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THE EFFECT OF THE QUIZIZZ-ASSISTED PROJECT BASED LEARNING MODEL ON STUDENTS' MATHEMATICS LEARNING MOTIVATION AT MAN 2 BANYUMAS

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Abstract

Education plays an important role in developing high-quality human resources. However, mathematics learning continues to face various challenges, including students' low interest and motivation, the perception that mathematics is a difficult and abstract subject, and students' limited ability to understand and apply concepts related to circles and arcs due to teacher-centered instructional practices. Therefore, innovative learning approaches that are more active, interactive, and capable of enhancing students' conceptual understanding and learning outcomes are needed. This study employed a quantitative research approach. The findings revealed that the implementation of the Quizizz-assisted Project-Based Learning (PBL) model in teaching the topics of circles and arcs at MAN 2 Banyumas was successfully carried out and created a more active, interactive, and student-centered learning environment. Statistical analysis indicated that the Quizizz-assisted Project-Based Learning model had a positive and significant effect on students' motivation to learn mathematics, as evidenced by a correlation coefficient of 0.976 with a significance value of 0.000 (< 0.05), a coefficient of determination of 95.3%, and the results of both the regression and F-tests, which confirmed a significant effect. These findings suggest that the more effectively the Quizizz-assisted Project-Based Learning model is implemented, the higher the students' motivation to learn mathematics. Therefore, the Quizizz-assisted Project-Based Learning model can be considered an effective and innovative instructional alternative for improving students' motivation to learn mathematics, particularly in the topics of circles and arcs at MAN 2 Banyumas.

Keywords: Project-Based Learning; Quizizz; Mathematics Learning Motivation; Students

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INTRODUCTION

Education plays a fundamental role in producing competent and high-quality human resources. Through educational processes, learners are expected not only to gain knowledge but also to develop critical thinking, problem-solving abilities, and positive attitudes that support their daily lives. Among the various school subjects, mathematics occupies a strategic position because it contributes significantly to the development of logical, analytical, and systematic thinking skills. Furthermore, mathematics serves as a cornerstone for the advancement of science and technology, making the improvement of mathematics learning quality an essential objective through the implementation of effective and innovative instructional practices (Agustian, 2024).

Despite its importance, mathematics learning continues to encounter numerous challenges, particularly concerning students' interest and motivation. A considerable number of learners perceive mathematics as a complex and abstract subject that is heavily dependent on memorizing formulas. Such perceptions often reduce students' enthusiasm and participation during classroom activities. Consequently, the level of motivation demonstrated by students in learning mathematics remains below expectations. Therefore, learning environments that are engaging, interactive, and capable of encouraging active student participation need to be developed to address this issue (Aisyah et al., 2025).

One mathematical topic that frequently presents difficulties for students is the study of circles and arcs. This material includes several interconnected concepts, such as radius, diameter, arc length, central angle, inscribed angle, sector area, and the relationships among these components. Understanding these concepts requires strong visualization abilities and comprehensive conceptual mastery. However, many students still struggle to comprehend the interrelationships among the elements of a circle, resulting in learning difficulties (Ekaputra, 2025).

The challenges experienced by students in mastering circle and arc concepts are often reflected in their limited ability to solve problems that demand conceptual understanding and analytical reasoning. Many learners can successfully answer routine questions that closely resemble examples provided by the teacher. Nevertheless, when confronted with contextual or non-routine problems requiring higher-order thinking and problem-solving skills, they frequently encounter difficulties. This condition indicates that students' conceptual understanding of circles and arcs remains inadequate and requires further improvement (Hafid & Mayasari, 2023).

These learning difficulties are closely associated with the instructional approaches employed in mathematics classrooms. Learning activities that are predominantly teacher-centered tend to position students as passive recipients of information. In such settings, teachers generally spend most of the instructional time explaining concepts, while students primarily listen, take notes, and complete exercises. As a result, opportunities for students to independently construct knowledge, explore mathematical ideas, and develop higher-order thinking skills become limited (Handayani et al., 2022).

