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The Effect Of Kahoot!-Assisted Interactive Learning On Students' Problem-Solving Abilities In Quadratificial Functions In Grade X

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Abstract

This study aims to determine the effect of interactive learning assisted by kahoot! on the problem-solving ability of class X students in the quadratic function material at the Free Methodist Private High School Medan. This study uses a quasi-experimental method with probability sampling techniques, where class XA is designated as the experimental class and class XB as the control class. The research instrument used is a test. After calculations using the *t*- test , the calculated t is 6.474. For α = 0.05 and df = 61-2 = 59 then t_0.05.59 = 2.95 then obtained t_table = 2.95 obtained t_count> t_table, which means reject H_0 and accept H_a. The results of data analysis show that the sig. (2-tailed) value is 0.000 <0.05 at a significance level of 5%, which means there is a significant difference between the experimental and control groups. The average problem-solving score of students in the experimental class was 83.806, while the control class obtained an average of 69.6. The results of the *N - Gain* test showed that the average score of the experimental class was 0.72 (high category), while the control class obtained a score of 0.53 (medium category). The large influence of interactive learning assisted by Kahoot! on students' problem-solving abilities reached 70.1%. Therefore, it can be concluded that interactive learning assisted by Kahoot! has an effect on the problem-solving abilities of class X students of SMA Swasta Free Methodist Medan on the quadratic function material.

Keywords: Learning, Interactive, Ability, Problem Solving, Kahoot

Phone number : (Must be filled)

INTRODUCTION

Mathematics is one of the fields of study taught at every level of education that has an important role in developing logical thinking skills, reasoning and developing creativity and problem solving in the learning process (Siregar & Panjaitan, 2018). Mathematics as a subject needs to be given to all students starting from elementary school (Situmorang, 2019) . In the development of Science and Technology, mathematics is considered as something that has an important role (Pertiwi & Sutama, 2020). As written in the Ministry of National Education (Rachmantika & Wardono, 2019) , mathematics is a subject that needs to be given to all students with the aim of equipping critical, analytical, systematic, critical, and creative thinking skills, as well as problem solving skills. The large role of mathematics requires

students to master mathematics lessons. Basically, among students, mathematics is often considered a scary subject, because according to them the material is difficult to understand so they have no desire to learn it, besides that, students do not pay attention to the teacher when explaining during the learning process (Kue et al., 2022).

One of the important mathematical topics taught is quadratic functions because they relate to everyday life. This material is very important in advanced mathematics such as calculus and other subjects such as Economics and Physics, for example, regarding uniformly accelerated linear motion (Nuraini & Afifurrahman, 2023) . However, many students still make mistakes in solving quadratic function problems (Ayunengdyah et al., 2020). Some students still do not understand how to solve the problems in the questions given (Yanti et al., 2022). Utami, 2016) revealed that students' ability to solve mathematical problems is influenced by the problem-solving patterns they had when they were in elementary and secondary school.

International research results such as *the Trends in International Mathematics and Science Study (TIMSS), the Programme for International Student Assessment (PISA), the Political and Economic Risk Consultancy (PERC),* and others show that Indonesian students' mathematics abilities are still low (Wijaya et al., 2014) . Not only low, but also consistently ranked at the bottom. PISA results show that Indonesian students' abilities are very low in solving problems based on real-life contexts (Wati & Murtiyasa, 2016) . Based on research results (Ayunengdyah et al., 2020), many students still make mistakes in solving quadratic function problems. Most students make mistakes in working on quadratic function problems that lead to problem solving, and students also experience confusion in applying quadratic function formulas to problem solving (Rizki & Wildaniati, 2015).

Problem solving is a very important part of the mathematics curriculum (Situmorang, 2017) . Problem solving is a learning process where students are required to be able to apply knowledge to solve problems given with previously acquired knowledge (Gultom, 2017) . Problem solving is the most important part in the mathematics learning process to improve students' knowledge and skills (Siregar & Panjaitan, 2018). Students who are trained to solve problems and solve problems in everyday life, students will be able to make decisions about a problem, because students have the skills to collect relevant information, analyze information, and realize the need to re-examine the results that have been obtained (La'ia & Harefa, 2021) . However, students' ability in problem solving is classified as low (Latifah & Luritawaty, 2020).

Based on research results (Sriwahyuni & Maryati, 2022) , students' mathematical problem-solving abilities are at a low qualification. Students' low mathematical problem-solving abilities were expressed (Susanti et al., 2022) in their research, namely that "students have not been able to plan problem solving, students have not been able to perform calculations correctly, and students have not been able to re-check the procedures and results of the solution." This is because many students are only able to solve the same math problems as the example problems given previously (Wahyuningsih et al., 2023).

