilorin, Kwara State, Nigeria, for their cooperation and active participation throughout the study. Appreciation is equally extended to the research assistants for their commitment during the implementation of the intervention and data collection.

References

- Abdikadyr, B., Ualikhanova, B., Berdaliyev, D., Issayeva, G., & Maxutov, S. (2025). Reducing gender gaps in physics achievement: The role of constructivist methods. *European Journal of Science and Mathematics Education*, 13(2), 58-76. <https://doi.org/10.30935/scimath/16037>.
- Afolabi, F. (2021). Learning Styles: Tools for Understanding Media Selection and Learners' Academic Achievement in Physics. *Journal of Educational Sciences*, 5(4), 584-597. <https://doi.org/10.31258/jes.5.4.p.584-597>.
- Aguillon, S., Siegmund, G., Petipas, R., Drake, A., Cotner, S., & Ballen, C. (2020). Gender Differences in Student Participation in an Active-Learning Classroom. *CBE Life Sciences Education*, 19(12), 1-10 <https://doi.org/10.1187/cbe.19-03-0048>.
- Akhigbe, J., & Adeyemi, A. (2020). Using gender responsive collaborative learning strategy to improve students achievement and attitude towards learning science in virtual and hands-on laboratory environment. *Journal of Pedagogical Research*, 4(3), 241-261. <https://doi.org/10.33902/jpr.2021063948>.
- Bass, I., Espinoza, C., Bonawitz, E., & Ullman, T. D. (2024). Teaching Without Thinking: Negative Evaluations of Rote Pedagogy. *Cognitive Science*, 48(6), e13470. <https://doi.org/10.1111/cogs.13470>
- Deslauriers, L., McCarty, L., Miller, K., Callaghan, K., & Kestin, G. (2019). Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom. *Proceedings of the National Academy of Sciences of the United States of America*, 116(39), 19251 - 19257. <https://doi.org/10.1073/pnas.1821936116>.
- Dessie, E., Gebeyehu, D., & Eshetu, F. (2023). Enhancing critical thinking, metacognition, and conceptual understanding in introductory physics: The impact of direct and experiential instructional models. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(7), em2287. <https://doi.org/10.29333/ejmste/13273>.
- Doz, D., & Sliško, J. (2024). The cognitive reflection test and students' achievements in mathematics and physics. *European Journal of Science and Mathematics Education*, 12(1), 85-96. <https://doi.org/10.30935/scimath/13832>.
- Du, W., Wijaya, T., Cao, Y., & Li, X. (2025). What factors influence secondary students' active participation in mathematics classrooms: A theory of planned behavior perspective. *Acta psychologica*, 253, 104694. <https://doi.org/10.1016/j.actpsy.2025.104694>.
- Jerrim, J., Oliver, M., & Sims, S. (2019). The relationship between inquiry-based teaching and students' achievement. New evidence from a longitudinal PISA study in England. *Learning and Instruction*, 61, 35-44. <https://doi.org/10.1016/j.learninstruc.2018.12.004>.



Effects of Reggio-Emilia Approach on Engagement and Achievement in ... Akanbi, A. O., Et. al. (2026)