The rapid progress of science and technology in the digital era has created new demands for innovation in educational practices. Teachers are increasingly expected to integrate learning models and instructional media that correspond to the characteristics and needs of twenty-first-century learners. Modern education extends beyond the mere transmission of knowledge and emphasizes the cultivation of critical thinking, creativity, collaboration, and communication competencies. Consequently, mathematics instruction requires learning models that effectively support the development of these essential skills (Khofifah et al., 2024).

One instructional model that has been recognized for its potential to enhance student engagement is Project-Based Learning (PBL). This approach emphasizes learning through the completion of meaningful projects, allowing students to actively construct their own understanding. Within the PBL framework, learners are challenged to solve problems or complete project tasks through investigation, discussion, and collaborative activities. Such experiences enable students not only to comprehend mathematical concepts theoretically but also to apply them in practical and authentic contexts (Lindasari & Arnidha, 2022).

Project-Based Learning offers numerous benefits for mathematics education. Through carefully designed projects, students are encouraged to connect mathematical concepts with situations encountered in everyday life. For instance, in learning circles and arcs, students may engage in projects involving the design of circular gardens, vehicle wheels, wall clocks, or athletic tracks. These contextual learning experiences help students

develop a deeper and more meaningful understanding of circle-related concepts (I. W. E. Mahendra, 2022).

Apart from selecting an appropriate instructional model, the utilization of attractive and interactive learning media is another important factor influencing students' academic achievement. Interactive media can increase learners' attention, motivation, and participation during instructional activities (Mudatsir, 2023). In response to technological advancements, various digital educational platforms have been developed to create more effective and enjoyable learning experiences for students.

Among the digital platforms commonly used in education is Quizizz. This game-based learning application allows teachers to design interactive quizzes equipped with engaging features. Through Quizizz, students can participate in online assessments presented in a dynamic format that includes scoring systems, rankings, and immediate feedback. These features contribute to a more enjoyable learning atmosphere while simultaneously encouraging healthy competition among learners (Nuraeni et al., 2025).

The implementation of Quizizz in mathematics instruction can contribute significantly to improving students' understanding of mathematical concepts. By incorporating game-based exercises, students become more motivated to engage with learning activities and solve mathematical problems. Moreover, the instant feedback provided by the platform enables learners to recognize errors and improve their comprehension of the material being studied (T. Nurjanah & Sundaygara, 2024).

Within the context of circle and arc topics, Quizizz can be utilized to present a wide range of exercises, from fundamental conceptual questions to more complex problem-solving tasks. Teachers can incorporate diagrams, illustrations, and calculations involving arc length and sector area into the quizzes. Such activities provide students with additional opportunities to practice and reinforce their conceptual understanding of the subject matter (A. Nurjanah et al., 2025).

The combination of Project-Based Learning and Quizizz has the potential to create a more effective learning environment than traditional instructional methods. Project-Based Learning facilitates the development of conceptual understanding and critical thinking through meaningful project activities, whereas Quizizz functions as an engaging tool for assessment and concept reinforcement. Together, these approaches can foster greater student involvement throughout the learning process (Nurmaulinda et al., 2025).

Previous research has demonstrated that Project-Based Learning positively influences students' academic performance. The model has been found to improve critical thinking abilities, creativity, and problem-solving skills. Similarly, Quizizz has been reported to enhance students' motivation, classroom participation, and learning achievement across various subjects, including mathematics. These findings suggest that the integration of both approaches holds considerable promise for mathematics education (Parahita et al., 2024).

Preliminary observations conducted at MAN 2 Banyumas revealed that several students continued to face challenges in understanding the concepts of circles and arcs. These difficulties were evident in their inability to accurately determine arc lengths, calculate sector areas, and explain the relationship between central angles and arc lengths. Additionally, students' participation in mathematics learning activities remained relatively low, indicating the need for instructional improvements to maximize learning outcomes.

The predominance of lecture-based instruction further contributes to this issue by limiting students' opportunities to independently explore mathematical concepts. Classroom activities tend to emphasize the delivery of content and the completion of routine exercises. Consequently, students are less frequently involved in learning experiences that promote creativity, collaboration, and problem-solving skills. Such

conditions may partially explain the relatively unsatisfactory learning outcomes observed among students.

