PLUSMINUS
Jurnal Pendidikan Matematika

Scratch vs Excel: Enhancing Math Problem-Solving and Student Confidence

Undang Indrajaya[1*], Siti Sadiyah[2], Rostina Sundayana[3], Nitta Puspitasari[4]
[1*,2,3,4]Program Studi Pendidikan Matematika, Institut Pendidikan Indonesia
Jalan Terusan Pahlawan No. 32, Sukagalih, Kec. Tarogong Kidul, Garut, West Java 44151, Indonesia
[1*]uindrajaya@institutpendidikan.ac.id; [2]sitisad16@gmail.com;
[3]rostinasundayana@institutpendidikan.ac.id; [4]nitta.puspitasari@yahoo.co.id

ABSTRAK

Artikel "Scratch vs Excel: Enhanching Math Problem-Solving and Student Confidence" bertujuan untuk mengetahui perbedaan peningkatan kemampuan pemecahan masalah matematis dan Self Confidence siswa dalam pembelajaran Matematika dengan menggunakan aplikasi Scratch dan Microsoft Excel. Penelitian ini menggunakan desain quasi eksperimen dengan subjek penelitian kelas XII MIPA pada salah satu SMA di Kabupaten Garut yang dipilih berdasarkan purposive sampling. Metode pengumpulan data meliputi tes, angket, dan observasi. Teknik analisis data mencakup statistik deskriptif, Gain ternormalisasi dan uji independen dua sampel untuk menguji perbedaan peningkatan (N-Gain) antara dua kelompok. Penelitian ini dapat menjawab kebutuhan akan pendekatan pembelajaran yang lebih efektif dan relevan dengan kondisi siswa, dengan fokus pada dua aspek yaitu kognitif (kemampuan memecahkan masalah) dan afektif (self confidence). Pada penelitian ini ditemukan adanya perbedaan peningkatan kemampuan pemecahan masalah matematis dan self confidence antara siswa yang menggunakan media pembelajaran interaktif aplikasi Scratch dan Microsoft Excel. Di mana Scratch terbukti memberikan peningkatan yang lebih baik dalam kemampuan pemecahan masalah matematis dan self confidence, dibandingkan Excel. Ini menunjukkan bahwa media interaktif berbasis animasi/visual dapat meningkatkan motivasi dan pemahaman siswa.

Kata Kunci: Excel; Pemecahan Masalah; Self Confidence; Scratch

ABSTRACT

The article "Scratch vs Excel: Enhanching Math Problem-Solving and Student Confidence" is a study to compare the differences in the improvement of the ability of mathematical problem-solving and student self-confidence in learning mathematics by using Scratch and Microsoft Excel applications. This study used a quasi-experimental design with the research subjects of class XII MIPA at one of the high schools in Garut Regency which was selected based on purposive sampling. Data collection methods include tests, questionnaires, and observations. Data analysis techniques include descriptive statistics, normalized Gain and two-sample independent test to test the difference in improvement (N-Gain) between two groups. This study can answer the need for a learning approach that is more effective and relevant to the conditions of students, focusing on two aspects, namely cognitive (problem-solving ability) and affective (self confidence). In this study, it was found that there were differences in the improvement of the ability of mathematical problem-solving and self-confidence between students who used interactive learning media Scratch application and Microsoft Excel. Scratch was shown to provide better improvement in mathematical problem-solving ability and self confidence, compared to Excel. This suggests that animation/visual-based interactive media can increase students' motivation and understanding.

Keywords: Excel; Problem-solving; Self Confidence; Scratch

Article Information:

Accepted Article: 04 January 2025, Revised: 18 February 2025, Published: 30 March 2025

How to Cite:

Indrajaya, U., Sadiyah, S., Sundayana, R., & Puspitasari, N. (2025). Scratch vs Excel: Enhancing Math Problem-Solving and Student Confidence. *Plusminus: Jurnal Pendidikan Matematika, 5*(1), 91-104.

DOI: https://doi.org/10.31980/plusminus.v5i1.2556

1. INTRODUCTION

Sumarmo and Hendriana (in Ridia & Afriansyah, 2019) stated that the goals of mathematical learning are for students to be able to 1) Understand mathematical concepts; 2) Use of logic; 3) Problem-solving; 4) Communicate ideas through symbols, tables, diagrams, or other media; and 5) An appreciation for the usefulness of mathematics in life. Based on this statement, to achieve these math learning objectives, one of the aspects that should be possessed to achieve math learning objectives is problem-solving. In the content standards in Permendiknas Number 22 of 2006 which states that the ability to solve mathematical problems, including the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained is one of the objectives of mathematics.

