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Analysis of Mathematical Communication Skills Vocational School Students Assisted Desmos in Solving Mathematics of Finance

Sahrul Ramadhan and Wahyu Setyaningrum

Faculty of Mathematics and Natural Science, Universitas Negeri Yogyakarta

Correspondence should be addressed to Sahrul Ramadhan:
sahrulramadhan.2022@student.uny.ac.id

Abstract

One of the mathematical skills that students must have been mathematical communication skills. Mathematical communication skills enable students to convey their understanding of mathematical concepts. The process of expressing mathematical ideas verbally or in writing helps students understand the material more deeply. Other previous research only described the effectiveness of software on mathematical communication skills, this study aims to analyze students' mathematical communication skills in 21st century learning when solving financial math problems with the help of desmos. This research is descriptive research with a qualitative approach. The results showed that the mathematical communication skills of class 11 SIJA B of 12 students belonged to the medium category. Desmos media has the potential to improve students' mathematical communication skills. A total of 2 students in the high mathematical communication skills category with a percentage of 16.7% were able to master all indicators of mathematical communication skills, 8 students in the moderate mathematical communication skills category with a percentage of 66.6% and some students were able to master all indicators of mathematical communication skills but were still lacking perfect, and 2 students in the low mathematical communication skills category with a percentage of 16.7% were only able to master one indicator, namely the second indicator of mathematical communication skills. The implications of this research are to investigate effective teaching methods to improve students' mathematical communication skills. Integrate tasks and activities that encourage mathematical communication in learning materials and further explore how technology can be applied to improve mathematical communication skills.

Keywords: Desmos; Mathematical Communication; Technology

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Abstrak

Salah satu keterampilan matematika yang harus dimiliki peserta didik adalah kemampuan komunikasi matematis. Ketrampilan komunikasi matematis memungkinkan siswa untuk menyampaikan pemahaman mereka tentang konsep matematika. Proses mengungkapkan ide-ide matematis secara verbal atau tertulis membantu siswa memahami materi dengan lebih mendalam. Penelitian lain sebelumnya hanya mendeskripsikan keefektifan software terhadap kemampuan komunikasi matematis, penelitian ini bertujuan menganalisis kemampuan komunikasi matematis siswa dalam pembelajaran abad-21 saat menyelesaikan soal matematika keuangan berbantuan desmos. Penelitian ini merupakan penelitian deskriptif dengan pendekatan kualitatif. Hasil penelitian menunjukkan bahwa kemampuan komunikasi matematis kelas 11 SIJA B dari 12 peserta didik tergolong pada kategori sedang. Media desmos berpotensi untuk meningkatkan kemampuan komunikasi matematis peserta didik. Sebanyak 2 siswa pada kategori kemampuan komunikasi matematis tinggi dengan persentase 16,7% mampu menguasai semua indikator kemampuan komunikasi matematis, 8 siswa pada kategori kemampuan komunikasi matematis sedang dengan persentase 66,6% dan beberapa siswa mampu menguasai semua indikator kemampuan komunikasi matematis namun masih kurang sempurna, dan 2 siswa pada kategori kemampuan komunikasi matematis rendah dengan persentase 16,7% hanya mampu menguasai satu indikator , yaitu indikator kedua dari kemampuan komunikasi matematis. Implikasi penelitian ini agar menyelidiki metode pengajaran yang efektif untuk meningkatkan ketrampilan komunikasi matematis siswa. Mengintegrasikan tugas dan aktivitas yang mendorong komunikasi matematis dalam materi pembelajaran dan lebih mengeksplorasi bagaimana teknologi dapat diterapkan untuk meningkatkan ketrampilan komunikasi matematis.

INTRODUCTION

The progress of science and technology is one of the fields that is growing rapidly in human life and has a significant impact on the field of Education (Adam & Syastra, 2015). Everyone needs education, and education is very important to improve human resource standards (Firdaus, 2017). Humans can broaden their views and learn new things through education (Lanani, 2015).