The implementation of Quizizz-assisted Project-Based Learning is expected to address these instructional challenges. Through project activities that involve applying circle concepts to real-life situations, students are anticipated to develop a more comprehensive understanding of the material. Simultaneously, Quizizz can create a more enjoyable learning environment and provide students with opportunities to evaluate their own conceptual mastery.

Furthermore, the application of Quizizz-assisted Project-Based Learning aligns with the objectives of the Merdeka Curriculum, which emphasizes active, collaborative, and student-centered learning. The integration of this instructional model and digital learning media can support teachers in fostering learning environments that facilitate the development of essential twenty-first-century competencies. As a result, students are expected not only to master mathematical content but also to acquire important skills needed for future challenges.

Research examining the effectiveness of Quizizz-assisted Project-Based Learning in teaching circles and arcs is necessary to generate empirical evidence regarding its impact on learning outcomes. The findings of such research are expected to provide valuable guidance for teachers in selecting appropriate instructional strategies and learning media to enhance mathematics education. In addition, the results may serve as a useful reference for future studies focusing on technology-based instructional innovations.

Based on the discussion above, it can be concluded that the relatively low level of students' motivation in learning mathematics, particularly in the topics of circles and arcs, requires serious attention. One promising alternative is the implementation of the Quizizz-assisted Project-Based Learning model. Therefore, this study is expected to contribute to efforts aimed at improving the quality of mathematics instruction and enhancing students' overall learning achievement.

METHODS

This study utilized a quantitative research approach with a survey method to investigate the influence of the Quizizz-assisted Project-Based Learning (PBL) model on students' mathematics learning motivation. The quantitative approach was chosen because the research sought to examine the relationship between variables through measurable numerical data that could be analyzed objectively using statistical procedures. The study was conducted at MAN 2 Banyumas and involved 40 students from the eleventh-grade science program. A saturated sampling technique was applied, whereby all members of the population were selected as participants in the study. The independent variable consisted of the implementation of the Quizizz-assisted Project-Based Learning model, while students' motivation to learn mathematics, particularly on the topics of circles and arcs, served as the dependent variable.

The research data were gathered using questionnaires, tests, and documentation. The questionnaire instrument was administered to collect information regarding the implementation and students' perceptions of the Quizizz-assisted Project-Based Learning model. In addition, a test was employed to assess students' mathematics learning motivation after they had participated in the learning activities. Documentation was also utilized to support and complement the primary data obtained from the questionnaires and tests.

Following the data collection process, the data were analyzed through descriptive and inferential statistical techniques. Descriptive statistics were used to provide an overview of the characteristics and distribution of the data, whereas inferential statistics were employed to examine the relationship between the variables under investigation. This combination of analytical methods enabled the researcher to obtain both a general description and a deeper understanding of the research findings.

Prior to conducting hypothesis testing, several prerequisite analyses were performed to ensure that the data fulfilled the assumptions required for statistical testing. These analyses included normality and linearity tests. The normality test was carried out to determine whether the data were normally distributed, while the linearity test was conducted to verify the existence of a linear relationship between the independent and dependent variables.

After the prerequisite assumptions had been satisfied, hypothesis testing was performed using simple linear regression analysis. This statistical procedure was applied to determine whether the Quizizz-assisted Project-Based Learning model exerted a significant influence on students' motivation to learn mathematics. The results generated from the regression analysis were subsequently interpreted as the basis for drawing conclusions regarding the effectiveness of the learning model in improving the mathematics learning motivation of eleventh-grade science students at MAN 2 Banyumas.