Polya (in Sundayana, 2016) defines problem-solving as an attempt to find a way out of an issue and achieve an unattainable goal. Problem-solving is essential in mathematical learning; when students are used to facing problems, they become accustomed to thinking for themselves, which helps them succeed in solving their daily problems. Polya's (in Winarti, 2017) indicators of mathematical problem-solving ability are used in this study, including: 1) Understanding the problem; 2) Developing a solution plan; 3) Implementing the solution plan; and 4) Rechecking.

The mathematical problem-solving abilities in Indonesia remain inadequate, as evidenced by the findings of the *Trends in International Mathematics and Science Study* (TIMSS) and the *Programme for International Student Assessment* (PISA), which indicate that students' proficiency in mathematical problem-solving is still comparatively low. The 2018 TIMSS' results showed that Indonesia was ranked 7th from the bottom, 73 out of 79 participating countries with an mean value of 397. The PISA's results in Indonesia also did not show substantial progress, which is always below 400. According to the findings of the TIMSS and PISA research, problem-solving skills in Indonesia can be enhanced by teaching mathematics in schools, particularly mathematical problem-solving (Abdiyani et al ., 2019).

In addition to mathematical problem-solving ability, there are other important aspects to achieve the goals of learning mathematics, which is the attitude aspect. Where one of the important attitudinal aspects is self-confidence. Syam & Amri (in Ningsih & warmi, 2021) state that self-confidence is an important aspect in someone's life. If someone does not have self-confidence, they will face many problems. This shows that self-confidence is one of the attitudes that attract attention (Lesi & Nuraeni, 2021).

Wulandari (in Fitayanti et al., 2022) stated that students with good Self Confidence can choose the best strategy to solve certain problems by planning and having the best strategy to achieve their goals. Furthermore, Yates (in Fauziah et al., 2018) emphasized that students' self-confidence is critical to their success in learning mathematics. According to Hendriana, et al. (2017) four elements of self-confidence include: (1) believing in themselves abilities, (2) acting

independently in decision-making, (3) having a good self-concept, and (4) daring to express opinions.

Improving students' problem-solving skills and self-confidence through the learning process can be facilitated, which becomes the responsibilities of the teacher to think about how to make the learning process fit the needs of students with a more meaningful and interesting learning process. One of the innovations that can be used is by using learning media. Mathematics learning needs to be adapted to the times that bring us to an era that is all digital, this has an impact on advances in the field of education, one of which is the application of ICT which can be utilized by teachers to create media. One of the ICT-based learning media that can be used is the *Scratch* application and *Microsoft Excel*. Pratiwi & Bernard (in Qodariah & Rabbani, 2022) explained that *Scratch* is a programming language that can be used as learning media in the form of quizzes, games, animations and others. *Scratch* application is a medium of educative learning that is effective in helping students understand math subject matter. (Nikmah & Ellianawati (in Qodariah & Rabbani, 2022)). Furthermore, *Microsoft Excel* is a spreadsheet software program developed by Microsoft Corporation and distributed by *Microsoft Corporation* that runs on *Microsoft Windows* and *Mac OS*. This program has a wide range of calculation and graphing features. In line with Sihombing' s research (in Martiningsih, 2015) has conducted research and stated the advantages of the *Microsoft Excel* computer-assisted learning process, which makes it easier for teachers to provide material to students in class where teachers do not need to bother to provide material to students in a form of an unreal picture, besides that students can also be more eager to learn from the uniqueness of the appearance of the images created and can motivate students to repeat material that has been learned at school to study at home with a computer with *Microsoft Excel* as an auxiliary medium for learning.

Although many studies have shown that technology-based learning media such as *Scratch* and *Microsoft Excel* can be used to improve mathematics learning outcomes, few have directly compared the effectiveness of these two media in simultaneously enhancing students' mathematical problem-solving ability and self-confidence. Most studies have focused on only one type of media or a single aspect of student ability, whether cognitive or affective. Furthermore, the lack of research conducted at the high school level, particularly in 12th-grade statistics material, makes this study significant in addressing the needs of upper-level mathematics instruction and enriching the literature in the use of ICT-based media in mathematics education.

Based on the background of the problem, the researchers are interested in knowing more about the comparison of the improvement of mathematical problem-solving ability and self confidence among students using *Scratch* application interactive learning media and *Microsoft Excel* learning media. By comparing these two approaches, this research emphasizes innovation

in ICT-based mathematics learning and seeks to evaluate which media is more effective in simultaneously supporting students' cognitive and affective domains.

