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Effectiveness of Powtoon Application-Assisted Inquiry Learning on Students' Learning Interest and Understanding of Mathematical Concepts at SMKN 3 Mataram

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Abstract
This study aims to analyze the effectiveness of Inquiry Learning and the impact of Powtoon-assisted learning on students' interest in learning and understanding of mathematical concepts at SMKN 3 Mataram. The low interest in learning and understanding of mathematical concepts that persists in schools is caused by learning that tends to be conventional and does not involve students actively in the learning process. Therefore, a learning model is needed that can increase active student engagement while being supported by engaging learning media. This research uses a quantitative approach with a quasi-experimental type and a pretest-posttest nonequivalent control group. The research population was all class XI students of SMKN 3 Mataram in the 2026 academic year. The research sample consisted of two classes, namely the experimental class, which was given treatment in Inquiry Learning using Powtoon, and a control class using conventional learning. The research instruments were a learning interest questionnaire and a mathematical concept understanding test. Data analysis was conducted using prerequisite tests (normality and homogeneity tests) and hypothesis testing with the Independent Samples t-Test. The results showed that Inquiry Learning and Powtoon-assisted learning are effective in increasing students' interest in learning and understanding of mathematical concepts. This is indicated by an increase in the average score in the experimental class, which was higher than the control class, both in terms of interest in learning and understanding of mathematical concepts. Thus, it can be concluded that Inquiry Learning and Powtoon assistance are effectively used in mathematics learning to increase students' interest in learning and understanding of mathematical concepts at SMKN 3 Mataram.

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1. INTRODUCTION

Mathematics is a field of study that plays a crucial role in developing students' logical, systematic, critical, and creative thinking skills. These skills are essential to facing the challenges of 21st-century learning, which requires students not only to master concepts but also to apply them to problem-solving. However, in school practice, mathematics is still often perceived as a difficult subject, resulting in low student interest.

Learning interest is an internal factor that significantly influences learning success. Learning interest reflects students' interest and involvement in the learning process, encouraging them to learn actively. Intrinsic motivation has been shown to play a significant role in increasing student engagement in mathematics learning (Arthur et al., 2022). According to Pitri et al. (2022), learning interest is a persistent tendency to pay attention to

and remember an activity continuously, accompanied by feelings of pleasure. Furthermore, a high level of learning interest is also associated with increased student motivation, attention, and learning outcomes (Fukhairo et al., 2025).

In addition to an interest in learning, understanding mathematical concepts is also a fundamental aspect that students must possess. Understanding concepts allows students not only to memorize formulas but also to explain, classify, and apply concepts in various problem-solving situations (Hulu et al., 2023). This is important because mathematical concepts are hierarchical and interrelated. (Besse et al., 2024).

The development of research in mathematics education shows that the *Inquiry Learning model is e*ffective in enhancing students' activeness and thinking skills. This model places students at the center of learning, actively discovering concepts through scientific processes such as observing, formulating problems, collecting data, and drawing conclusions (Efendi et al., 2021). Furthermore, the use of technology-based learning media, such as Powtoon, is also growing. Powtoon, as an animated medium, presents material visually, engagingly, and interactively, thereby enhancing students' attention and understanding during the learning process. The use of technology in learning also supports the development of students' digital competencies (Štemberger, 2021). (Wardah et al., 2025) also proved that the use of Powtoon media had a significant effect on increasing students' interest in learning.

However, previous studies generally still focus on the application of *Inquiry Learning* or Powtoon media separately. Studies integrating the two to assess their effectiveness on students' learning interest and understanding of mathematical concepts, particularly at the vocational high school level, are still relatively limited. Furthermore, mathematics instruction at SMKN 3 Mataram is still dominated by conventional, teacher-centered methods, which provide little space for students to actively participate in the learning process.

Based on these conditions, there is something new in this research, namely the integration of *Inquiry Learning and* Powtoon-assisted learning approaches, which emphasize not only the active process of concept discovery but also utilize interactive visual media to improve the quality of mathematics learning. This integration is expected to provide a more meaningful learning experience and simultaneously increase students' interest in learning and understanding of mathematical concepts.

Based on the description, the problem formulation in this research is: (1) Is there effectiveness in implementing *Inquiry Learning assisted* by Powtoon on students' interest in learning mathematics? and (2) is there any effectiveness in implementing *Inquiry Learning* Powtoon-assisted learning on students' understanding of mathematical concepts? In line with the formulation of the problem, this study aims to analyze the effectiveness of *Inquiry Learning* Powtoon-assisted learning on students' interest and understanding of mathematical concepts at SMKN 3 Mataram.