The low ability of students to solve mathematical problems is caused by classroom learning that still uses conventional learning methods such as teachers only providing materials and teacher-centered learning (Husna & Munawarah, 2018) . Until now, the skills of teachers in some schools are not adequate to use ICT-based learning media and products,

so far teachers have only used lectures, discussions, laboratory exercises, and field trips to teach mathematics students (Anwas, 2013). Therefore, the teaching media used have not been able to maximize learning, many teachers still rely on lecture methods without utilizing innovative or technology-based media which results in learning tending to be monotonous and less interesting for students.

Therefore, a student-centered learning model is needed to address these issues. One proposed solution is the implementation of an interactive learning model, using the Kahoot! application as a game-based learning medium that emphasizes the active participation learning style of all students (Firdausi, 2020) . Kahoot! allows teachers to create interactive quizzes that can increase student participation and make the learning process more enjoyable (Janattaka & Tiyana, 2022). Interactive learning using Kahoot! in mathematics can improve student motivation and learning outcomes (Putra & Afrilia, 2020) . In addition, the use of Kahoot! can also help students develop problem-solving skills. With a challenging and competitive quiz format, students are encouraged to think critically and find solutions to the problems given (Tumangger & Simanjuntak, 2023) . Through the implementation of interactive learning assisted by Kahoot!, it is hoped that students' problem-solving skills will improve.

Based on information from one of the mathematics teachers at SMA Free Methodist Medan, class X said that many students still have low problem-solving abilities. Because the learning is still teacher-centered, causing students to be passive in the learning process so that students find it difficult to solve problems in mathematics. This was proven when researchers observed the learning process in the classroom that the teacher taught during the Field Experience Practice (PPL) period. Therefore, it can be concluded that the problem-solving abilities of SMA Free Methodist Medan students are still low.

Based on the description above, the researcher is interested in conducting research with the title The Effect of Kahoot!-Assisted Interactive Learning on Students' Problem-Solving Ability in Quadratic Function Material for Class X at SMAS Free Methodist Medan in the 2025/2026 Academic Year. Economics at Nommensen Campus High School, Pematangsiantar, Academic Year 2025/2026

METHOD E

The type of research used by researchers is quantitative experiments. Quantitative research is a research method based on the philosophy of positivism, used to research certain populations or samples, data collection using research instruments, quantitative/statistical data analysis, with the aim of testing predetermined hypotheses (Sugiyono, 2021:16). According to Sugiyono, (2021:111) that "Experimental research is a research method carried out by experiments, which is a quantitative method, used to determine the effect of independent variables (*treatment*) on dependent variables (results) under controlled conditions.

There are several forms of experimental design that can be used in research, namely: *pre-experimental, true experimental, factorial,* and *quasi-experimental designs* (Sugiyono, 2021:112) . In this study, the researcher used *a quasi-experimental design* .

This research was conducted at the Free Methodist Senior High School in Medan, located at Jl. Beringin Raya 152 E, Helvetia Subdistrict, Medan Helvetia District, Medan City,

North Sumatra. This research will be conducted in the odd semester of the 2025/2026 academic year.

Population is a generalization area consisting of objects and subjects that have a certain number and characteristics determined by the researcher to be studied and then conclusions are drawn (Sugiyono, 2021:126) . The population used includes all class X students of SMAS Free Methodist Medan for the 2025/2026 Academic Year, totaling 3 classes with a total of 123 students. The sample is part of the number and characteristics possessed by the population (Sugiyono, 2021:127) . In this study, sample determination was carried out randomly (*random sampling*), so that the research sample obtained was class XA as the experimental class and class XB SMAS Free Methodist Medan as the control class, with a total of 80 people.

Research variables are anything in any form that researchers determine to be studied to obtain information about it, and then draw conclusions (Sugiyono, 2021:67) . In this study, the variables measured are:

Once the research data has been collected, data analysis is performed. Data analysis involves grouping data based on variables and respondent types, tabulating data based on variables across all respondents, presenting data for each studied variable, performing calculations to answer the research questions, and testing the proposed hypotheses (Sugiyono, 2021:206).