RESULTS & DISCUSSION

Results

The Implementation of the Quizizz-Assisted Project-Based Learning Model in Mathematics Learning on the Topics of Circles and Arcs at MAN 2 Banyumas

The mathematics learning process on the topics of circles and arcs at MAN 2 Banyumas was implemented through the Project-Based Learning (PBL) approach, which emphasizes active student participation throughout the instructional activities. At the outset of the lesson, the teacher communicated the learning objectives, expected competencies, and the relevance of circle and arc concepts to everyday life. To stimulate students' prior knowledge and prepare them for the learning activities, the teacher conducted an apperception session by connecting the lesson content to familiar objects such as bicycle wheels, clocks, plates, and athletic tracks. This introductory activity was designed to increase students' readiness to learn and generate greater interest in the material being discussed.

Following the introductory phase, students were introduced to contextual problems related to circles and arcs that served as the foundation for project implementation. They were encouraged to investigate various aspects of circle geometry, including identifying circle elements, examining the relationship between central angles and arc lengths, and exploring the application of these concepts in practical situations. To facilitate collaborative learning, students were organized into several groups and tasked with discussing the assigned problems collectively (Sunny et al., 2023). Within these groups, students worked together to collect relevant information, formulate problem-solving strategies, and develop project ideas that could address the challenges presented by the teacher.

Throughout the learning activities, students engaged actively in collaborative discussions, project development, and classroom presentations related to circle and arc concepts. In this process, the teacher assumed the role of a facilitator by providing guidance, monitoring group progress, and assisting students when necessary. Each group

was given an opportunity to present the outcomes of its discussions and project work before the class, while other groups participated by asking questions, offering suggestions, and providing constructive feedback. These interactive activities enabled students not only to gain conceptual knowledge but also to strengthen essential twenty-first-century skills, including critical thinking, communication, collaboration, and problem-solving abilities (Oktaya & Panggabean, 2022).

Upon completion of all project activities and learning sessions, an evaluation was conducted to measure students' mastery of the concepts that had been studied. The assessment process utilized Quizizz as a digital learning evaluation platform, allowing students to answer questions related to circles and arcs in an interactive and engaging format. Through this evaluation, the teacher was able to assess students' understanding of the material while simultaneously creating a more enjoyable assessment experience. The following section presents the circle and arc evaluation questions administered through the Quizizz platform.



Figure 1.
Multiple-Choice Learning Evaluation

The incorporation of multiple-choice questions through Quizizz is intended to evaluate students' mastery of the fundamental concepts of circles and arcs that support the completion of project assignments. Within the Project-Based Learning (PBL) framework, students are expected not only to produce project outcomes but also to develop a comprehensive understanding of the mathematical concepts embedded in project activities. Therefore, multiple-choice assessments are used to measure students' understanding of key concepts such as radius, diameter, central angles, arc length, and sector area that have been applied throughout the project implementation process (F. E. Mahendra et al., 2023). In addition, the use of Quizizz is aligned with the principles of PBL, which emphasize the integration of technology into learning activities. After participating in concept exploration, collaborative discussions, and project completion, students are given the opportunity to assess their understanding through interactive digital quizzes. This approach reduces the pressure often associated with conventional assessments and transforms the evaluation process into a more engaging and motivating learning experience, thereby encouraging active participation and optimal performance during assessment activities (Maysarah et al., 2023).

Furthermore, the use of Quizizz-based multiple-choice assessments enables teachers to design contextual questions closely related to the projects completed by students. For example, students may be asked to calculate the arc length of a circular park design or determine the area of a sector within a project scenario, allowing the assessment to evaluate

not only formula recall but also the application of mathematical concepts to authentic situations connected to project experiences (Eriza & Hadi, 2023). Another important advantage of Quizizz is the provision of immediate feedback, enabling students to instantly review their results and reflect on their level of understanding. Since reflection is a key component of Project-Based Learning, Quizizz functions not only as an assessment tool but also as a reflective learning medium that strengthens conceptual understanding. Therefore, the implementation of Quizizz-assisted multiple-choice assessments serves as a mechanism to ensure that project-based activities have successfully facilitated meaningful learning, while providing teachers with a comprehensive perspective on the effectiveness of the PBL model in enhancing students' mathematics learning motivation, particularly on the topics of circles and arcs at MAN 2 Banyumas. Following the completion of the multiple-choice assessment, students were also administered essay-based evaluations to further assess the depth of their understanding and reasoning abilities.



