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The impact of utilizing educational games-based technology as learning media on students' numeration skills in high school economics subjects

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ABSTRACT

This study was motivated by the low numeracy skills of students in economic subjects at SMA 2 Kuningan which was known through pre-research conducted. The purpose of this study was to determine the effect of using educational game-based technology learning media on students' numeracy skills in economic subjects in class XII SMAN 2 Kuningan Regency. The method used in this research is experimental method. The number of respondents in each class was 32 students each. Data processing methodology begins with instrument testing (including validity and reliability tests) followed by prerequisite assessment in the form of normality and homogeneity tests. Hypothesis testing using t-test and n-gain. Based on the results of hypothesis testing, there are significant differences in learning outcomes between students who utilize technology-based educational games and students who do not utilize technology-based educational games. These results indicate a difference in learning outcomes and numeracy skills between students who use technology-based educational games and those who do not. The results showed that the average normalized gain score of the experimental class of 76.76% was included in the effective category based on the interpretation of the effectiveness gain index. Therefore, it can be concluded that the integration of technology-based educational games is efficacious in improving students' numeracy skills in class XII economics subjects at SMAN 2 Kuningan.

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Introduction

Today's digital era, technology has become an important part of everyday life (Myers, 2016). No exception in the field of education, technology has been used to help improve the quality of student learning. In the realm of education, technology plays an integral role in enhancing the quality of student learning (McGonigal, 2011). According to (Perdani & Azka, 2019) One prevalent technological tool in education is technology-based educational games. These games serve as a captivating and interactive alternative for economics learning, offering students an engaging platform to develop their thinking abilities, including heightened concentration when solving problems. Despite the potential benefits, there remains a scarcity of research exploring the impact of technology-based educational games on students' numeracy skills in economics subjects. Notably, numeracy skills hold significant importance in grasping economic concepts, such as profit calculations, loss assessments, percentages, and more ((Aswita et al., 2022); (Afrilina, 2017)).

The problem underlying this research is the low numeracy skills of students in economics subjects in schools, as well as the lack of variation in learning methods used by teachers to improve students' numeracy skills. In addition, the increasingly rapid development of technology opens up opportunities for the use of technology-based educational games as an alternative in improving students' numeracy skills in economics subjects. Education in Indonesia still faces various challenges, including a lack of student interest in studying subjects that are considered difficult, such as mathematics and economics. In economics subjects, numeracy skills play an important role in everyday life, including understanding economic concepts. However, not all students have the same interest in mathematics or economics, and they often find it difficult to understand related concepts. On the other hand, students' tendency to spend their free time playing games is considered to be a problem in itself. Additionally, some students may need a more interactive and engaging learning approach to understand these concepts.

According to ((Fajriyah, 2022); (Ifrida et al., 2023)) Literacy and numeracy are two important skills in the field of education. Literacy refers to an individual's ability to read, write, and understand written texts and use language knowledge and skills to communicate effectively (Kirsch, 2001b). Literacy is the ability to understand and use a writing system to read, write, and communicate effectively (Paiva et al., 2016). Meanwhile, numeracy refers to the ability to understand and use mathematical concepts to make decisions in participating in social and political life (Barbosa, 2015). Numeracy is also defined as an individual's ability to understand, use and interpret numbers and perform basic mathematical operations. Regarding numeracy, in the field of education, numeracy is very important because this skill is the basis for learning in almost all subjects. Numeracy refers to the ability to understand and use mathematical concepts to make decisions and participate in public and political life (Toppo, 2015). Numeracy is also defined as an individual's ability to understand, use and interpret numbers and perform basic mathematical operations. Numeracy is the ability to understand and use mathematical concepts in everyday life.

Current advances in science and technology cannot be separated from the position of education because education is the basis for gaining knowledge. One of the discoveries in the field of science and technology includes the discovery of educational games as a learning medium. Educational games consist of two words, namely games and education. Games are semi-structured activities intended to entertain. The term game comes from English which means basic game (Kirsch, 2001b). A game is a form of play that involves a game system or other players based on luck itself (Schreiber, 2009). Games present an activity that attracts players' interest as a means of entertainment to motivate and support player activities (Andang, 2007). Educational games can be interpreted as learning using games. Educational games are a type of game with game media that aims to facilitate users' understanding of learning material ((Hartanti, 2019); (Wulandari et al., 2017). Several experts define the term educational game as follows: (1) Games that can create a sense of participation in learning by offering an educational format. In the studies that have been carried out, it can be seen that carefully selected computer games can help improve a person's way of thinking ((Myers, 2016); (2) Educational games are games that can teach a skill. Games can also be used as innovation in educational activities (McGonigal, 2011). (3) Educational games are software in the form of games to teach students in an interesting and useful way (Kirsch, 2001a).