2. RESEARCH METHODS

This research is quantitative research with an *experimental approach, which* aims to test the effectiveness of the implementation of *Inquiry Learning* Powtoon-assisted research on students' learning interest and understanding of mathematical concepts. Quantitative research is a method based on the philosophy of positivism and is used to study specific populations or samples by collecting numerical data that is analyzed statistically to test research hypotheses (Sugiyono, 2023). Meanwhile, experimental research is used to test causal relationships through the administration of treatments in certain groups (Bungin, 2021). The research design used is *Nonequivalent Control Group Design*, namely a quasi-

experimental design involving two groups, namely the experimental group and the control group, which were not selected randomly (Teddlie, 2010). Both groups were given a pretest before treatment and a *posttest* after treatment to see the changes that occur due to the treatment.

Table 1. ***Pretest-Posttest Nonequivalent Control Group Design***

Group	*Pretest*	Treatment (*Treatment*)	*Posttest*
Experiment	O_1	X	O_2
Control	O_1	–	O_2

This design is used because in field conditions it is not possible to carry out full randomization, but it can still control the initial differences between groups through a *pretest* (Sugiyono, 2023).

The research procedure was carried out systematically with the following steps:
1. Problem identification based on observation results at SMKN 3 Mataram.
2. Literature study related to Inquiry Learning, Powtoon, learning interest, and understanding of mathematical concepts.
3. Develop learning tools and research instruments.
4. Conduct validity and reliability tests of the instrument.
5. Determine the research sample (experimental class and control class).
6. Conduct a pretest on both groups.
7. Giving treatment:
   a. Experimental group →*Inquiry Learning* with the help of Powtoon
   b. Control group → conventional learning
8. Carry out the learning process according to the research design.
9. Give a posttest to both groups.
10. Collect data from questionnaires and tests.
11. Analyze data using inferential statistics.
12. Draw conclusions based on the results of hypothesis testing.

This procedure follows the principles of experimental research, which emphasizes the existence of measurements before and after treatment to see the causal effect of the independent variable on the dependent variable (Bungin, 2021).

Data collection was carried out using two main instruments, namely:
1. Learning interest questionnaire: Used to measure students' level of learning interest before and after treatment using a Likert scale.
2. Mathematical concept understanding test: Used to measure students' ability to understand mathematical concepts through pretest and posttest.

Data collection was carried out in two main stages, namely before treatment*(pretest)*and after treatment*(posttest),* so that the changes that occur can be analyzed quantitatively.

Data analysis was performed using descriptive and inferential statistics with the help of SPSS. Before hypothesis testing, the following prerequisite tests were conducted:
1. Normality Test

The normality test is used to determine whether the data are normally distributed using *Kolmogorov-Smirnov* or *Shapiro-Wilk.* Data are said to be normal if the significance value is > 0.05.

2. Homogeneity Test
   The homogeneity test is used to determine the similarity of variance between groups using *Levene's Test*. Data is declared homogeneous if the significance value is > 0.05.

3. Hypothesis Testing
   Hypothesis testing is used to determine the effectiveness of treatment on research variables.
   If the data is normally distributed → *Independent Samples t-test is used*
   If the data is not normally distributed → *Mann–Whitney U Test is used*

   Decision-making criteria:
   Say< 0.05 → there is significant effectiveness/difference
   Say≥ 0.05 → there is no effectiveness/significant difference

   The use of this statistical test aims to test the average difference between the experimental group and the control group objectively and systematically (Sugiyono, 2023).

3. RESULTS AND DISCUSSION

3.1.Research result

Table 2. Descriptive Statistics of Concept Understanding Test

		Control class		Experimental class		information
		Pre-Test	*Post-Test*	*Pre-Test*	*Post-Test*	
MOH 75	< 75	31	26	31	5	Not Completed
	≥ 75	0	5	0	26	Completed
Amount		31	31	31	31	-
Rate – rate		32,90	58,87	36,29	83,06	
The highest score		60	80	65	100	
Lowest value		10	40	10	65	

The analysis results showed that in the initial ability (pretest), the average understanding of mathematical concepts in the experimental class was 36.29 and the control class was 32.90. These values were still below the Minimum Completion Criteria (KKM), which was 75, indicating that the initial abilities of students in both classes were relatively low.
After being given treatment, there was an increase in learning outcomes in both groups. The average posttest score for the experimental class increased to 83.06, while the average posttest score for the control class increased to 58.87. The increase in the experimental class was higher than in the control class, indicating that learning was effective. *Inquiry Learning assisted* by Powtoon provides a more optimal impact on students' understanding of mathematical concepts.

Table 3. Descriptive Statistics of Learning Interest Questionnaire Data

Category	Control Class		Experimental Class		Information
	Pre-test	*Post-test*	*Pre-test*	*Post-test*	
Medium/Low	31	3	31	0	Not yet optimal
High/Very High	0	28	0	31	Increase
Amount	31	31	31	31	-
Rate – rate	49,48	77,35	50,74	84,29	
The highest score	62	85	62	94	
Lowest Value	38	69	38	77	

Regarding the learning interest variable, pretest results showed that both classes were in the low to medium category. After treatment, there was an increase in both classes, but the increase was higher in the experimental class. The average learning interest in the experimental class increased from 50.74 to 84.29, while the control class increased from 49.48 to 77.35. In addition, all students in the experimental class were in the high/very high category after treatment, while in the control class there were still a small number of students in the medium/low category.