Education is a deliberate and planned action with the aim of changing human nature and behavior (Hasanah et al., 2017). Mathematics is a subject that has a significant impact on the field of education. (Imanisa & Effend, 2023). Mathematics is a crucial instrument for students to improve their thinking and their capacity to solve issues in the actual world (Kızıltoprak & Köse, 2017). One of the pillars of modern technological progress is mathematics (Apriyono, 2016).

Technology offers a promising future and has an impact on the 21st century educational learning process, including learning mathematics (Hidayah et al., 2017; Darmawijoyo, 2011). Based on Miller (2018) technology can increase student motivation and student learning outcomes in mathematics. According to research Redhana (2019) 4Cs include critical thinking, creativity, communication, and collaboration—which have been introduced in the 21st century. The competencies that students need to possess to succeed in 21st century learning, such as inventiveness and originality, collaboration and interaction, information research and comprehension, critical thinking, problem solving, and making choices, as well as digital and technology concepts,(Syahputra, 2019).

Students now find it simpler to comprehend and portray mathematical things because to technological advancements. This is reinforced by the statement Taufik & Pagiling (2021) in research that web/ technology-based learning media can assist in visualizing abstract information. One of them is Desmos, where Desmos is a program that can display information involving mathematics (Isroil et al., 2022). Through the web or iOS and Android applications, Desmos is a platform or service that provides a variety of math tools, digital math activities and exercises, and courses to support high-level learning in a fun way (Kristanto, 2021). A graphs calculator, a scientific calculator, a four-

function calculator, a matrix calculator, and a geometry tool are a few of the math tools that Desmos provides.

Desmos is a sophisticated tool for making graphs that is free, simple to use, intuitive, and has several advantages over other software or apps (Ebert, 2014). Creator of Desmos Activities Additionally, it has been demonstrated to give pupils the chance to explore mathematical ideas thoroughly and effectively. In addition, teachers can find out the learning progress of each student in real-time(Orr, 2017). Students may take advantage of a variety of learning possibilities because to Desmos Activity Builder's superiority (Gulati, 2017). The graph function allows students to create plots, communicate with one another, share their research with other students, and assess their learning progress so that teachers may monitor each student's development while they are in class(Herman, 2020). Since students may practice autonomously presenting a mathematical notion or image of information that is learned and expressing it with other students, this demonstrates that Desmos media has the potential to improve students' mathematical communication skills.

Communication skills include the ability to convey messages clearly, understand other people's perspectives, and adapt to other students. In the modern era, communication skills continue to develop along with technological advances and social changes(Efendi, 2021; Imanuel Silalahi, 2023). Apart from that, there is the term mathematical communication ability. Students' ability to communicate mathematics is investigated as the content of messages that must be transmitted and clarified via a comprehension of a mathematical notion. Mathematical communication skills is the capacity of students to utilize mathematics as a communication instrument (language of math) (Kusumah et al., 2020; NCTM, 2000). According to Kamid et al. (2020) the capacity to communicate mathematical concepts clearly and effectively using words, notations, symbols, and visual representations is known as mathematical communication skills. Hodiyanto (2017) claims that written and verbal interaction are both part of mathematical communication skills. Verbal interaction such as discussions and explanations, and seen from the way students understand concepts and mention symbols correctly (Pantow et al., 2020), whereas written communication involves presenting mathematical concepts by the use of language that students can grasp using images or graphs, tables, or equations (Riyadi et al., 2021). According to Hasanah et al. (2017) mathematical communication skills are students' capacity to understand and communicate concepts or ideas by connecting symbols, visuals and actions in solving mathematical problems.

The communication mathematically is one of the key abilities that pupils need to possess in order to grasp mathematics (Pantow et al., 2020). The 2006 Government Regulation concerning Content Standards clarifies the importance of mathematical communication skills. This is also supported by BNSP (2007) and Kemendikbudristek (2022) which states that one of the objectives of teaching mathematics is to enable students to express and communicate mathematical concepts using symbols, graphs, tables and diagrams or other tools to clarify situations or understand problems.In order for students to grasp the content being presented and be able to appropriately communicate mathematical symbols while solving mathematical problems, it is crucial that the material is delivered to them in a clear and accurate manner(Sandy et al., 2022). The outcomes of Indonesian mathematics education in the area of