The development of games in educational activities is a form of interactive multimedia innovation with educational content. Therefore, educational games are defined as a method in the world of education (Gros, 2015). The entertainment aspect of a game is a medium to increase motivation and learning experience (Costikyan, 2013). Based on this description, it can be concluded that educational games are software in which there are learning elements that provide knowledge and skills indirectly. Educational games are games designed by creators to stimulate thinking, increase concentration and solve certain problems. Educational games are games that are packaged to stimulate thinking power, including increasing concentration and solving problems. Technology-based educational game learning media is a form of teaching that uses games or games specifically designed for educational purposes. These educational games utilize technology, such as computer software, mobile applications, or online platforms to create interactive and engaging learning experiences. From several definitions as above, technology-based educational game learning media are applications or games designed to help the learning process through playing experiences. They utilize modern technology, such as computer software, mobile applications, or online platforms, to create interactive, engaging, and effective learning environments

The functions of technology-based educational games are: (1) Teaching concepts: Educational games help teach lesson concepts in a more interesting and interactive way; (2) Learning Motivation: Increasing students' learning motivation through the use of game elements, such as challenges, rewards and competition; (3) Skills Development: Supports the development of specific skills, be they math, language, science, or critical and creative skills; (4) Progress Measurement: Provides direct monitoring of student progress, allowing teachers to

assess student understanding and skills in more detail. Technology-based educational games also have advantages and disadvantages, including: Advantages: (1) High Motivation: Educational games increase students' learning motivation through elements of excitement and challenge; (2) Interactivity: providing interactive learning experiences that can improve understanding of concepts; (3) Progress measurement: providing measurable data about student progress in real-time; (4) Student involvement: increasing student involvement in the learning process.

Disadvantages: (1) Dependency: there is a risk of dependence on the game, so that students may focus too much on the game aspect rather than on actual learning; (2) Access gaps: not all students have equal access to the technology needed for educational games; (3) Curriculum suitability: not all educational games are suitable for certain curricula or learning standards; (4) potential for social ablation: if not properly regulated, the use of educational games can cause social isolation among students. Thus, it is important to design and integrate educational games wisely in the learning environment, taking into account the needs and characteristics of students as well as the desired learning objectives. An effective interactive learning technique for children is to use educational games, this is because most children have a high curiosity about everything in their surrounding environment (Tamrin & Ma'arif, 2020). It is hoped that the use of this educational game can reduce children's boredom in learning and further increase children's understanding of the material presented by the teacher. The aim of using this educational game is to overcome learning problems by increasing interest in learning, helping the development of intelligence and improving children's abilities in the children's learning process. For this reason, interactive, interesting and fun learning media is needed so that the delivery of this educational game can be done by playing while learning.

A multitude of prior studies have demonstrated the positive impact of technology-based educational games on student learning outcomes. Various investigations have specifically highlighted the influence of employing such games on students' numeracy skills across diverse subjects. For instance, a study conducted by (Adiwijaya & Christyono, 2015) scrutinized the effect of educational games on students' mathematics skills, revealing a significant improvement in students' mathematical proficiency. Similarly, research conducted by (Barbosa, 2015), focusing on the impact of educational games on students' critical thinking skills, indicated notable enhancements in students' cognitive abilities. Despite the consistent findings in the literature regarding literacy and numeracy improvements associated with the use of educational games, as exemplified by the aforementioned studies, it is noteworthy that some research yields differing results concerning the influence of technology-based educational games on student learning outcomes.

It should be noted that in the field of economics education, numeracy is very important to help students understand complex economic and financial concepts and to make smart financial decisions. Economic numeracy skills in education include students' ability to understand economic terminology, economic concepts such as demand and supply, inflation, fiscal and monetary policy, and interpret and analyze financial information such as financial reports, graphs and tables (Fitriana & Ridlwan, 2021). These skills can help students understand the business world and prepare for careers in economics. Meanwhile, numeracy skills in economic education include students' ability to calculate and analyze financial data, compare investment or purchasing options, and evaluate the risks and returns of financial decisions. These numeracy skills are essential to help students understand mathematical concepts related to finance and to assist them in making smart financial decisions.