2. METHOD

This study combined a quantitative and an experimental method. The studies design utilized is a *quasi-experimental* approach called the *Nonequivalent Pretest-Posttest Control Group Design*. The study' s population consisted of all students in class XII at SMA Negeri 19 Garut in the 2023/2024 Odd Semester who were chosen using a purposive sampling technique. A sample of 29 students from class XII MIPA 2, designated as Experimental Class 1, were given treatment using *Scratch* as the learning media, while 29 students from class XII MIPA 7, labeled as Experimental Class 2, were given treatment using *Excel* as the learning media. Data gathering methods include written tests, questionnaires, and observations. The test was aimed at obtaining data on students' mathematical problem-solving ability where the test was presented in terms of a descriptive test question sheet of four questions containing indicators of mathematical problem-solving ability on statistics material. Questionnaires are used to obtain information related to students' Self Confidence in the learning process during learning. This questionnaire consists of twenty-one statements that contain indicators of Self Confidence and observation sheets to measure student learning activities and the teacher's ability to manage learning.

The used instruments were examined, and the results indicate that they are suitable to use. The data analysis technique was used to determine the study's outcomes following treatment with learning media. The data used in the analysis came from the Pretest, Posttest, Normalized Gain, and questionnaire distribution. The data has been processed using descriptive and inferential statistical methods, such as descriptive statistics for determining the maximum, minimum, mean, and standard deviation; normalized gain to observe the change from pretest to posttest; normality test; homogeneity test; and independent samples hypothesis testing. After satisfying the normality and homogeneity assumptions for the two sample groups, a t-test was utilized.

3. RESULTS AND DISCUSSIONS

a. Results

1) Mathematical Problem-Solving Ability

Sumartini (2016) stated that problem-solving is a method used to overcome difficulties in achieving desired goals in mathematics. Students must have abilities to problem-solve in order to tackle problems related to problems. From the data of the research results with a different treatment to the two classes, the class that received *Scratch* learning media and the class that received *Microsoft Excel* learning media. Both classes received a pre- and post-test, with the findings shown in Table 1.

Tabel 1. Data on Mathematical Problem-solving Ability Results

Group		n	Xmaks	Xmin	x	s
Scratch	*Pretest*	29	35	1	15,31	6,96
	Posttest		58	29	47,83	5,78
	Gain		0,86	0,40	0,67	0,12
Ms. Excel	*Pretest*	29	23	3	13,03	4,98
	Posttest		63	18	39,4	13,6
	Gain		0,98	0,17	0,53	0,23

From table 1 above with an ideal value of 64, it is obtained that for the Scratch class, the minimum value is 1 and the maximum value is 29, while the mean value is 15,31 and the standard deviation is 6,96. For the posttest data, the minimum value is 35 and the maximum value is 58, while the mean value is 47,83 and the standard deviation is 5,78. Furthermore, the data obtained from the Microsoft Excel class for Pretest data is with a minimum value of 3 and a maximum value of 23, while the mean value is 13.03 and a standard deviation of 4.98. For posttest data, the minimum value is 18 and the maximum value is 63, while the mean value is 39.4 and the standard deviation is 13.6. As for the Scratch class N-Gain results, the mean value was 0.67 and a standard deviation of 0.12, while for the Microsoft Excel class the N-Gain results were 0.53 and standard deviation of 0.23.

The N-Gain results were assessed for normalcy with the Lilliefors test at a 5% significance level, revealing that the gain values from the two media were regularly distributed. Because both have a normal distribution, the next test is the homogeneity test using the F test. It is obtained that $F_{hitung} = 3{,}98 \geq F_{tabel} = 1{,}882$ so it can be concluded that the two media are not homogeneous. The next step will be to compare the improvement in math problem-solving skills among students who utilize the interactive learning media *Scratch* program and *Microsoft Excel* learning media. Table 2 shows the significance test results for students' mathematical problem-solving abilities.

Tabel 2. N-Gain t-test Analysis Results

Keterangan	Nilai Gain Ternormalisasi
N_1	29
N_2	29
t'_{hitung}	2,870
t'_{tabel}	2,048
Kesimpulan	Ho Ditolak

Based on the hypothesis testing results with the t test with a 5% significance level, it was obtained that $t'_{hitung} = 2{,}870 \leq t'_{tabel} = 2{,}048$. Hal ini menyebakan Ho ditolak. This causes Ho to be rejected. It is concluded that a significant difference exists in the enhancement of the ability of mathematical problem-solving among students who use interactive learning media *Scratch*

application and *Microsoft Excel*. This means that the learning media used truly affects the improvement of students' the ability of mathematical problem-solving, with *Scratch* having a more significant impact than *Microsoft Excel*.