Figure 2.
Essay-Based Learning Evaluation Model

Following the completion of the multiple-choice assessment administered through Quizizz, students were required to undertake an essay-based evaluation to obtain a more comprehensive understanding of their mastery of the concepts of circles and arcs. The essay format was selected because it enables the assessment of students' abilities to explain concepts, describe solution procedures, and justify answers through logical reasoning. Within the framework of Project-Based Learning (PBL), the development of critical thinking and problem-solving skills is a primary objective; therefore, assessment instruments capable of measuring these competencies are essential. As illustrated in Figure 2, the essay assessment was conducted after students completed both project activities and the multiple-choice evaluation. The essay questions were designed based on learning indicators emphasizing the application of circle and arc concepts in authentic and contextual situations encountered in daily life (Widiawati & Kristin, 2025). Through these questions, students were expected not only to provide correct answers but also to demonstrate the reasoning and analytical processes underlying their solutions. This approach is consistent with the principles of Project-Based Learning, in which students actively engage in identifying problems, gathering information, conducting analyses, and formulating solutions, thereby fostering higher-order thinking skills (HOTS).

Through essay questions, students were given opportunities to demonstrate their ability to connect mathematical concepts with contextual situations, such as calculating arc lengths, determining sector areas, and analyzing the relationship between central angles

and arc lengths in specific scenarios. This allowed teachers to evaluate not only the accuracy of final answers but also the logical reasoning and problem-solving strategies employed throughout the solution process (Hardiningsih et al., 2023). In addition, essay assessments strengthened students' mathematical communication skills by requiring them to organize responses coherently, use appropriate mathematical terminology and symbols, and provide clear justifications for each step of their calculations. The assessment also encouraged reflection on learning experiences gained during project implementation and enabled teachers to identify misconceptions, conceptual difficulties, and common errors that could inform future instructional improvements (Pramiswari, 2024). Consequently, the integration of multiple-choice and essay-based assessments within the Quizizz-assisted Project-Based Learning model provided a holistic evaluation of learning outcomes, with multiple-choice questions measuring broad conceptual understanding and essay questions assessing critical thinking, reasoning, and problem-solving abilities in greater depth. Therefore, essay assessments function not only as tools for measuring learning outcomes but also as valuable instruments for evaluating the effectiveness of Project-Based Learning in developing students' mathematical competencies in a comprehensive and meaningful manner.

The Effect of the Quizizz-Assisted Project-Based Learning Model on Students' Motivation to Learn Mathematics

Correlations

		X	Y
X	Pearson Correlation	1	.976**
	Sig. (2-tailed)		.000
	N	15	15
Y	Pearson Correlation	.976**	1
	Sig. (2-tailed)	.000	
	N	15	15

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 3.
Pearson Correlation Test Results

Based on figure 3, the Pearson correlation test results show that the correlation coefficient (Pearson Correlation) between the Quizizz-assisted Project-Based Learning (PBL) model variable (X) and students' mathematics learning motivation (Y) is 0.976, indicating a positive and very strong relationship between the two variables. This suggests that the more effectively the Quizizz-assisted PBL model is implemented in the learning process, the higher the level of students' mathematics learning motivation. The correlation coefficient of 0.976 falls within the range of 0.80–1.00, which is categorized as very strong, reflecting a high degree of association between the variables. Furthermore, the significance value (Sig. 2-tailed) is 0.000, which is lower than the predetermined significance level of 0.05 ($0.000 < 0.05$), indicating that the relationship is statistically significant and not merely due to chance. These findings demonstrate that the integration of Project-Based Learning and Quizizz effectively enhances student engagement by providing opportunities to explore mathematical concepts through project activities while simultaneously increasing motivation through interactive and enjoyable assessments. As a result, students' understanding of circle and arc concepts improves, contributing positively to their overall learning outcomes. Therefore, it can be concluded that there is a very strong and significant relationship between the Quizizz-assisted Project-Based Learning model and students'