RESULTS AND DISCUSSION

Research result

This research was conducted at SMAS Free Methodist Medan located at Jl. Beringin Raya 152 E Kel. Helvetia, Kec. Medan Helvetia, Medan City, North Sumatra. This research was conducted in class X SMAS Free Methodist Medan in the 2024/2025 academic year. From the total of 3 classes, 2 classes were taken as samples consisting of 61 students, where the experimental class of class XA consisting of 31 students and the Control class of class XB consisting of 30 students. This research involved 2 classes that were treated differently, where the experimental class in the teaching and learning process used interactive learning assisted by kahoot! while the control class did not use interactive learning assisted by kahoot! (Firdausi, 2020)

The material taught by the researcher was quadratic functions to determine students' problem-solving abilities. The research instrument used by the researcher was a test (*pretest* and *posttest*) consisting of 8 descriptive problem-solving ability questions.

Research Instrument Trial Results

This study used a research instrument to measure the conceptual understanding and problem-solving abilities of quadratic functions. Prior to conducting the study, the researcher tested the questions, including validity, reliability, difficulty level, and discriminatory power, in class XII-A of SMA Free Methodist Medan. The following calculations were obtained from the trial data:

Test Validity Test

Calculation of the validity of the questions to obtain the validity coefficient of each question item. The results of the trial questions given to class XII-MIPA, with a total of 35 students, all questions were said to be valid. $r_{hitung} > r_{tabel}$said to be valid with a significant level . $\alpha = 5\%$.This means that 8 questions are suitable for use as instruments in research.

Calculating Normalized *N-Gain*

The calculation of N - $Gain$ was carried out to determine whether there was an increase in students' problem-solving abilities from the *pretest* and *posttest results* of the experimental and control classes. In this case, the calculation of the N - $Gain$ score aims to determine whether the interactive learning treatment assisted by Kahoot! has an effect on increasing students' problem-solving abilities (Bicen & Kocakoyun, 2018).

The calculation of $N - Gain$ in the study using *SPSS 25.00 for Windows* in (appendix 11) can be seen in more detail. Based on the calculation results, the following results were obtained:

Table 1. Results of $N - Gain$ Experimental class and Control class

No	Group	*N-Gain* Score	Criteria
1	Experiment	0.72	Tall
2	Control	0.53	Currently

Thus, it can be concluded that interactive learning assisted by Kahoot! has an effect on improving students' problem-solving abilities in quadratic function material.

Research Hypothesis Testing

By fulfilling the prerequisite tests, namely the normality and homogeneity tests with the results of normally and homogeneously distributed data, the hypothesis test is then carried out.

a. Determining the Research Hypothesis

$H_0 : \mu_1 = \mu_2$: The average problem-solving ability with interactive learning assisted by Kahoot! in the experimental class is the same as the average problem-solving ability in the control class, on the quadratic function material for class X at SMAS Free Methodist Medan in the 2025/2026 academic year.

$H_a : \mu_1 > \mu_2$: The average problem-solving ability with interactive learning assisted by Kahoot! in the experimental class is greater than the average of the control class, on the quadratic function material for class X at SMAS Free Methodist Medan in the 2025/2026 academic year.

The t-test decision-making criteria are:

RejectH_0 : if $t_{hitung} > t_{tabel}$at $\alpha = 0{,}05$, the assumption is: there is an influence of interactive learning assisted by Kahoot! on

students' problem-solving abilities in the quadratic function material.

AcceptH_0 : if $t_{hitung} < t_{tabel}$at $\alpha = 0{,}05$, the assumption is: there is no influence of interactive learning assisted by Kahoot! on students' problem-solving abilities in the quadratic function material

***t*- test**

To see whether there is an influence of interactive learning assisted by Kahoot! on students' problem-solving abilities on the quadratic function material for class X at SMA Swasta Free Methodist Medan in the 2025/2026 academic year, which is presented in Appendix 16. The table shows the results of the *t -test calculation* as follows:

Table 2. t-Test Results

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
NGain_Persen	Equal variances assumed	3.288	.075	6.474	59	.000	19.968	3.084	13.796	26.139
	Equal variances not assumed			6.517	52.046	.000	19.968	3.064	13.820	26.116

After carrying out calculations using the t -test , the result is obtained $t_{hitung}$is 6.474. For $\alpha = 0{,}05$and $df = 61 - 2 = 59$then $t_{0{,}05.59} = 2{,}95$we get $t_{tabel} = 2{,}95$. By comparing the values $t_{hitung}$and t_{tabel}we get $t_{hitung} > t_{tabel}$, this means reject $H_0$and accept H_a.