To find out more about students' ability of mathematical problem-solving after the treatment, based on the pretest and posttest values, the normalized gain data is obtained in Table 3.

Tabel 3. Description of Improvement in Mathematical Problem-solving Ability

Keterangan	*Scratch*	*Ms. Excel*
N	29	29
Xmaks	0,86	0,98
Xmin	0,40	0,17
x	0,67	0,53
Interpretasi	Sedang	Sedang

The results of the mean value of the increase in the ability of mathematical problem solving from *Scratch* and *Microsoft Excel* classes are 0.67 with moderate interpretation for *Scratch* classes and 0.53 with moderate interpretation for *Microsoft Excel* classes. Although both classes showed improvement in the ability of mathematical problem-solving in the moderate category, the class using the Scratch media outperformed on mean. The higher gain value indicates that the use of Scratch is more effectively used in assisting students understand and solve mathematical problems, possibly because the visualizations and interactivity provided by Scratch are easier to comprehend. Researchers also see that there are other factors that influence the conclusions obtained. Reviewing the observation sheet that has been filled in, there are not too many teacher activities in the classroom that can affect learning outcomes, because the teacher is fairly always doing the steps of the learning model thoroughly.

2) Self Confidence

In addition to examining the ability of mathematical problem-solving, researchers also want to examine students' self-confidence. In this study, researchers distributed questionnaires to *Scratch* class and *Microsoft Excel* class. The steps to analyze the data are the same as analyzing mathematical problem-solving ability, but the difference is that before calculating normality and homogeneity, the data obtained is ordinal data, must first be converted into interval data by means of MSI (Method of Succesive Interval). So that the data obtained in Table 4.

Tabel 4. Self Confidence Data Results

Group		n	Xmaks	Xmin	x	s
Scratch	first questionnaire	29	76,57	58,10	65,30	4,49
	final questionnaire		84,18	63,85	72,99	4,75
	Gain		0,51	0,02	0,21	0,11
	first questionnaire		79,03	45,71	60,58	8,61

Group		n	Xmaks	Xmin	x	s
Ms. Excel	final questionnaire	29	83,28	56,39	66,67	6,65
	Gain		0,41	0,01	0,15	0,11

From Table 4 with an ideal value of 84, it is obtained that for the *Scratch* class the initial questionnaire data obtained a minimum value of 58,10 and a maximum value of 76,57, while the mean value is 65.30 and a standard deviation of 4,49. For the final questionnaire data, the minimum value was 63.85 and the maximum value was 84.18, while the mean value was 72,99 and the standard deviation was 4,75. Then the data obtained from the *Microsoft Excel* class for the initial questionnaire data is with a minimum value of 45,71 and a maximum value of 79,03, while the mean value is 60,58 and a standard deviation of 8.61. The final questionnaire data obtained a minimum value of 58,39 and a maximum value of 83.28, while the mean value was 66,67 and a standard deviation of 6,65. Likewise, for the *Scratch* class N-Gain results, the mean value is 0,21 and the standard deviation is 0,11, while for the *Microsoft Excel* class the N-Gain results obtained an mean value of 0,15 and a standard deviation of 0,11.

The N-Gain data then tested for normality using the Lilliefors test with a 5% significance level obtained that the gain data of the two media were normally distributed. Since both are normally distributed, the next test is the homogeneity test using the F test. The value of $F_{hitung} = 3{,}98 \geq F_{tabel} = 1{,}882$ was obtained, so it can be concluded that the two media are not homogeneous. The next step is to test the difference in the improvement of mathematical problem-solving ability between students who use interactive learning media *Scratch* application and *Microsoft Excel* learning media using t' test because the data produced is normally distributed but not homogeneous. The following results of the significance test analysis of students' mathematical problem-solving ability are presented in Table 5.

Tabel 5. N-Gain t-test Analysis Results

Independent Samples Test										
		Levene's Test for Equality of Variances		*t-test for Equality of Means*						
Variabel Statistic		F	*Sig.*	t	df	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	95% Confidence Interval of the Difference	
									Lower	*Upper*
SC	Equal variances assumed	.123	.729	2.241	56	.029	6.414	2.862	.681	12.147

Based on Table 5, the t test testing criteria is Ho is accepted if the $sig \geq \alpha$ then Ho is accepted. Based on Table 5, the $sig = 0{,}029 < \alpha = 0{,}05$ so Ho is rejected. This means that there

is a significant difference in increasing Self Confidence between students who use interactive learning media *Scratch* application and *Microsoft Excel* learning media.