This study centers on investigating the impact of technology-based educational games on students' numeracy skills in economics subjects, a research endeavor deemed both relevant and imperative. Undertaking research of this nature contributes significantly to the expansion of our comprehension regarding the influence of technology-based educational games on students' learning outcomes in the field of economics. Technology-based educational games present a compelling alternative, holding the potential to enhance students' numeracy skills in economics subjects. Additionally, a substantial body of research within the educational domain has explored the use of educational games, consistently demonstrating positive outcomes in terms of heightened student motivation and improved learning results. Consequently, this research stands as a valuable contribution toward the advancement of innovative and effective learning methodologies in the realm of economic education.

Numeracy skills are essential because they provide the basic ability to understand and utilize quantitative information in a variety of disciplines, including economics (Pattah, 2014). In economics subjects, numeracy is very important because most of the concepts and theories studied involve data and numbers. The ability to understand economic data, such as inflation rates, economic growth, and other statistics, is essential in making good decisions in business and economics. Apart from that, in the world of work, numeracy skills are also a skill that is really needed. For example, in finance and accounting, the ability to understand and use numbers correctly is essential to managing a company's finances well. Therefore, developing students' numeracy skills in education is very important, especially in economics subjects, so that they are ready to face future challenges

and can contribute positively in the world of work. The objectives of this study are threefold: (1) to assess the improvement in numeracy skills among economics subjects utilizing technology-based educational game learning media, comparing the initial measurement (pretest) with the final measurement; (2) to evaluate the numeracy skills of economics subjects not utilizing technology-based educational game learning media, examining both the initial measurement (pretest) and the final measurement (posttest); and (3) to determine whether a more substantial enhancement in students' numeracy skills occurs in economics subjects instructed with technology-based educational game learning media compared to those instructed without it, specifically in the final measurement (posttest).

Method

The research method used was an experimental method with research subjects of 64 students taken from eight classes and divided into two groups, namely the experimental group which used technology-based educational games and the control group which did not use educational games (conventional method). According to (Gainau, 2016) The experimental research method is a scientific approach in which researchers systematically manipulate one or more independent variables to measure their effects on the dependent variable, while controlling for other factors that may influence the results. Students' numeracy skills will be measured using a numeracy skills test before and after treatment. Data were analyzed using the t-test. This research tries to focus on the influence of the use of technology-based educational games on students' numeracy skills in economics subjects which researchers consider relevant and important to do. Based on the research objectives as stated by the researcher in the introduction, a plan is prepared that must be followed as a road map to achieve the research objectives. This road map involves several stages, including: First, planning is carried out by determining the research objectives, determining the research subjects to be taken, and formulating hypotheses. This stage also includes planning the use of technology-based educational games in the learning process. Second, data collection was carried out by testing students' numeracy skills before and after using technology-based educational games. The collected data was then processed and analyzed to determine the effect of using technology-based educational games on students' numeracy skills.

The introduction of technology-based educational games is carried out by presenting technology-based educational game media to students on how to play educational games with the help of computers using laptops and projectors. This research is intended to test the following hypotheses: (1) There is an increase in numeracy skills in economics subjects who use technology-based educational games in the initial measurement (pretest) and the final measurement (posttest); (2) There is an increase in numeracy skills in economics subjects that do not use technology-based educational game learning media in the initial measurement (pretest) and the final measurement (posttest); (3) There was a higher increase in students' numeracy skills in economics subjects taught using technology-based educational game learning media compared to students who were taught without using technology-based educational game learning media in the final measurement (posttest). Through this research, the aim is to contribute to the expansion of knowledge and understanding regarding the impact of employing technology-based educational game learning media on students' numeracy skills in economics subjects. The research endeavors to ascertain the significance of using technology-based educational game learning media in enhancing students' numeracy skills compared to learning media devoid of technology-based educational games. The outcomes of this study will provide insights into whether technology-based educational game learning media can serve as an effective alternative for improving students' numeracy skills in high school economics subjects or not.