With the help of *SPSS 25.0 windows,* the *output of the sig. (2- tailed*) value from the *independent* sample t- test is 0.00. Because the significance is <0.05, it can be concluded that "reject H_0" means that the average problem-solving ability with interactive learning assisted by Kahoot! in the experimental class is greater than the control class, so there is an influence of interactive learning assisted by Kahoot! on students' problem-solving abilities. Where the influence is caused by the treatment of interactive learning assisted by Kahoot! and without interactive learning assisted by Kahoo!. Because there is an influence, it can be concluded that interactive learning assisted by Kahoot! influences students' problem-solving abilities in the quadratic function material of class X at SMA Swasta Free Methodist Medan in the 2025/2026 academic year.

Correlation Coefficient

Based on the results of the correlation coefficient calculation (attachment 17) with the criteria of the level of closeness of the relationship between the variables *X* and *Y* variables , the relationship is said to be very strong/very high if the correlation value of $0{,}90 - 100$the relationship is said to be strong/good, $0{,}70 - 0{,}89$the relationship is said to be sufficient if $0{,}40 - 0{,}69$the relationship is said to be low if $0{,}20 - 0{,}39$and the relationship is said to be

very weak if $0{,}00 - 0{,}19$. The results of the correlation coefficient calculation are shown in table 4.9 below:

Table 2. Correlation Coefficient Test Results

Correlation Value	Information
0.837	Strong/Good Relationship

Correlation Coefficient Significance Test

The correlation coefficient significance test aims to see whether there is a significant correlation coefficient between interactive learning assisted by Kahoot! and students' problem-solving abilities between before and after treatment. The following is the statistical hypothesis for the t- test of differences in mathematical literacy abilities:

H_0 : There is no significant correlation coefficient between interactive learning assisted by Kahoot! and students' problem-solving abilities.

H_a : There is a significant correlation coefficient between interactive learning assisted by Kahoot! and students' problem-solving abilities.

The decision-making criteria for the t test are:

accept H_0if $t_{hitung} < t_{tabel}$, then the correlation coefficient is significant.

reject H_0if $t_{hitung} > t_{tabel}$, then the above criteria are not met.

To see whether there is a significant correlation coefficient between interactive learning assisted by Kahoot! and students' problem-solving abilities on the quadratic function material for class X at SMA Swasta Free Methodist Medan for the 2025/2026 academic year, which is presented in Appendix 18. Based on the calculation results, the following results were obtained:

Table 3. Results of the Correlation Coefficient Significance Test

t_{hitung}	t_{tabel}
8,251220	2,04523

After the calculation using the t -test , it is obtained t_{hitung} that $8{,}251220$ and t_{tabel} are $2{,}04523$. For $\alpha = 0{,}05$ and $db = 31 - 2 = 29$. By comparing the values $t_{hitung}$and t_{tabel}obtained $t_{hitung} > t_{tabel}$or $8{,}251220 > 2{,}04523$, this means reject $H_0$and accept H_a. Thus, it can be concluded that there is a significant correlation coefficient between interactive learning assisted by Kahoot! and students' problem-solving abilities.

Coefficient of Determination

To see how big the influence of interactive learning assisted by Kahoot! is on students' problem-solving abilities on the quadratic function material of class X at SMA Swasta Free

Methodist Medan for the 2025/2026 academic year is presented in appendix 19. The results of the determination coefficient calculation are shown in the table below:

Table 4. Results of the Determination Coefficient Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.837[a]	.701	.691	2.803

a. Predictors: (Constant), Kemampuan Pemecahan Masalah

With the help of *SPSS 25.0 windows,* the coefficient of determination or *R square value* is shown to be 0.701. The value of *R square* is derived from squaring the correlation coefficient value, which is $0{,}837 \times 0{,}837 = 0{,}701$. The coefficient of determination is 0.701, or 70.1%. Therefore, it can be concluded that interactive learning assisted by Kahoot! has an effect on problem-solving ability of 70.1%. While the remaining ($100\% - 70{,}1\% = 29{,}9\%$).

Discussion of Research Results

In this study, the focus is to determine whether interactive learning assisted by Kahoot! has an effect on improving the problem-solving abilities of class X students of SMA Swasta Free Methodist Medan. This study was conducted in 3 meetings for class XA and XB on July 31 – August 2, 2025 in the Odd Semester of the 2025/2026 Academic Year on two groups of students, namely the experimental class consisting of 31 people and the control class consisting of 30 people.