mathematical communication are still poor, according to the reality on the ground(Tiffany et al., 2017). Support this the results of the research Program for International Student Assessment (PISA), which demonstrate that Indonesian students' average mathematical communication skill is below the global average and where Indonesia's mathematical ability score in 2015 was 386 (OECD, 2018) and the PISA results in 2018 saw a decrease in score of 379; however, this score is still significantly below that of other ASEAN nations like Thailand (419), Malaysia (440), and Singapore (569) and below the global average score of 489, placing Indonesia at 72 out of 78 countries that participated(OECD, 2019). One way to improve mathematical communication skills is by using digital tools, applications or software that can help students present mathematical information more interactively. The use of digital tools in mathematics classrooms has become popular among innovative pedagogical practices for designing and implementing challenging, active, student-centered, and motivating learning (Hoyles, 2018). Student-centered learning can enable students use decontextualized language to express themselves accurately and understand it, which helps develop skills for math learning (Caniglia et al., 2017).

As for according to the report NCTM (2000), there are a number of indicators that can be used to gauge students' proficiency in mathematical communication. These indicators include the following: 1. Communicating mathematical ideas through oral, written, and imagining mathematical concepts; 2. Understanding, interpreting, and evaluating mathematical ideas verbally, in writing, or in additional visual forms; 3. Using mathematical terms, notations, and constructions to present ideas and explain relationships between mathematical concepts. Meanwhile, according to Purnama & Afriansyah (2016) the indicators for mathematical communication are 1. Using real-world examples, images, real-world circumstances, and mathematics to explain concepts, situations, and mathematical connections in writing; 2. Integrating mathematical concepts with real-world objects, images, or diagrams; 3. Use language or mathematical symbols to convey daily happenings. Furthermore, Yunisha et al. (2016) states the following are some signs of mathematics communication skills: 1. Present concepts, circumstances, or mathematical issues as illustrations or graphs; 2. Expressing problems, images, or graphics in terms of language, symbols, ideas, or mathematical models; 3. Arranging arguments or expressing opinions and providing explanations for answers. In this article, we will discuss more about written communication skills using indicators based on the conclusions drawn from the three researchers, namely 1. Expressing a situation or image into an idea or mathematical language; 2. Interpret and evaluate a mathematical idea and mathematical presentation in writing into mathematical models; 3. Explain the problem-solving procedure and conclude it.

Based on the description above, in this study the focus was on describing the results of the exploration of students' communication skills in solving Desmos-assisted problems mathematical of financial. The purpose of this study is "Analyze students' mathematical communication skills in 21st century learning when solving Desmos-assisted financial math problems". To enhance and strengthen students' mathematical thinking and to aid them in understanding fundamental concepts both verbally and in writing, it is vital to assess and learn about their mathematical communication skills. The benefit of this research is that students can properly

and correctly describe plans for solving financial math problems through mathematical communication skills with the help of Desmos.

METHOD

This research wants to find out whether and how the use of technology can influence students' mathematical communication skills. The analysis of mathematical communication skills in solving financial mathematics problems in this research is research with a qualitative approach that uses descriptive methods as an analysis analyzer. Qualitative research is descriptive in nature and usually uses analysis(Bernard et al., 2018). To gauge the quality of students' mathematical communication skills, a qualitative technique is applied.

The test instrument used to measure students' mathematical communication skills is in the form of multiple choice questions and descriptions with a total of 15 questions with 12 multiple choice questions and 3 descriptions which include three process components used as indicators of mathematical communication: expressing ideas, interpreting and concluding answers (Nisa & Arliani, 2023). The questions are written in full using methods and explanations with the aim of making it easier for researchers to understand students' use of mathematical communication skills. The instruments used have been validated by Two vocational high school teachers with master's degrees and a doctoral degree. The resulting questions have very valid criteria with a validity level of more than 0.8. The questions have a reliability coefficient of more than 0.6 so the questions are very reliable. This research was conducted at one of the State Vocational Schools in Sleman, Yogyakarta in class 11 SIJA B with a total of 34 students. The research subjects took as many as 12 students with techniques purposive sampling as a limited trial. According to Jatmiko in Ramadhan et al. (2021) stated that small group trials consisted of 10-20 students. 12 test takers were selected based on various criteria, including having the highest UTS scores in their class, clear and easy-to-read writing, ability to reason clearly and logically.