Tabel 6. Description of Self Confidence Improvement

Keterangan	*Scratch*	*Ms. Excel*
N	29	29
Xmaks	0,51	0,41
Xmin	0,02	0,01
x	0,21	0,15
Interpretasi	Rendah	Rendah

According to the Table 6, mean value of the normalized gain obtained from the *Scratch* and *Microsoft Excel* classes, it is 0,21 with a low interpretation for the *Scratch* class while 0,15 with a low interpretation for the *Microsoft Excel* class.

b. Discussions

Generally, there are differences in the improvement of the ability of mathematical problem-solving and Self Confidence between students who use interactive learning media *Scratch* application and *Microsoft Excel* learning media.

There are several factors that influence the results of the study where *Scratch* learning media obtained an increase in the ability of mathematical problem-solving with moderate and high interpretations. While using *Microsoft Excel* learning media where there is an increase in the ability of mathematical problem-solving with high, medium and low interpretations. This is because students who were previously less able to do it, but after participating in learning and solving the problems presented in the LKS students understand better and know how to solve problems by discussing with their groupmates and the help of researcher guidance. In addition, it is also because the enthusiasm of students in finding problems is quite good, although some students are still less active in learning because students do not take the initiative to search or find problems. Since this learning is done with group discussions so that if there are students who are less capable, they can be assisted by their friends who already understand, or assisted by the teacher.

This indicates that the use of *Scratch* learning media can be used as one of the innovative learning strategies that provide a stronger effect on students' KPMM achievement than the use of *Microsoft Excel* learning media. This can be seen from the quality of the KPMM improvement of Scratch class students better than *Microsoft Excel* class. The difference can occur because learning by using Scratch learning media students' difficulties in solving problems can be helped by using *Scratch* in understanding a problem in a problem that is summarized more interesting and easier to understand, so that students are motivated in solving problems. While *Microsoft Excel* learning media is very difficult for students who have less ability because in the use of

Microsoft Excel learning media students are encouraged to be able to operate directly to find their own solutions to any existing problems even though this learning is done in groups and guided by researchers, in addition because of the limitations of learning media to inhibit students in understanding the material so that students are also more quickly bored and complain in learning. Another factor that causes differences in the improvement of the ability of mathematical problem-solving and Self Confidence between students who use interactive learning media *Scratch* application and *Microsoft Excel* learning media is due to the advantages and disadvantages of each learning media. Therefore, there is a difference between the application of both learning media.

Other result findings, such as the study by Purwasih (2015), show that the use of interactive media like Scratch within a guided inquiry learning model can improve students' mathematical understanding and self-confidence. This is in line with the findings of the present study, which indicate that Scratch has a more positive impact compared to Excel. Similarly, Martiningsih (2015), in her study on the use of Microsoft Excel, also demonstrated its effectiveness in explaining mathematical concepts. However, the results of this study suggest that Excel may be more challenging for students with lower abilities, as it requires more advanced technical skills.

Since in general there are differences in the improvement of the ability of mathematical problem-solving between students who use interactive learning media *Scratch* application and *Microsoft Excel* learning media, then to further strengthen the results of the study, then it will be discussed about the results of student answers that result in differences in the improvement of the ability of mathematical problem-solving. In the test instrument there are 4 questions that contain 4 indicators. The discussion of the description of the results of student answers on each indicator is as follows:

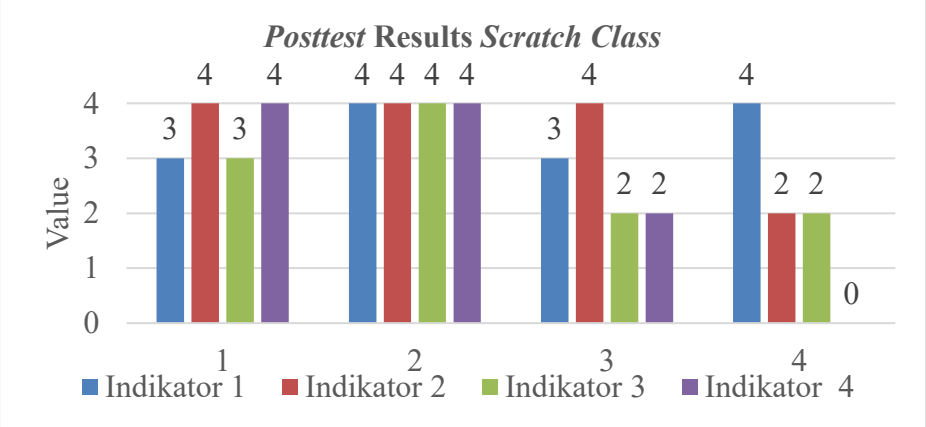

Figure 1. Posttest Results at *Scratch* Class

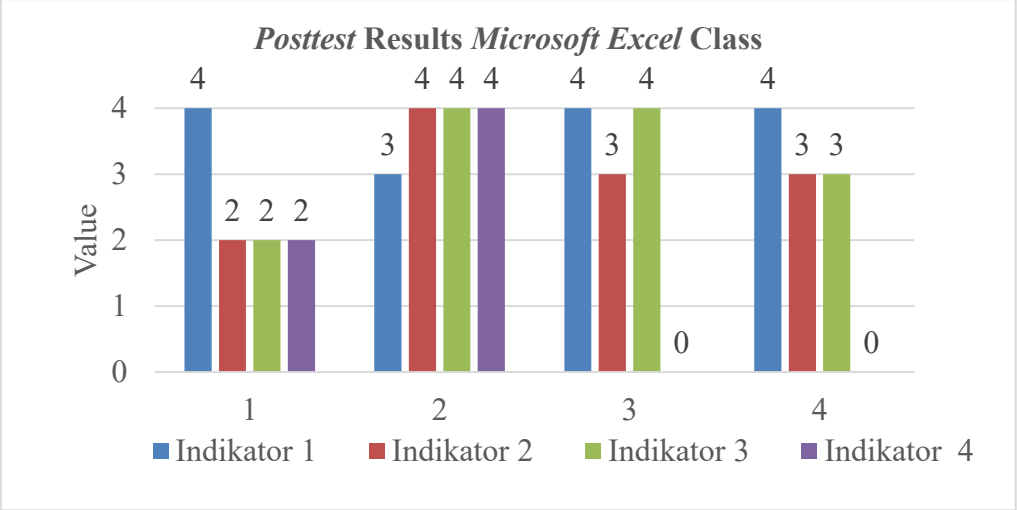

Figure 2. Posttest Results at *Microsoft Excel* Class

Based on Figure 1, Scratch class students' posttest answers on question number 1 indicate that they did not understand the presented problem. Students make a minor error by omitting the information provided in the problem; this is evident in the *Scratch* class solutions, which only write some of the number of students and do not include the mean contribution of all groups. Furthermore, in the indicator of solution planning, pupils can write the formula in a methodical and full manner. Students can answer the indicator of carrying out the solution, although there is a minor error because the symbol is not written in the formula. Then, as an indicator of checking back, students submit conclusions based on the answers acquired by writing the conclusions to the questions obtained. Whereas in Figure 2 of students' posttest answers to question number 1 of the *Microsoft Excel* class, students were able to understand the problem since they could write the information from the problem entirely. Thus, the indicator of grasping the problem based on student responses can be met. Furthermore, in the indication of designing the solution, pupils write the formula but leave it incomplete. The indicator of carrying out the solution of students obtaining answers is less precise so that this indicator is not fulfilled. Later, in the indicator of checking back, students provide conclusions from the results of incorrect answers.

Self-confidence is students' ability to believe in themselves in relation to mathematics. Kloosterman (in Rafianti, 2013) stated that students' success and failure rates are influenced by motivation, self-confidence, and confidence in their efforts to study mathematics. According to the results of the data analysis of the students' self-confidence scales in both groups, the two groups improved differently. This is because students' Self Confidence before getting treatment is not good so that most students using *Scratch* learning media have a low mean interpretation. Meanwhile, the increase in Self Confidence of students using *Microsoft Excel* learning media has a low interpretation as well. This is because students' Self Confidence

before getting treatment is not good so that most students using *Microsoft Excel* learning media have a low mean interpretation.

In this study, Scratch learning media is better for increasing students' Self Confidence because in *Scratch* learning media students are more active in the process of learning activities, since the material presented is more concise and interesting so that students are active to speak in front of their friends to explain the results of their discussion, and active to answer the quiz questions presented. Not all students can speak and be active in the learning process. In contrast to *Microsoft Excel* learning media which only trains their confidence in the practice of using *Microsoft Excel* learning media and filling out the LKS provided, so there is little effect on increasing students' Self Confidence.

However, it is also due to the situation of classroom conditions that are less conducive in carrying out learning such as the limited use of *Microsoft Excel* learning media due to students who mostly do not have laptops, permission from the school regarding the use of computer labs, and limited use of projectors in the classroom because there are several projectors that cannot be used. In line with the aspects that can build self-confidence as expressed by Walgio (in Purwasih, 2015) one way to foster Self Confidence is to train each individual to be able to express opinions to others through social interactions, be trained to think independently and be given a safe atmosphere so that individuals are not afraid to make mistakes. Thus, to foster students' Self Confidence ability, namely with group work. So that learning using *Scratch*-Based ICT Media and *Microsoft Excel* can have a maximum effect on Self Confidence ability.