The material used in this study is a quadratic function. To determine students' problem-solving abilities, *a pretest* and *posttest* consisting of 8 descriptive questions were given. After *the pretest* was carried out, the researcher provided treatment to each sample where class XA (the experimental class) received treatment with interactive learning assisted by Kahoot!. Class XB (the control class) used learning without interactive learning assisted by Kahoot!. After the samples were given treatment, *a posttest was conducted* to see students' abilities after being given treatment. So that the average score of the experimental class was 83.80645, while the control class obtained an average score of 69.6.

After the average calculation is carried out, it will be continued by conducting a hypothesis test. Before the hypothesis test is carried out, the *posttest data* that has been obtained will be tested for prerequisites first. The prerequisite tests carried out are the normality test and the homogeneity test which aims to determine what hypothesis test will be used. After the normality test was carried out, it was found that *the pretest* and *posttest* data were normally distributed as well as in the hypothesis test the data obtained were homogeneous. After the calculation using the t- test , it was obtained t_{hitung}at 7.635. For $\alpha = 0{,}05$and $db = 61 - 2 = 59$then $t_{0{,}05.59}$it is obtained $t_{tabel} = 2{,}95$. By comparing the values $t_{hitung}$and t_{tabel}obtained $t_{hitung} > t_{tabel}$, this means reject H_0which means accept H_a, that the average problem-solving ability with interactive learning assisted by kahoot! in the experimental class is greater than the control class. Next, the researcher conducted a parametric test, namely the *t- test* in the study produced sig. (2-tailed) data of 0.00 <0.05 it

can be concluded that "reject H_0". It turns out that there is an influence on the results of the problem-solving ability of class XA students.

Then, from the results of the N - $Gain$ test , the average score of the experimental class was 0.73 (high criteria) and the control class score was 0.51 (medium criteria). So, it can be concluded that interactive learning assisted by Kahoot! has an effect on students' problem-solving abilities in the quadratic function material for class X at SMA Swasta Free Methodist Medan in the 2025/2026 academic year.

Next, the researcher conducted a correlation test to determine the relationship between interactive learning assisted by Kahoot! and students' problem-solving abilities in the experimental class. The results of the analysis showed that the correlation coefficient (r_{xy}) was 0.84, which means there is a strong relationship between the two variables. Based on the results of the correlation significance test, the values of $t_{hitung} = 8{,}251220$ and $t_{tabel} = 2{,}04523$. Because t_{hitung}it is greater than t_{tabel}, it can be concluded that there is a significant correlation coefficient, so the relationship between interactive learning assisted by Kahoot! and students' problem-solving abilities in the experimental class is significant.

Based on the calculation of the coefficient of determination, a value of 70.1% was obtained, which (Bawa, 2019).

This means that interactive learning assisted by Kahoot! has an influence of 70.1% on students' problem-solving abilities in the experimental class on quadratic function material in class X of SMA Swasta Free Methodist Medan in the 2025/2026 Academic Year.

Based on the results of the research conducted by the researcher, it can be concluded that the implementation of interactive learning assisted by Kahoot! has a significant influence on the problem-solving abilities of class X students of SMA Swasta Free Methodist Medan on the quadratic function material. This can be seen from the difference in the average *posttest score* which is higher in the experimental class compared to the control class, the results of the t -test which show a significant difference, as well as the results of the N - $Gain$ test which indicates a higher increase in the experimental class (Pintor Díaz, 2017).

Furthermore, correlation tests showed a strong relationship between Kahoot!-assisted interactive learning and students' problem-solving abilities, with a contribution of 70.1%. Thus, Kahoot!-assisted interactive learning has been proven to be a learning model for improving students' problem-solving abilities (Wang & Tahir, 2020).

CONCLUSION

Based on the formulation of the problem and the proposed research hypothesis and the research results that have been analyzed, it can be concluded that:

1. There is an influence of interactive learning assisted by Kahoot! on students' problem-solving abilities in the quadratic function material of class X SMA Swasta Free Methodist Medan in the 2025/2026 academic year.
2. The magnitude of the influence of interactive learning assisted by Kahoot! on students' problem-solving abilities is 70.1%, with high criteria.

B. Suggestion

Based on the conclusions obtained from this research, the researcher provides several suggestions as follows:

1. In implementing mathematics learning, teachers are expected to encourage students to be more active and motivated in learning, with a more student-centered focus.
2. Teachers' understanding of the use of learning media needs to be improved so that students do not get bored and can obtain new innovations during the teaching and learning process.
3. Teachers in schools are expected to use the interactive learning process assisted by Kahoot! in teaching, especially mathematics subjects, as an alternative to improve students' problem-solving abilities.
4. There are limitations in carrying out this research, so it is recommended that there be further research on interactive learning assisted by Kahoot!.

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