Data collection techniques are based on the results of mathematical communication skills tests and observations from observers. The data analysis technique used when collecting qualitative data is the Miles & Huberman model analysis technique (Lamonta et al., 2016). The first stage is by doing data reduction, to classify data with a certain pattern so that it is easier to read. The second stage presents data. The third stage is drawing conclusions from all the data that has been obtained. The results of students' answers will be calculated, then the acquisition of scores and the average and the standard deviation of the test will be used to classify the students' levels of mathematical communication into three categories: high, medium, and low. The following table provides an explanation of the research subject grouping table (Ridzkiyah & Effendi, 2021).

Table 1. Category of Students' Mathematical Communication Skills

Interval	Skills level
$x \geq \bar{x} + SD$	High
$\bar{x} - SD < x < \bar{x} + SD$	Medium
$x \leq \bar{x} + SD$	Low

The categorization of high, medium, and low level abilities is shown in Table 1. After that, the percentages were calculated and analysis of the students' work was done answers to the test questions which referred to indicators of their mathematical communication skills (Kuslinar et al., 2019). The results of this research are said to be valid because the instruments used have met construct

validity and statistical validity, where Construct Validity: Ensures that the variables being measured truly reflect the concept you want to measure. Statistical Validity: Ensuring that the statistical analysis used is appropriate to the data and research objectives.

RESULTS AND DISCUSSION

Results

This research was conducted to evaluate students' mathematical communication skills on material mathematics of finance. This research was carried out in class 11 SIJA B, one of the State Vocational Schools in Sleman, Yogyakarta. Researchers will use the test results as a guide to categorize students' mathematical communication skills into three categories.

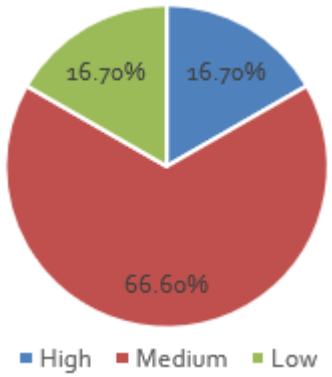

Figure 1. Category Group Chart

Figure 1 shows that there are two students with high mathematics communication skills (16,7%), 8 students have moderate mathematical communication abilities (66.6%), and there are 2 students who have low mathematical communication abilities (16 ,7%). Table 2 presents descriptive statistics that represent the results of assessing students' ability to communicate mathematically.

Table 2. Descriptive Statistics of Students' Mathematical Communication Skills Test Results

	N	Min. Value	Max. Value	Rate	Standard Deviation
Mathematical Communication Skills Test Scores	12	35	100	75	18,82

Table 2 shows that the student's test score obtained the maximum value of 100. However, in table 2 there are also some students who obtained a minimum score of 35. The resulting standard deviation was 18.82, and the average student score was 75. The average value obtained obtained showed that the achievement of these scores did not meet the Mathematics Minimum Completeness Criteria (KKM) score in the schools examined, namely 78. In addition, 7 out of 12 participants who were studied obtained higher results than the KKM scores. Additionally, classifications for students' mathematical communication skill levels based on high, medium, and low categories will be established. The findings are shown below as a percentage of the students' mathematical communication skills levels.

Table 3. Percentage of Students' Mathematical Communication Skills Level

Category	Value Limit	Amount	Percentage
High	$x \geq 93{,}82$	2	16,7%
Medium	$56{,}18 < x < 93{,}82$	8	66,6%
Low	$x \leq 56{,}18$	2	16,7%
	Total	12	100%

Table 3 shows that as many as 2 students who have mathematical communication skills at the high category level with a percentage of 16.7%. There were 8 students who obtained the moderate category level, with student test scores at intervals of 56.18 and 93.82 with a percentage of 66.6% for mathematical communication skills. Furthermore, there were 2 students who showed a low category level with a percentage of 16.7% for mathematical

communication skills and obtained a test score of less than equal to 56.18.