mathematics learning motivation, highlighting the potential of innovative learning approaches that combine project-based activities and digital technology to improve the quality of mathematics education at MAN 2 Banyumas.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-1.025	1.261		-.813	.431	-3.749	1.699
	X	1.057	.065	.976	16.216	.000	.916	1.198

a. Dependent Variable: Y

Figure 4.
Results of the Simple Linear Regression Analysis

Based on figure 4, the simple linear regression analysis shows that the Quizizz-assisted Project-Based Learning (PBL) model has a positive and significant effect on students' mathematics learning motivation. The regression equation indicates that every one-unit increase in the implementation of the Quizizz-assisted PBL model leads to an increase of 1.057 units in students' learning motivation, as reflected by the positive regression coefficient. Furthermore, the t-test results reveal a calculated t-value of 16.216 with a significance value of 0.000, which is lower than 0.05, indicating that the effect is statistically significant. The Standardized Coefficient Beta value of 0.976 also demonstrates a very high contribution of the Quizizz-assisted PBL model to students' learning motivation. These findings suggest that integrating project-based activities with interactive Quizizz assessments can effectively enhance students' engagement, motivation, and understanding of mathematics, particularly in the topics of circles and arcs at MAN 2 Banyumas.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.976[a]	.953	.949	.59874	.953	262.974	1	13	.000

a. Predictors: (Constant), X

Figure 5.
Coefficient of Determination

Based on figure 5, the coefficient of determination analysis shows an R value of 0.976, indicating a very strong relationship between the Quizizz-assisted Project-Based Learning (PBL) model and students' mathematics learning motivation. The R Square (R^2) value of 0.953 indicates that 95.3% of the variation in students' mathematics learning motivation can be explained by the implementation of the Quizizz-assisted PBL model, while the remaining 4.7% is influenced by other factors outside the scope of this study. Furthermore, the Adjusted R Square value of 0.949 confirms that the regression model has a high level of accuracy in explaining the relationship between the variables. These findings suggest that the Quizizz-assisted PBL model makes a substantial contribution to enhancing students' motivation by combining project-based activities with interactive and engaging assessments through Quizizz. Therefore, it can be concluded that the Quizizz-assisted

Project-Based Learning model is a dominant factor influencing students' mathematics learning motivation in the topics of circles and arcs at MAN 2 Banyumas.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	94.273	1	94.273	262.974	.000[b]
	Residual	4.660	13	.358		
	Total	98.933	14			

a. Dependent Variable: Y

b. Predictors: (Constant), X

Figure 6.
F-Test Results

Based on figure 6, the F-test results indicate that the Quizizz-assisted Project-Based Learning (PBL) model has a significant effect on students' mathematics learning motivation. This is evidenced by the calculated F-value of 262.974 and a significance value of 0.000, which is lower than the significance level of 0.05, indicating that the regression model is statistically significant and suitable for explaining the relationship between the variables. The ANOVA results further show that the Regression Sum of Squares (94.273) is substantially greater than the Residual Sum of Squares (4.660), while the Mean Square Regression (94.273) is much higher than the Mean Square Residual (0.358), demonstrating that most of the variation in students' learning motivation can be explained by the Quizizz-assisted PBL model rather than by external factors or random error. These findings confirm that the integration of project-based learning and Quizizz provides a meaningful and engaging learning experience that enhances students' motivation and participation in mathematics learning. Therefore, it can be concluded that the Quizizz-assisted Project-Based Learning model has a positive and significant effect on students' mathematics learning motivation at MAN 2 Banyumas, supporting the acceptance of the research hypothesis.

Discussion

The findings of this research indicate that the implementation of the Quizizz-assisted Project-Based Learning (PBL) model in mathematics instruction on the topics of circles and arcs at MAN 2 Banyumas successfully fostered a more active, participatory, and student-centered learning environment. Within this instructional approach, students were not merely passive recipients of information delivered by the teacher but actively engaged in project-based activities that required them to gather information, collaborate with peers, analyze mathematical problems, and formulate solutions based on the concepts being learned. Such findings align with the fundamental principles of PBL, which emphasize students' active role in constructing knowledge through meaningful and authentic learning experiences (Rahayu et al., 2025).