Results and Discussions

The participants in this study comprised 64 students selected from various classes and were subsequently divided into two groups: the experimental group (Class A) utilizing technology-based educational games and the control group (Class B) not incorporating technology-based educational games. The primary objective of this research is to determine the more effective instructional model for enhancing students' numeracy skills in economics subjects—whether it be the utilization of technology-based educational game learning media or conventional teaching methods without such media. Numeracy skills in this study were assessed through students' pretest and posttest scores, quantified on a scale of 100. Bottom of FormBased on the analysis of pretest and posttest scores from the control group students, it is revealed that the average pretest score stands at 38.44, with the highest score recorded as 50 and the lowest as 30. Subsequently, the posttest scores for the control group students indicate a mean score of 42.34, ranging from a high of 55 to a low of 35. These average values will be utilized in the hypothesis test for this research, whereas the highest and lowest values will be employed for the normality test.

Similarly, upon evaluating the pretest and posttest scores of the experimental group students, it is observed that the average pretest score is 40.16, with the highest score noted as 55 and the lowest as 35. The mean, standard deviation, and other statistical measures for the posttest data will be calculated accordingly for further analysis.

Table 1. Deskriptive Statistics of Posttest Data

The calculation results	N	Mean	Std. Deviation	Minimum	Maximum
Postest eskperimen	32	86,0938	6,68826	70,00	95,00
Postest kontrol	32	42,3438	5,67740	30,00	55,00

Based on the descriptive statistics derived from the data, it is evident that the mean posttest score of the experimental class surpasses that of the control class. Additionally, the comparison between the mean posttest score and mean pretest score within the experimental class, as illustrated in the table above, further supports this observation. These findings suggest a positive impact of utilizing technology-based educational games on students' numeracy skills in Economics subjects. The posttest score data for the control class students has been organized into a frequency table, presented in Table 2 below. This table provides a comprehensive overview of the learning outcomes associated with posttest scores for control class students.

Table 2. Frequency Table of Control Class Posttest Numeracy Skills

Student Score		Frequency	Percent	Valid Percent	Cumulative Percent
	30	1	3,1	3,1	3,1
	35	4	12,5	12,5	15,6
	40	13	40,6	40,6	56,2
Valid	45	9	28,1	28,1	84,4
	50	3	9,4	9,4	93,8
	55	2	6,2	6,2	100,0
Total		32	100,0	100,0	

From the frequency table above, it can be seen that the posttest of numeracy skills of control class students are in the range of 30-55. This frequency table is used to determine the frequency of posttest scores from each control class student, find out the number of control class students who have answered posttest questions, and find out the percentage and total percentage of control class students' posttest scores. The results of the posttest scores for control class students at SMAN 2 for the 2022/2023 academic year are presented in the histogram below:

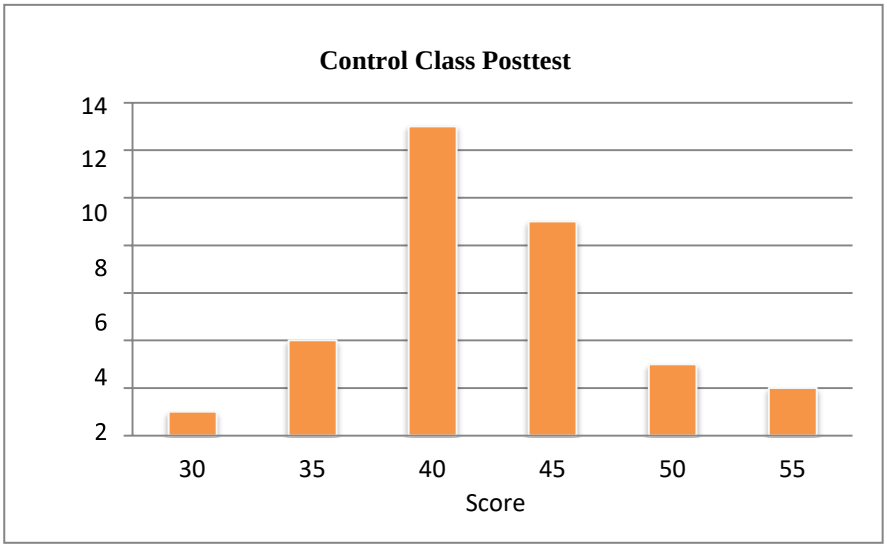

Figure 1. Histogram of Control Class Students' Posttest Scores

Posttest score data for experimental class students is presented in a frequency table. The following is a frequency table of these learning outcomes.