After finding the results of each category of students' mathematical communication abilities, the researcher then determined the research subjects whose answers would be analyzed. Subjects were selected as many as 1 student from each ability category, namely 1 high category subject, 1 medium category subject and 1 low category subject. The percentages listed below are based on the findings of 12 participants' scores on the test of mathematical communication skills.

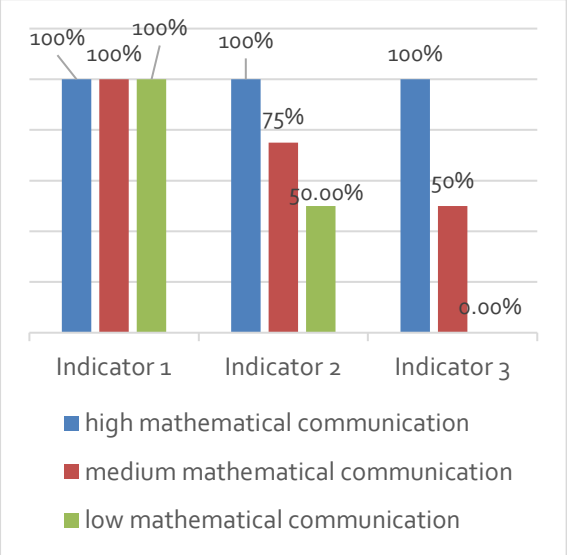

Figure 2. Indicator Percentage Chart based on Student Test Results

Based on Figure 2, it can be concluded that the percentage can be seen from the acquisition of scores on students' mathematical communication skills test results. In indicator 1, namely expressing a situation or picture into an idea or mathematical language, a percentage of 100% is obtained for students in the high category; medium category and and low category. In indicator 2 interpreting and evaluating a mathematical idea and mathematical presentation in writing into the mathematical model obtained a percentage of 100% for students in the highcategory, 75% for students in the medium category and 62.5% for students in the low category. On indicator 3, namely explaining the procedure for solving problems and concluding that a percentage of 100% is obtained for students in the high category; 50% for students in the moderate category and 0% for students in the low category.

Discussion.

This study will analyze the results of the test questions, by categorizing them based on high, medium, and low levels for mathematical communication skills. The following is a discussion of the research's findings.

Students with High Category Mathematical Communication Skills

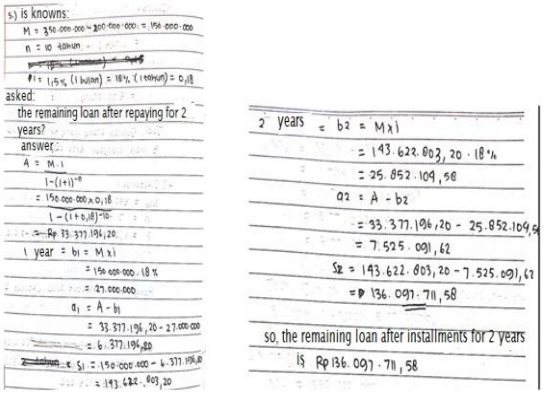

Figure 3. Answers of Low Category Level Students in Question 5

Figure 3 shows the answers of students who were successful in conveying a scenario or image into thoughts and mathematical language, which is the first indicator of mathematical communication abilities. It is evident from the replies that students' are able to put down what they have learned from the problems given and are able to write down various information provided in language and mathematical symbols, namely M = 150,000,000; p = 18% per year; and n = 10 years, apart from that students were also able to write down what was asked in the

problem, namely how much of the loan was left after repaying it for 2 years. The second indicator of mathematical communication skills, which is the ability to analyze and evaluate a mathematical idea and mathematical presentation in writing into a mathematical model, is then demonstrated by students in Figure 3 *(see Appendix)*. This is also evident from the responses provided by students in making a mathematical model by first writing down the size of the annuity, namely 33.377.196,20. After knowing the size of the annuity, then looking for interest and installments in the first year you get interest of 27,000,000 and the amount of the first year's installments is 6.377.196,20 so that the remaining installments of the first year ie 143.622.803,20. By doing the same calculation for the second year, students write down the amount of interest in the second year 25.852.104,58 and the second installment viz 7.525.091,62. Additionally, it can be shown in Figure 3 that students successfully met the third indication of mathematical communication, which is to be explaining the problem-solving process and conclude it. This is evident from the test answers that students were able to write down, namely the remaining installments in the first year minus installments in the second year, so that students write conclusions from the results obtained, namely the amount of the remaining installments in the second year is 136.097.711,58. This is in line with research ST. Marjan Ahsani Ardan (2020) which states that if students with high mathematical communication skills are able to express mathematical concepts into terms concrite, mathematical models and explain in detail what is asked for in the questions.