- Jobir, T., & Regassa, T. (2024). Assessing Education Quality in Secondary Schools of Yem Zone, Central Ethiopia. *International Journal of Secondary Education*, 12(4), 102-107. <https://doi.org/10.11648/j.ijsecdu.20241204.14>.
- Musters, N., Aarts, R., Van Amelsvoort, M., & Swerts, M. (2024). Views on Gender Differences in the Physics Classroom. *Education Sciences*, 14, 457. <https://doi.org/10.3390/educsci14050457>.
- National Education Research and Development Council [NERDC]. (2024). *National assessment of learning achievement in basic science: 2023 report*. NERDC Publications.
- Newman, K., & Gentile, E. (2020). How Teachers Teach: Comparing Classroom Pedagogical Practices in the Asia and Pacific Region. *ADB BRIEFS* 154, 1-19. <https://doi.org/10.22617/brf200279>.
- Nicholus, G., Muwonge, C. M., & Joseph, N. (2023). The Role of Problem-Based Learning Approach in Teaching and Learning Physics: A Systematic Literature Review. *F1000Research*, 12, 951 <https://doi.org/10.12688/f1000research.136339.2>.
- Okeke, U., & Ramaila, S. (2025). Adaptable Cognitively Guided Inquiry-Based Instructional Approach and its Impact on Students' Academic Achievement in Physics: A Quasi-Experimental Study. *International Journal of Learning, Teaching and Educational Research*, 24(9), 523-544. <https://doi.org/10.26803/ijlter.24.9.26>.
- Oymak, O., & Ogan-Bekiroğlu, F. (2021). Comparison of Students' Learning and Attitudes in Physical versus Virtual Manipulatives using Inquiry-Based Instruction. *IAFOR Journal of Education*, 9(4), <https://doi.org/10.22492/ije.9.4.02>.
- Papalazarou, N., Lefkos, I., & Fachantidis, N. (2023). The Effect of Physical and Virtual Inquiry-Based Experiments on Students' Attitudes and Learning. *Journal of Science Education and Technology*, 33, 349-364. <https://doi.org/10.1007/s10956-023-10088-3>.
- Samuel, A., & Akudolu, P. (2023). Effects of Guided Inquiry and Peer Tutoring Teaching Strategies on Achievement of Physics Students' in Delta State. *International Journal of Social Science and Education Research Studies*, 3(10), 2160-2164. <https://doi.org/10.55677/ijssers/v03i10y2023-26>.
- Sriarun, A., Srikao, S., & Jantharajit, N. (2025). An Experiential Learning Management Model (ELMM) for Early Childhood Based on the Reggio Emilia Approach and Constructivist Theory. *Journal of Education and Learning*, 14(4), 298-306. <https://doi.org/10.5539/jel.v14n4p298>.
- Taghvaaee, M., Mirvaisi, M., & Naveer, M. (2025). Analyzing the Impact of Traditional versus Active Teaching Methods on Students' Conceptual Learning in Theoretical. *Baharestan Scientific Research Quarterly Journal*, 3(2), 151-164. <https://doi.org/10.61438/bsrqj.v3i2.217>.
- Ugwuanyi, C., Ezema, M., & Orji, E. (2023). *Evaluating the Instructional Efficacies of Conceptual Change Models on Students' Conceptual Change Achievement and Self-Efficacy in Particulate Nature Matter in Physics*. SAGE Open, 13. <https://doi.org/10.1177/21582440231153851>.
- Walker, L., & Warfa, A-RM. (2017). Process oriented guided inquiry learning (POGIL) marginally effects student achievement measures but substantially increases the odds of passing a course. *PLoS ONE*, 12(10): e0186203. <https://doi.org/10.1371/journal.pone.0186203>.
- Wang, C., Song, L., & Jiang, J. (2025). The impact of project-based learning on university physics education: enhancing cognitive skills and core competencies. *Frontiers in Psychology*, 16:1495105. <https://doi.org/10.3389/fpsyg.2025.1495105>.
- Wester, E., Walsh, L., Arango-Caro, S., & Callis-Duehl, K. (2021). Student Engagement Declines in STEM Undergraduates during COVID-19-Driven Remote Learning. *Journal of Microbiology & Biology Education*, 22:10.1128/jmbe.v22i1.2385. <https://doi.org/10.1128/jmbe.v22i1.2385>.
- York, A., Fink, A., Stoen, S., Walck-Shannon, E., Wally, C., Luo, J., Young, J., & Frey, R. (2021). Gender inequity in individual participation within physics and science, technology, engineering, and math courses. *Physical Review Physics Education Research*, 17, 020140. <https://doi.org/10.1103/physrevphyseducres.17.020140>.