Table 2. Frequency Table of Experimental Class Posttest Numeracy Skills

Student Score		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	70	1	3,1	3,1	3,1
	75	3	9,4	9,4	12,5
	80	4	12,5	12,5	25,0
	85	10	31,2	31,2	56,2
	90	8	25,0	25,0	81,2
	95	6	18,8	18,8	100,0
Total		32	100,0	100,0	

From the frequency table above, it can be seen that the posttest numeracy skills of experimental class students are in the range of 70-95. This frequency table is used to determine the frequency of posttest scores for each experimental class student, determine the number of experimental class students who have answered posttest questions, and determine the percentage and total percentage of experimental class students' posttest scores. The results of the posttest scores for experimental class students are presented in the histogram on Figure 2.

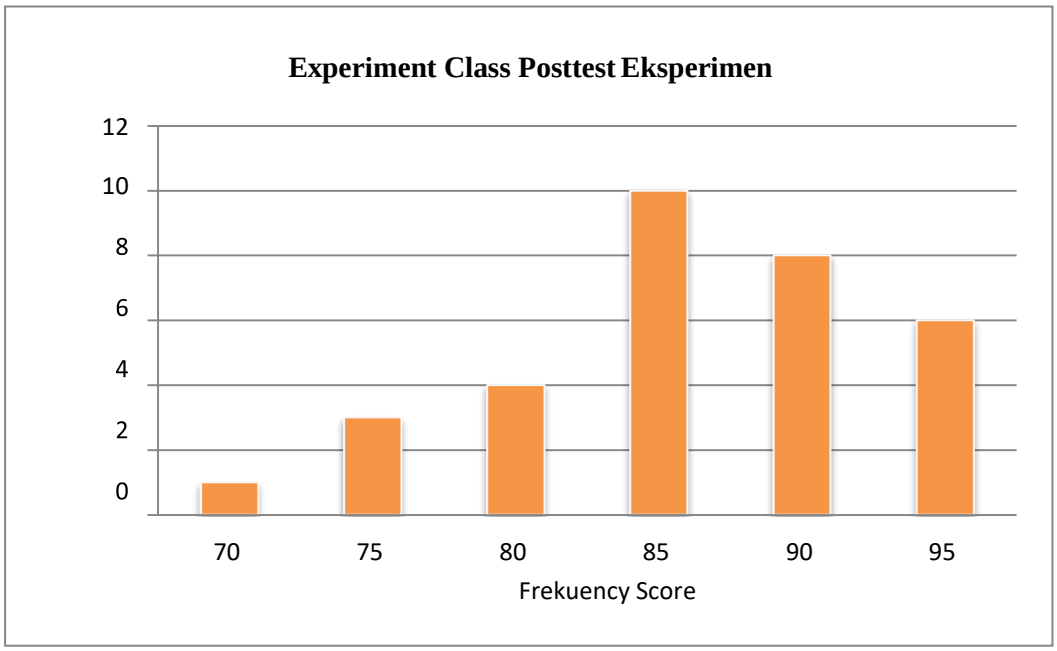

Figure 2. Histogram of Experiment Class Students' Posttest Scores

From the calculation results, the average posttest score for the experimental class was 86.09 and the average pretest score for the experimental class students was 40.15. The average posttest score for experimental class students is greater than the average pretest score (before using technology-based educational games) indicating an increase in learning outcomes after using technology-based educational game media applied to the experimental class. This proves that the use of technology-based educational games in economics learning has an effect on improving the numeracy skills of class XII students at SMAN 2 Kuningan. Apart from that, the results obtained from calculating the difference in the average posttest and pretest scores for experimental class students were 45.94 and the difference between the average posttest and pretest scores for control class students was 3.91. From the results of these calculations, it can be seen that the difference in the average posttest and pretest scores of the experimental class students is higher when compared to the difference in the average posttest and pretest scores of the control class students. This indicates that learning using technology-based educational games produces better learning outcomes.

Data for the distribution normality test were obtained from posttest data, both from the experimental group and the control group with the help of the SPSS version 26.0 program. Testing was carried out using the Kolmogorov Smirnov test. To find out whether the data is normally distributed or not, it can be seen from the |FT value – FS| biggest. If the value |FT – FS| largest < Kolmogorov Smirnov table value at a significance level of 5%, then the data is not normally distributed, whereas if the value |FT – FS| largest > Kolmogorov Smirnov table value at a significance level of 5%, then the data is normally distributed. The application of the Kolmogorov Smirnov test is that if the value |FT – FS| largest < Kolmogorov Smirnov table value at a significance level of 5% means that the data to be tested has a significant difference from standard normal data, meaning the data is not normal. Furthermore, if the value |FT – FS| largest > Kolmogorov Smirnov table value

at a significance level of 5% means there is no significant difference between the data to be tested and standard normal data, meaning that the data tested is normal, because it is not different from standard normal. The following is a table that presents the results of the Kolmogorov Smirnov test on the posttest scores of control class students and the posttest scores of experimental class students:

Table 3. Kolmogorov Smirnov Test Results

Test result		Numeracy Skills Postest (Eksperiment)	Numeracy Skills Postest (Control)
N		32	32
Normal Parameters	Mean	86,09	42,34
	Std. Deviation	6,58	5,58
Score $\|F_T - F_S\|$ Biggest		0,724	0,9256
Test distribution is Normal.			

The results of the research on the control class posttest showed that the value |FT – FS| the largest is 0.9256. Based on the Kolmogorov Smirnov test criteria, it can be concluded that the distribution of the control class posttest data is normal because the |FT – FS| largest > than the Kolmogorov Smirnov table value at the 5% significance level (0.211). Likewise, the results of research on the experimental class posttest show that the value |FT – FS| the largest is 0.724. Based on the Kolmogorov Smirnov test criteria, it can be concluded that the distribution of posttest data for the experimental class is normal because the |FT – FS| largest > than the Kolmogorov Smirnov table value at the 5% significance level (0.211). Based on the histogram of posttest scores for the experimental class, it can also be seen that the data is normally distributed with a normal curve as seen in the following curve:

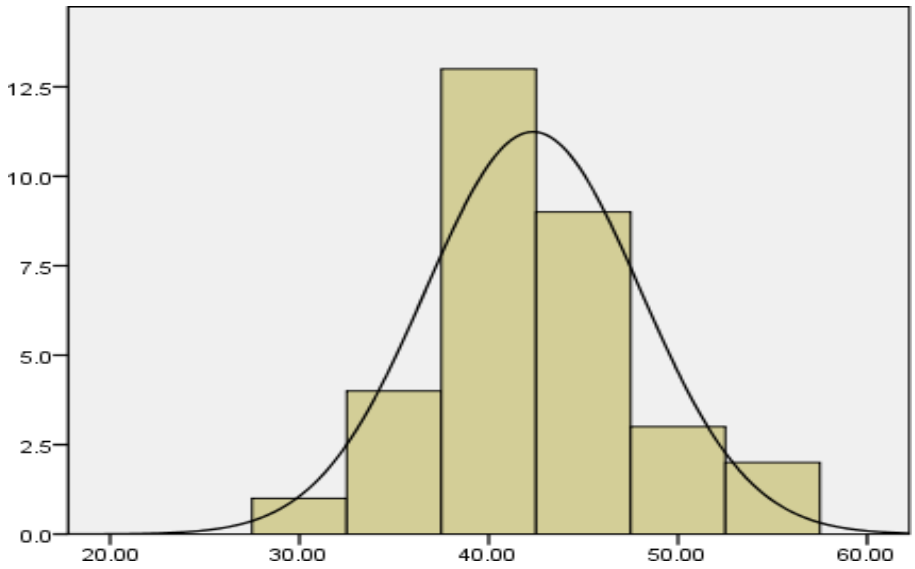

Figure 3. Control Class Posttest Score Curve

Based on the histogram of posttest scores for the experimental class, it can also be seen that the data is normally distributed with a normal curve as seen in the following curve on Figure 4.

Homogeneity testing is intended to determine that a set of data does come from populations that are not much different in diversity and to determine whether or not there is variance in a group of data. Testing the homogeneity of posttest data for the experimental group and control group was carried out using the F-test, namely comparing the largest variance (control group) with the smallest variance (experimental group). To find out whether the data is homogeneous or not, it can be seen from the F-count value. If the F-count value > F-table means the variance is not homogeneous, whereas if the F-count value < F-table, it means the variance is homogeneous. The results of the homogeneity test to test the equality of the experimental and control posttest variances obtained an F-count value of 1.3878. Because the F-calculated value is smaller than the F-table value at the 5% significance level, it can be stated that the experimental and control class variances are homogeneous. Based on the results of the normality test and homogeneity test, the results showed that the data was normally distributed and homogeneous, so the Independent Sample T-Test was used using equal variances assumed.