Students with Medium Category Mathematical Communication Skills

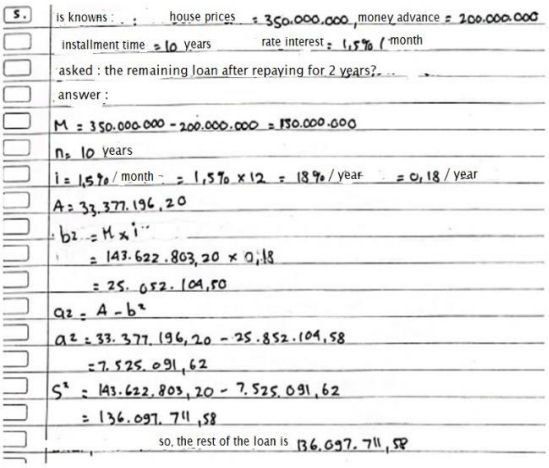

Figure 4. Answers of Students at the Moderate Category Level in Question 5

Figure 4 shows the answers of students who were successful in conveying a scenario or image into thoughts and mathematical language, which is the first indicator of mathematical communication abilities. Based on the answers given above, it is evident that students are able to put down they have learned from the problems given and are able to write down various information provided in language and mathematical symbols, namely M = 150,000,000; i = 18% per year; and n = 10 years, apart from that students were also able to write down what was asked in the problem, namely the remaining loan after repaying 2 years. Then the results of the answers show that students are less able to fulfill the second indicator of mathematical communication skills, namely interpreting and evaluating a mathematical idea and mathematical presentation in writing into a mathematical model. Because it can be seen from the answers given by students in making mathematical models, students are incomplete in writing their mathematical models, they tend to directly write the results of annuities and the remaining loans after the first year's installments. This is in line with Setiawan (2021) which said that most students work

in a hurry. This is also supported by the research of Anwar & Ramdan (2019) which states that there are some students who have incomplete answers because they finish them in a hurry. Additionally, it can be shown in Figure 4 that students were able to complete the third indicator of mathematical communication, which explaining the problem solving procedure and concluding it. This can be seen from the test answers of students who are able to write conclusions from the results obtained, namely writing down the remaining loan after repaying for 2 years, namely by reducing the remaining first year loan with installments in the second year. This is in line with the research of according to Ismayanti & Sofyan (2021) research, which says that if students with medium mathematical communication skills may not be able to learn some of theindicators of mathematical communication.

Students with Low Category Mathematical Communication Skills

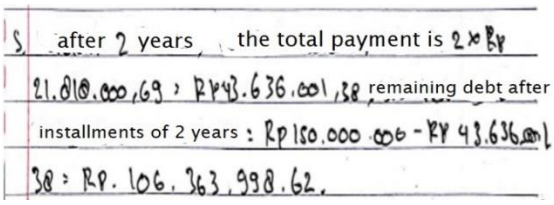

Figure 5. Answers of Low Category Level Students in Question 5

Figure 5 shows that students only successfully understand and evaluate a mathematical idea and mathematical presentation in writing into a mathematical model, which is the second indication of mathematical communication abilities. This is because students don't record what is known and what is being asked, along with their arguments or conclusions. However, the things students write are also wrong in modeling mathematics and they don't know the meaning of the numbers being operated (Anggraeni & Herdiman, 2018). This is in line with the research of Lamonta et al. (2016) that students with low communication skills only meet 1 indicator of mathematical communication.