In the context of circle and arc materials, the application of PBL enabled students to establish connections between mathematical concepts and real-world phenomena. Learners were encouraged to examine objects with circular characteristics in their surroundings and associate them with concepts such as radius, diameter, arc length, and sector area. Through these experiences, mathematical concepts that were previously perceived as abstract became more concrete and understandable because students could directly observe their

practical applications in everyday life (Samsiyati, 2023). This demonstrates that project-based learning contributes positively to the development of students' conceptual understanding.

The effectiveness of PBL implementation was strengthened by the integration of Quizizz as an assessment medium. Unlike conventional assessment methods, Quizizz offers interactive features, including automated scoring, ranking systems, and immediate feedback mechanisms (Situmeang et al., 2022). These features successfully increased students' enthusiasm and engagement during assessment activities. Furthermore, the enjoyable and interactive nature of the platform helped minimize students' anxiety toward mathematics, which is often regarded as a difficult subject.

Quizizz served not only as an assessment tool but also as a medium for reinforcing the concepts acquired through project-based activities. Upon completing their projects, students were required to answer questions related to circles and arcs using the Quizizz platform. This process provided opportunities for learners to evaluate and reflect on their level of understanding regarding the concepts they had explored during the learning process (Widyastika et al., 2025). Consequently, the integration of PBL and Quizizz produced a more comprehensive learning experience encompassing concept exploration, practice, reflection, and evaluation.

The study also revealed that students demonstrated highly positive responses toward the implementation of the Quizizz-assisted PBL model. They expressed greater interest and enthusiasm in participating in learning activities because they were actively involved in group discussions, collaborative tasks, and project completion processes. The high level of student participation observed throughout the learning activities indicates that this instructional model effectively promotes learning motivation and engagement, which subsequently contribute to improved mathematics learning outcomes (Mariyani & Afghohani, 2025).

Statistical findings further indicated a very strong relationship between the implementation of the Quizizz-assisted PBL model and students' mathematics learning outcomes. The correlation coefficient value of 0.976 suggests that improvements in the quality of learning model implementation are associated with corresponding increases in students' academic achievement (Nuris et al., 2025). This strong correlation highlights the significant role of instructional models in facilitating deeper understanding of circle and arc concepts.

The results of the simple linear regression analysis also demonstrated that the Quizizz-assisted PBL model exerted a positive and statistically significant influence on mathematics learning outcomes. This implies that enhancements in the implementation of the instructional model are followed by improvements in students' academic performance. Such positive effects may be attributed to the experiential learning opportunities provided by PBL and the concept reinforcement facilitated through the interactive features of Quizizz (Azis & Sulaeman, 2025).

Additional support for these findings was provided by the coefficient of determination value, which reached 95.3%. This result indicates that a substantial proportion of the variance in students' mathematics learning outcomes can be explained by the implementation of the Quizizz-assisted PBL model. The magnitude of this contribution suggests that the instructional model served as a dominant factor influencing students' academic achievement, while only a small percentage was affected by external variables not examined in this study (Azizah, 2022).

These results are consistent with constructivist learning theory, which posits that meaningful learning occurs when students actively construct knowledge through direct experiences and interactions. Project-based activities provide opportunities for learners to

build understanding independently, whereas educational technologies such as Quizizz create engaging and motivating learning environments that align with the characteristics of digital-age learners (Dharin et al., 2023). Therefore, the integration of PBL and Quizizz represents an effective instructional strategy for enhancing the quality of mathematics education.

Based on the overall findings and analyses, it can be concluded that the implementation of the Quizizz-assisted PBL model not only promotes student engagement and participation but also significantly improves mathematics learning outcomes (Sumarni & Manurung, 2023). Through student-centered project activities supported by digital learning technologies, students are better able to comprehend and apply circle and arc concepts in various contexts. Consequently, the Quizizz-assisted PBL model may be considered a promising instructional innovation for improving the quality of mathematics learning at MAN 2 Banyumas.