The results of the homogeneity test can be seen in the following table:

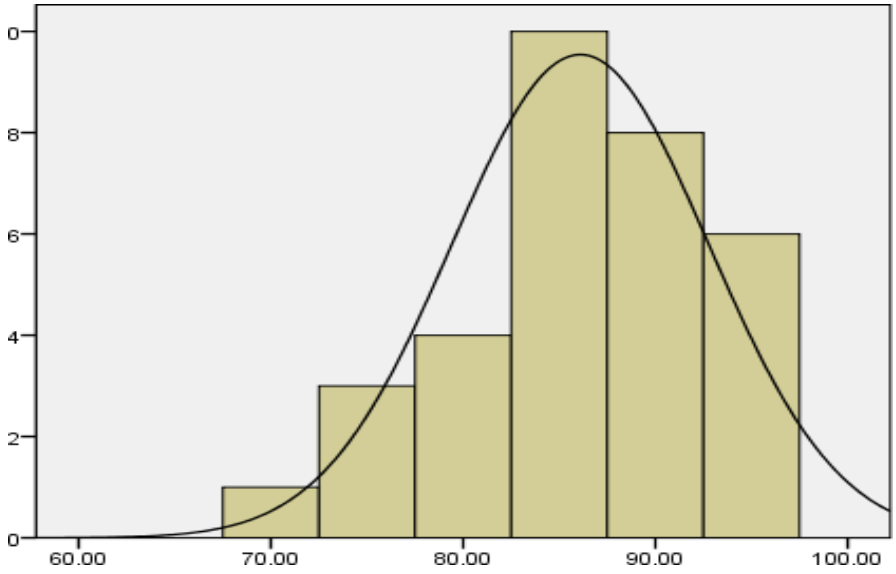

Figure 4. Experimental Class Posttest Score Curve

Table 3. F-test Results

Variables Tested	Identify Data Variance	Levene's Test for Equality of Variances		dk Numerator	dk Denominator
		F-count	F-table		
Numeracy Skills (Postest)	*Equal variances assumed*	1,3878	1,84	31	31

The hypothesis in this research is that there is a significant difference between the numeracy skills of students whose learning uses technology-based educational games and the learning outcomes of students whose learning does not use numeracy-based educational games. This research uses the t-test and normal gain test, the t-test is used to determine the difference in numeracy skills between students whose learning uses technology-based educational game media (experimental class) and the numeracy skills of students whose learning does not use technology-based educational game media (control class).). If there are differences in the numeracy skills between the experimental class and the control class, then the researcher will calculate the normal gain score to obtain categorization results for the effectiveness of using technology-based educational games in economic learning. The results of the t-test calculation are presented in the following table.

Table 4. T-test Results

Variables Tested	Identify Data Variance	T-test for Equality of Means		
		T_{count}	t_{table}	Dk
Numeracy Skills (Postest)	Equal VariancesAssumed	28,66	1,99897	62

Based on the t-test results table, if the $t_{count} > t_{table}$ then Ha is accepted and Ho is rejected. The tcount value is 28.66 which means tcount > ttable (1.99897) so that Ha is accepted so the research hypothesis "There is a significant difference between the numeracy skills of students whose learning uses technology-based educational game media and the numeracy skills of students whose learning does not use games." Technology-based education" is proven. Apart from that, judging from the average posttest score for the experimental class, namely 86.09, it is greater than the average posttest score for the control class, namely 42.35, which means that the learning outcomes of students whose learning uses technology-based educational game media are higher than the numeracy skills of students whose learning does not use games. Technology-based education. Apart from that, it can also be seen from the average difference between the posttest and pretest scores of experimental class students which is higher compared to the average difference between the posttest and pretest scores of control class students, which means that the increase in numeracy skills of students whose learning uses technology-based educational game media is higher than the increase in skills. number of students whose learning does not use technology-based educational games.

To obtain results categorizing the effectiveness of using technology-based educational games, researchers used the normal gain test. Normal gain is the difference between posttest and pretest scores. Normal gain shows an increase in students' understanding or mastery of concepts after the learning process. This normal gain test was carried out to calculate the effectiveness value of using technology-based educational games in economic learning and to obtain categorization results for the effectiveness of using technology-based educational games in economic learning. This can be done by using the normal gain formula according to Meltzer (2002).

$$Ngain = \frac{Skor\ Posttest - Skor\ Pretest}{Skor\ Ideal - Skor\ Pretest}$$

With the interpretation of the effectiveness of normal gain according to Arikunto (1999).