In contrast to studies by Wijaya & Afrilianto (2018) and Arina & Nuraeni (2022) which claim that vocational students' mathematical communication skills fall into the low level category, the results of this study state that the level of mathematical communication skills of class 11 SIJA B students in the medium category. The application of the group investigation learning model with a scientific approach also influences the success of learning in improving mathematical communication skills because it can provide a basis for understanding how communication skills can be integrated into mathematics learning. Apart from that, using the Desmos application can improve students' mathematical communication skills in solving mathematical problems. Based on the results from observers, it was found that some students were more active using the group investigation type cooperative model compared to conventional learning. The observation results also show that Desmos provides the opportunity to see students' active involvement in carrying out the assignments given both in groups and individually. This is in line with research Tesfamicael (2022) which states that the use of Desmos and Geogebra provides active involvement in students' abilities.

This is in line with the research Kulsum et al. (2020) which states that the use of technology can support the development of learning potential and students' abilities in learning mathematics, because they are able to provide or explore a wide range of material. This is also supported by Yuliardi & Habibi (2016) that using technology-based learning materials may help students' mathematical communication skills. According to the

findings of the study, which involved 12 students, there were 2 students with high category communication skills (16.7%) and 8 students with medium category mathematics communication skills (66.6%). 2 students scored in the low category for communication skills with a percentage of 16.7%, and the average value of the test results is 75.

These results indicate that the use of Desmos as an interactive learning tool and become the main research instrument has the potential to improve students' mathematical communication skills (Koyunkaya & Dede, 2024; Machado et al., 2023; Safarini et al., 2023; Salas-Rueda, 2023) with attractive visualizations and a deeper learning experience, Desmos can help students who are in the medium category to move to the high category. Furthermore, with facilities such as the 'Activity Builder' which allows teachers to create lessons that suit everyone's needs, Desmos can be an effective tool for targeting and improving mathematical communication skills for students in the low category. Therefore, the integration of Desmos in the mathematics curriculum is recommended for further consideration in mathematics education research and practice.

How Desmos shapes communication skills can be seen through several aspects: (1) Desmos allows users to create clear and interactive visualizations of mathematical concepts. By using graphs and plots, users can easily explain and share mathematical ideas with others, both orally and in writing; (2) Desmos facilitates collaboration between users. For example, several people can work together to create or solve math problems using this platform to communicate and share ideas more effectively; (3) Desmos also allows users to create activities that allow others to interact with mathematical concepts.

Apart from that, in this research developing communication skills using Desmos involved several steps: (1) Active Practice: Users must actively use Desmos to communicate mathematical concepts, either by creating graphs, solving problems, or explaining mathematical ideas to others; (2) Collaboration: Discussion and exchange of ideas with others can help hone communication skills; (3) Receiving Feedback: Receiving feedback from others about how to convey mathematical ideas can help users improve their communication skills. This can be done through revisions and updates of graphics or activities that have been created; (4) Exploration: Using Desmos to explore various mathematical concepts and trying different ways to convey those ideas can help users become more skilled at conveying mathematical concepts in a clear and easy-to-understand manner.

Implication of Research

It is recommended that further research be carried out to study and explore in more detail learning models by applying technology to improve vocational school students' mathematical communication skills and what factors can improve vocational school students' mathematical communication abilities.

Limitation

This research has limitations, including: the small number of respondents from one of the SMKNs in Yogyakarta also limited the diversity of responses and took 12 samples for a limited trial to determine the communication skills of SMK students. The 12 test takers were selected based on various criteria, including having the highest UTS score in their class, clear and readable writing, the ability to reason clearly and logically.

CONCLUSION

The mathematical communication skills of class 11 SIJA B students at a State Vocational School in Sleman, Yogyakarta is included in the medium category level. Students in class 11 SIJA B at a State Vocational School in Sleman, Yogyakarta, fall into the medium category level for mathematical communication abilities. According to the findings of the study, 7 of the 12 students that participated in it scored higher than the KKM. A total of 2 students with a percentage of 16.7% on high mathematical communication skills, while 8 students with a percentage of 66.6% on moderate mathematical communication skills and 2 other students on low mathematical communication skills with a percentage of 16.7%. Students that fall into the high category can master all mathematics communication skill indicators. While other some students in the medium category can master all indicators of mathematical communication skills but are still imperfect. In other words, in the medium category they already understand what the problem or questions are meant for, but students are still not thorough and in a hurry without considering the mathematical model used, and sometimes without writing down the mathematical model but immediately writing down the result and are not used to it. write the conclusion when solving the given problem. Additionally, students in the low category are only capable of mastering the second indicator of mathematical communication skill. It is advised that more study be conducted to examine the learning model in greater detail using technology to enhance the mathematical communication skills of vocation school students and what factors can improve the mathematical communication skills of vocation school students.