Menurut Suherman, et al., (2003) the formation of affective areas (attitudes) as a result of learning is relatively slower than the formation of cognitive and psychomotor areas, because changes in affective areas (attitudes) require a longer time and are the result of the formation of cognitive and psychomotor areas.

In addition to the reasons mentioned above, Fauziah et al. (2018) revealed that self-confidence has a significant relationship with the success of solving mathematical problems. This study supports the importance of enhancing the affective aspect in mathematics learning, which is also one of the focuses of this article. The affective aspect is also influenced by close individuals and the surrounding environment. As stated by Azwar (in Suherman, 2003), the responses given by subjects to stimuli on a psychological scale are, to some extent, influenced by irrelevant variables such as the subject's mood, disturbances in conditions, and the surrounding situation. The development of the affective domain should receive substantial attention, just as the cognitive domain does, because successful learning is learning that is capable of developing both students' cognitive and affective abilities.

As an implication of the findings of this study, mathematics teachers are advised to use Scratch for materials that require high levels of visualization and interactivity, particularly for

students with low self-confidence or difficulties in understanding abstract concepts. Schools should facilitate teacher training to optimize the use of digital applications such as Scratch in the learning process. The availability of infrastructure, such as computers or laptops, also needs to be improved.

4. CONCLUSION

Based on the findings of the studies, data analysis, and hypothesis testing conducted in this study, it is possible to conclude that there are differences in the improvement of mathematical problem-solving ability and self-confidence between students who use the interactive learning media Scratch application and Microsoft Excel learning media. Based on the results of normalized gain data analysis, Scratch class students were classed as high or medium in terms of the quality of their growth in mathematical problem-solving skills. In general, the rise is seen as mild. The level of improvement in mathematical problem-solving skills of Microsoft Excel class students is characterized as high, medium, or low based on the findings of normalized gain data analysis. Overall, the rise is considered moderate. While the quality of the growth in self-confidence of Scratch class students is graded as medium or low based on normalized gain data analysis results. However, the overall increase is categorized as low, and the quality of the increase in Self Confidence of Microsoft Excel class students based on the results of normalized gain data analysis is classified as medium to poor. However, in general, the rise is low.

Although both media demonstrated a moderate improvement in students' mathematical problem-solving abilities, Scratch produced more stable and consistent results compared to Microsoft Excel. Regarding Self Confidence, the improvement was low in both groups, but it was better in the Scratch group, as it supported social interaction and encouraged students to speak up in group settings.

This study contributes to the field of mathematics education, particularly in the selection of ICT-based instructional media, showing that interactive media such as Scratch can have a more positive effect than Microsoft Excel, especially in improving students' the ability of mathematical problem-solving. From the affective aspect (Self Confidence), this research reinforces that more visual and interactive learning media (like Scratch) can better encourage students to speak confidently and believe in their own abilities.

Mathematics learning using either Scratch or Microsoft Excel can serve as an alternative approach to enhance students' mathematical problem-solving abilities and Self Confidence. However, this study only focused on the improvement of these two aspects; therefore, future research is recommended to explore other cognitive and affective aspects. In addition, since this study only examined mathematical problem-solving abilities in the topic of statistics, future studies are encouraged to investigate the improvement of other mathematical abilities

supported by Scratch or Microsoft Excel, as well as other topics that are suitable for using these applications.

REFERENCES

Abdiyani, S. S., Khabibah, S., & Rahmawati, N. D. (2019). Profil Kemampuan Pemecahan Masalah Matematika Siswa SMP N 1 Jogoroto Berdasarkan Langkah-Langkah Polya ditinjau dari *Adversity Quotient*. *Al-Khwarizmi: Jurnal Pendidikan Matematika Dan Ilmu Pengetahuan Alam*, *7*(2), 123 – 134.

Fauziah, R., Maya, R., Fitrianna, A. Y. (2018). Hubungan *Self Confidence* terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMP. *Jurnal Pembelajaran Matematika Inovatif, 1*(5).

Fitayanti, N., Rahmawati, A., & Asriningsih, T. M. (2022). Pengaruh *Self Confidence* terhadap Kemampuan Pemecahan Masalah Matematika Siswa. *Maret*, *5*(2), 335-344. https://doi.org/10.22460/jpmi.v5i2.335-344

Hendriana, H. (2014). Membangun Kepercayaan Diri Siswa melalui Pembelajaran Matematika Humanis. *Jurnal Pengajaran MIPA*, *19*(1), 52-60.