Table 5. Normal Gain Effectiveness Categories

Persentase (%)	Interpretation
< 40	Ineffective
40-55	Less Effective
56-75	Effective Enough
>76	Effective

Based on the gain index effectiveness category table, technology-based educational games can be said to be effective if the normal gain score calculation results are greater than 76% calculated from the posttest and pretest scores of experimental class students. From the results of the normal gain score test in the experimental class, the results were obtained as presented in the following table. The average normal gain score for the experimental class shows a value of 76.76% which is included in the effective category (>76%) according to the interpretation of the effectiveness of the gain index according to Arikunto so it can be said that the use of technology-based educational games is effective in improving students' numeracy skills in economics subjects. class XII of SMAN 2 Kuningan for the 2022/2023 academic year.

Based on the conclusion that the use of technology-based educational games is effective in improving students' numeracy skills in economics subjects, this technology-based educational game is effectively used as a fun interactive learning medium in economics subjects. This technology-based educational game is expected to be a solution to the problem of students' low numeracy skills in economics subjects in high school. Based on the research results as described above, the discussion of this research resulted in several things as follows.

There is a significant difference between the numeracy skills of students whose learning uses technology-based educational games and the learning outcomes of students whose learning does not use technology-based educational games.

Based on the results of hypothesis testing, it can be seen that there is a significant difference between the learning outcomes of students whose learning uses technology-based educational games and the learning outcomes of students whose learning does not use technology-based educational games. This can be seen from the t-count value of 28.66 which means tcount > ttable (1.99897) so that Ha is accepted. This shows that there is a difference between the learning outcomes of students whose learning uses technology-based educational games and the learning outcomes of students whose learning does not use technology-based educational games. The results of the research regarding differences in learning outcomes between the control class and the experimental class are the same as the results of research conducted by (Irfan et al., 2017). The experimental class had higher learning outcomes than the control class after being given treatment. The difference between the two classes is caused by the treatment or treatment in the form of learning using technology-based educational game media in economic learning for the experimental class and learning without using technology-based educational game media in economic learning for the control class. The results of research conducted by researchers produced data that the experimental class learning outcomes were higher than the control class learning outcomes after being given treatment. The learning outcomes that were compared were learning outcomes in the form of experimental class posttest scores and control class posttest scores which were calculated using the t-test statistical analysis test. Based on the results of this discussion, it was concluded that there was a significant difference between the learning outcomes of students whose learning used technology-based educational games and the learning outcomes of students whose learning did not use technology-based educational games.

Learning using effective technology-based educational games to improve numeracy skills in economics subjects in class XII SMAN 2 Kuningan

The results of the research show that the average normal gain score calculation for the experimental class is 76.76% which is included in the effective category (>76%) according to the interpretation of the effectiveness of the gain index based on (Daryanes & Ririen, 2020) so it can be said that the use of technology-based educational games is effective for improving skills. Student numeration in economics subjects in class XII SMAN 2 Kuningan. The use of learning media is one of the important and influential things in achieving learning goals. Technology-based educational game learning media has been proven to improve students' numeracy skills in economics subjects. Apart from that, this technology-based educational game learning media can increase students' interest, motivation and creativity in learning economics. Technology-based educational games are also preferred by students because they are interesting and prevent students from getting bored quickly. Learning media must be able to attract students' attention so that students are interested in participating in the teaching and learning process with enthusiasm. In this way, teaching and learning activities will not be boring and monotonous. Apart from that, it is able to improve students' skills in operating computers as a medium for running this technology-based educational game.

The reality that occurs in the field is in accordance with ((Uyun & Myori, 2021); (Saputra & Gunawan, 2021)) that the use of learning media at the learning orientation stage will really help the effectiveness of the learning process and the delivery of messages and lesson content at that time. Apart from arousing student motivation and interest, learning media can also help students improve understanding, present data in an interesting and reliable manner, facilitate data interpretation, and condense information. Based on the learning outcomes related to improving numeracy skills, it can be concluded that learning using technology-based educational games is very effective in improving students' numeracy skills in economics subjects in class XII at SMAN 2 Kuningan.

Conclusions

Based on the results and discussion, it can be concluded that there are differences in the value of numeracy skills in economic subjects that use technology-based educational games in the initial measurement (pretest) and the final measurement (posttest) in economic subjects in class XII SMA. There is an increase in the value of students' numeracy skills in economics subjects taught using technology-based educational game learning media compared to students taught without using technology-based educational games in the final measurement (posttest) in economics subjects in class XII SMA.

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