The implementation of this learning model also encouraged students to become more responsible for their own learning process. During project completion, students were required to manage time effectively, divide tasks among group members, and ensure that project objectives were achieved according to predetermined criteria. These experiences contributed to the development of self-regulated learning skills that are essential for academic success.

Another important finding observed during the learning process was the improvement of students' communication skills. Through group discussions and project presentations, students learned how to express ideas clearly, defend arguments logically, and respond constructively to feedback from peers and teachers. Such skills are highly relevant to the demands of twenty-first-century education.

Collaborative activities conducted throughout project implementation also strengthened students' teamwork abilities. Students learned to appreciate different perspectives, negotiate solutions to problems, and work together toward common goals. These social competencies are important outcomes that extend beyond academic achievement and support students' personal development.

The use of real-world contexts in project activities made mathematics learning more meaningful for students. Rather than perceiving mathematical concepts as isolated theories, learners were able to understand their relevance to everyday situations. This contextual learning approach increased students' appreciation of mathematics and its practical applications.

The integration of technology through Quizizz contributed significantly to creating a dynamic classroom atmosphere. Students appeared more enthusiastic when participating in learning evaluations because the platform provided immediate feedback and an element of friendly competition. This positive learning environment helped maintain students' attention and interest throughout the instructional process.

Moreover, the learning model encouraged students to develop higher-order thinking skills. Throughout project activities, students were required to analyze information, evaluate alternative solutions, and make decisions based on evidence. Such cognitive processes are fundamental components of critical thinking and problem-solving abilities.

The implementation of Quizizz-assisted PBL also provided teachers with more comprehensive information regarding students' learning progress. Through digital assessment results, teachers could identify students' strengths and weaknesses more efficiently, allowing for timely instructional adjustments and targeted interventions.

From a pedagogical perspective, the integration of project-based learning and digital assessment represents an innovative approach capable of addressing the challenges of contemporary education. The model combines active learning principles with technological

advancements, thereby creating instructional experiences that are both meaningful and engaging.

The success of this instructional approach suggests that similar strategies may be implemented in other mathematics topics. Concepts that require visualization, application, and problem-solving can benefit from project-based activities supported by interactive digital platforms. Therefore, the potential application of this model extends beyond the topics of circles and arcs.

Furthermore, the findings indicate that educational technology should not merely function as a supplementary tool but rather as an integral component of the learning process. When technology is appropriately integrated with effective instructional models, it can significantly enhance learning quality and student achievement.

Overall, the implementation of the Quizizz-assisted Project-Based Learning model demonstrates that innovative, student-centered, and technology-supported instruction can provide meaningful improvements in mathematics education. The combination of active learning, collaborative experiences, authentic projects, and digital assessment creates an environment that supports both academic achievement and the development of essential lifelong learning skills.

CONCLUSION

The implementation of the Quizizz-assisted Project-Based Learning model in mathematics instruction on the topics of circles and arcs at MAN 2 Banyumas was carried out successfully. The learning process was conducted through project-based activities that encouraged students to actively identify problems, engage in discussions, collaborate with peers, and complete tasks related to the concepts of circles and arcs. The use of Quizizz as a learning assessment medium enhanced students' engagement, motivation, and enthusiasm in participating in the learning process. Furthermore, the combination of project-based learning and digital technology provided a more engaging, interactive, and meaningful learning experience, thereby helping students develop a deeper understanding of mathematical concepts.

Based on the results of the statistical analysis, the Quizizz-assisted Project-Based Learning model had a positive and significant effect on students' mathematics learning motivation at MAN 2 Banyumas. This was evidenced by a correlation coefficient of 0.976, indicating a very strong relationship, a significance value of 0.000, which was lower than 0.05, and a coefficient of determination of 95.3%, indicating that students' mathematics learning motivation was largely influenced by the implementation of the learning model. The results of the regression and F-tests also demonstrated that the Quizizz-assisted Project-Based Learning model had a significant effect on improving students' mathematics learning motivation. Therefore, the Quizizz-assisted Project-Based Learning model can be considered an effective alternative instructional approach for enhancing mathematics learning motivation, particularly in the topics of circles and arcs.

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