Lesi, A. N., & Nuraeni, R. (2021). Perbedaan Kemampuan Pemecahan Masalah Matematis dan *Self-Confidence* Siswa antara Model TPS dan PBL.

Martiningsih. (t.t.). *Efektifitas Pemanfaatan Ms Excel dalam Pembelajaran Matematika di Smp Muhammadiyah 1 Surabaya*.

Permendiknas, R. I. (2006). No 22 Tahun 2006. *Tentang Standar Isi untuk Satuan Pendidikan Dasar dan Menengah.* Jakarta: Depdiknas.

Purwaningsih, S., & Warmi, A. (2021). *Analisis Kepercayaan Diri (Self Confidence) Pada Pembelajaran Matematika Siswa SMP*. (Vol. 8, Issue 2). FKIP Universitas Singaperbangsa Karawang.

Purwasih, R. (2015). Peningkatan Kemampuan Pemahaman Matematis dan *Self Confidence* Siswa MTS di Kota Cimahi Melalui Model Pembelajaran Inkuiri Terbimbing. *Didaktik, 9*(1), 16-25.

Qodariah, H., & Rabbani, S. (2022). Pengembangan Media Pembelajaran Ayam MSP Materi Satuan Panjang Berbantuan Aplikasi *Scratch* dengan Menggunakan Model *Discovery Learning* untuk Meningkatkan Pemahaman Konsep Matematika pada Siswa SD Kelas III / *1*. https://doi.org/10.22460/jpp.v1i2.11103

Rafianti, I. (2013). *Penerapan Model Pembelajaran Matematika Berbasis Multiple Intelligiences untuk Meningkatkan Kemampuan Pemecahan Konsep, Penalaran Matematis dan Self Confidence Siswa MTs*. (Tesis). Sekolah Pascasarjana. Universitas Pendidikan Indonesia, Bandung.

Ridia, S., & Afriansyah E. A. (2019).Perbandingan Kemampuan Pemahaman Matematis Siswa melalui Auditory Intellectualy Repetition dan Student Teams Achievement Division. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(3).

Suherman, E. (2003). *Evaluasi Pembelajaran Matematika*. Bandung: JICA – Universitas Pendidikan Indonesia.

Sumartini, T. S. (2016). Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa Melalui Pembelajaran Berbasis Masalah. *Mosharafa: Jurnal Pendidikan Matematika*, *5*(2), 148-158.

Sundayana, R. (2016). Kaitan antara Gaya Belajar, Kemandirian Belajar, dan Kemampuan Pemecahan Masalah Siswa SMP dalam Pelajaran Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, *5*(2), 75-84.

TIMSS. 2018. *International Mathematics Report: Findings from IEA' s Trends in International Mathematics and Science Study the Fourth and Eight Grades*. Boston: TIMSS & PIRLS International Study Center.

Winarti, D. (2017). Kemampuan Pemecahan Masalah Siswa Dalam Menyelesaikan Soal Cerita Berdasarkan Gaya Belajar Pada Materi Pecahan di SMP. *Jurnal Pendidikan Dan Pembelajaran, 6*(6), 1 – 9.

AUTHORS BIOGRAPHY

Undang Indrajaya, M.Pd.

Born in Jakarta, on July 4, 1971, a civil servant lecturer at the Indonesian Institute of Education Garut, S1 Study of Mathematics Education STKIP Garut, graduated in 2004; S2 Study of Mathematics Education University of Education Indonesia, Bandung, Graduated in 2011.

Siti Sadiyah, S.Pd.

Born in Garut, on January 15, 2002, studied S1 Mathematics Education, Indonesian Institute of Education, Garut, graduated in 2024.

Dr. Rostina Sundayana, M.Pd.

Born in Garut, on December 28, 1966. Civil servant lecturer at the Indonesian Institute of Education Garut. Study S1, S2, S3 Mathematics Education University of Education Indonesia. Bandung. Study S2 PKLH Siliwangi University, Tasikmalaya.

Dr. Nitta Puspitasari, M.Pd.

Born in Garut, on August 6, 1981. Teaching Staff at the Indonesian Institute of Education Garut in the Mathematics Education Study Program. S1 study of Mathematics Education, STKIP Garut, graduated in 2004; S2 study of Mathematics Education, University of Education Indonesia, Bandung, graduated in 2010. Study S3 Mathematics Education, University of Education Indonesia, Bandung, graduated in 2021.