Table 4. Post-test Achievement of the Learning Interest Questionnaire

Category		Amount	Presentation
Experimental Class	High/Very High	31	100%
	Medium/Low	0	0%
Control Class	High/Very High	3	9,68%
	Medium/Low	28	90,32%

Based on the KKM (≥75), the completeness of conceptual understanding in the experimental class showed that 26 students (83.88%) completed it, while in the control class only 5 students (16.12%) completed it. In terms of learning interest, all students in the experimental class (100%) were in the high/very high category, while in the control class 90.32% of students were in the high/very high category and 9.68% were still in the medium/low category.

1. Prerequisite Test
   The Shapiro-Wilk normality test showed that all data, both conceptual understanding and learning interest, had a significance value >0.05, indicating a normal distribution. Furthermore, the homogeneity test used Levene's Test also showed a significance value > 0.05, so the data are declared homogeneous.
2. Hypothesis Testing
   Hypothesis testing using an *Independent Samples t-Test* at a significance level of 0.05 shows that the value *Sig. (2-tailed)* for conceptual understanding of 0.000 < 0.05 and for learning interest of 0.000 < 0.05. Thus, H_0 is rejected, and H_1 is accepted, which means there is a significant difference between the experimental class and the control class. The *mean difference i*n conceptual understanding of 24.194 and in learning interest of 6.635, it shows that the increase in the experimental class was higher than in the control class.

3.2 Discussion

The results of the study show that the learning method *Inquiry Learning with t*he Powtoon application has a significant effect on students' understanding of mathematics concepts and interest in learning mathematics at SMKN 3 Mataram. This was proven through hypothesis testing using an *independent sample t-test*with a significance value of 0.000 < 0.05, so H_1 is accepted. The effectiveness of the learning method, *Inquiry Learning, and t*he assistance of the Powtoon application can be explained through the systematic relationship between each stage of inquiry and increasing students' understanding of concepts and interest in learning mathematics.

During the orientation phase, the Powtoon application presents problems visually and animatedly, effectively fostering students' curiosity and interest from the beginning of the lesson. This aligns with findings (Astuti et al., 2025) that suggest that a combination of inquiry-based learning models supported by animated videos can create an interactive, enjoyable, and meaningful learning environment. Inquiry *learning* encourages students to explore and think independently, while animated videos help present the material visually and concretely.

During the problem formulation and hypothesis stage, students are trained to think critically and logically in identifying problems and independently proposing tentative hypotheses, which directly establishes connections between mathematical concepts and real-world problems. This activity encourages students to participate directly in the learning process, rather than simply receiving information from the teacher. This is in line with Putri et al. (2021), who stated that the use of Powtoon in mathematics learning is expected to increase student learning interest through engaging and interactive presentation of material.

In the data collection stage, students' roles shift from recipients of information to active seekers and processors of information, allowing conceptual understanding to develop through a meaningful inquiry process. Furthermore, in the hypothesis testing stage, students engage in logical and systematic reasoning using their understanding of mathematical concepts in an applied manner. (Yuliani et al., 2021), At the stage of testing the hypothesis, students are directed to determine an acceptable answer according to the data or information obtained based on the evidence that has been collected during the investigation process.

At the conclusion-drawing stage, students gain experience discovering concepts independently, which creates feelings of pleasure and satisfaction, thus contributing directly to increased motivation and interest in learning (Yuliani et al., 2021). Through this stage, students get a conclusion from the learning that has been done by linking hypotheses with the data and theories obtained, so that the knowledge gained becomes more meaningful and embedded in students' understanding.

Thus, integration of *Inquiry Learning with t*he Powtoon app has proven effective in creating active, interactive, and meaningful learning, while systematically building students' conceptual understanding and learning interest at every stage. Students not only memorize formulas but are directly involved in formulating problems and hypotheses, collecting data, testing hypotheses, and drawing conclusions, all while experiencing increased feelings of enjoyment, attention, interest, and engagement in mathematics learning.

4. CONCLUSION

Based on the results of the research and discussion that have been carried out, it can be concluded that the application of the learning method *Inquiry Learning with t*he Powtoon application has been proven effective in improving students' conceptual understanding and

interest in learning mathematics at SMKN 3 Mataram. This is demonstrated by the results of independent sample tests. *A t-test* shows a significance value of 0.000 < 0.05, so that H_0 is rejected and H_1 is accepted, both for the variables of conceptual understanding and students' interest in learning mathematics.

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