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Appendix of article entitled: Analysis of Mathematical Communication Skills Vocational School Stu-dents Assisted Desmos in Solving Mathematics of Finance

The students' high category communication skills are shown in Figure 3

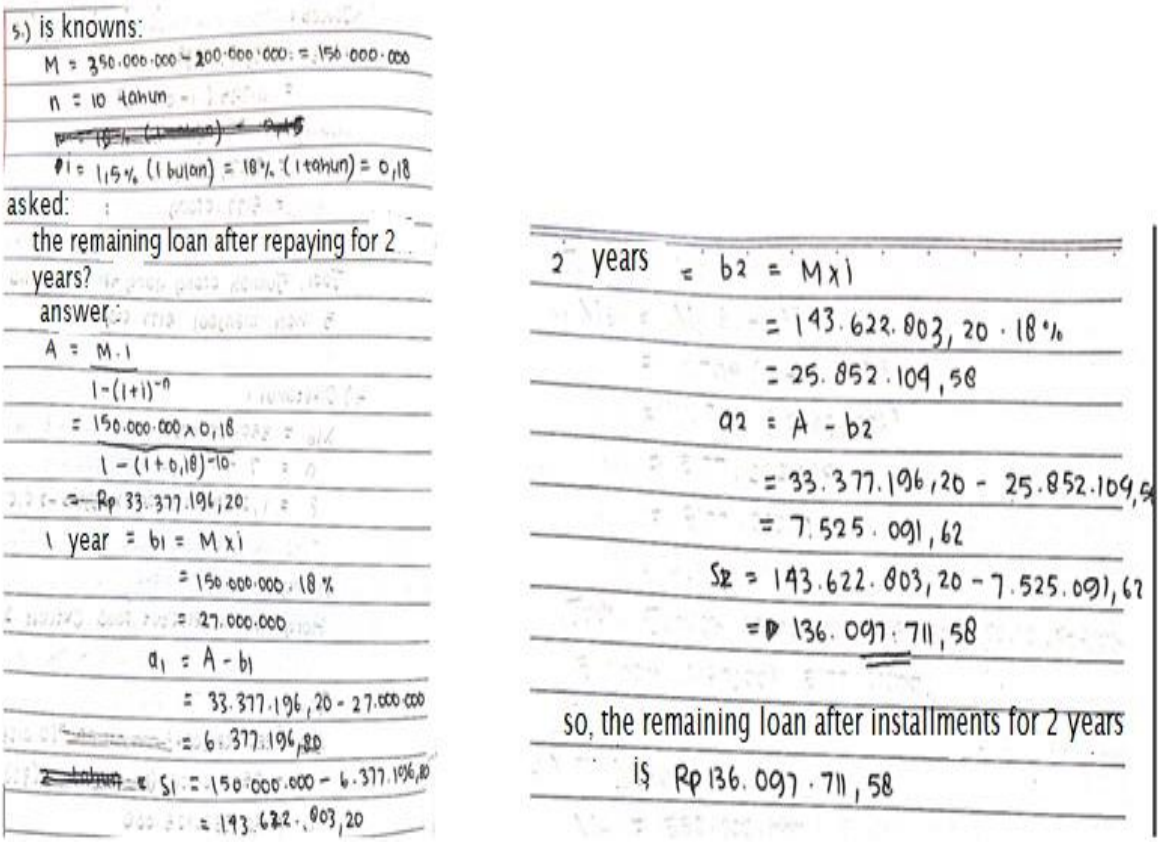

Figure 3. Answers of Low Category Level Students in Question 5