

IMPROVING THE STUDENTS' NUMERICAL LITERACY SKILLS BY USING INTERACTIVE MATHEMATICAL COMICS ON PYTHAGOREAN THEOREM

Verra Arischa Kustantina¹, Nuryadi², Nafida Hetty Marhaeni³

^{1,2,3} Depaartment of Mathematics Education, Universitas Mercu Buana Yogyakarta

*verra.arischa519@gmail.com

Abstrak: Penelitian ini bertujuan untuk mengetahui peningkatan kemampuan literasi numerasi siswa menggunakan komik matematika interaktif pada materi teorema pythagoras. Jenis penelitian ini adalah penelitian eksperimen dengan desain pretest posttest control group design. Sampel dalam penelitian ini adalah kelas VIIIA sebagai kelas eksperimen berjumlah 21 siswa dan kelas VIIIB sebagai kelas kontrol berjumlah 19 siswa. Teknik pengumpulan data menggunakan wawancara, observasi, dan soal pretest dan posttest kemampuan literasi numerasi siswa. Hasil penelitian menunjukkan bahwa penggunaan komik matematika efektif meningkatkan kemampuan literasi numerasi siswa. Hal ini dikarenakan komik matematika disajikan berdasarkan konsep cerita yang menarik, bentuk percakapan sehari-hari yang interaktif sehingga dapat meningkatkan motivasi belajar siswa. Dalam komik matematika, soal-soal yang disajikan juga menstimulus kemampuan literasi numerasi siswa karena disajikan dengan informasi-informasi berbentuk angka, data, dan simbol yang berhubungan dengan matematika. Selain itu, dengan pembelajaran menggunakan komik matematika siswa dituntut untuk dapat menganalisis berbagai informasi berbentuk grafik, tabel, bagan, dan kemampuan menarik sebuah kesimpulan. Oleh karena itu, penelitian ini menyimpulkan bahwa penggunaan komik matematika dalam pembelajaran matematika efektif untuk meningkatkan kemampuan literasi numerasi siswa.

Kata-kata kunci: Peningkatan, Komik matematika, Literasi numerasi

Abstract: This study aims to determine improving the students' numeracy literacy skills by using interactive mathematical comics on pythagorean theorem. This type of research is experimental research with pretest posttest control group design. The sample in this study was class VIIIA as the experimental class totaling 21 students and class VIIIB as the control class totaling 19 students. Data collection techniques used interviews, observations, and questions pretest and posttest of students' numeracy literacy abilities. The results showed that the use of mathematical comics was effective in increasing students' numeracy literacy skills. This is because mathematical comics are presented based on interesting story concepts, interactive forms of daily conversation so that they can increase students' learning motivation. In math comics, the questions presented also stimulate students' numeracy literacy skills because they are presented with information in the form of numbers, data, and symbols related to mathematics. In addition, by learning to use mathematical comics students are required to be able to analyze various information in the form of graphs, tables, charts, and the ability to draw conclusions. Therefore, this study concludes that the use of mathematical comics in mathematics learning is effective in improving students' numeracy literacy skills.

Keywords: Improvement, Math Comics, Numeracy Literacy

INTRODUCTION

Mathematics is the main component of the intelligence of human thinking and the revolution in modern science and technology today (Ernest, 2015). When learning mathematics, the thinking process of students appears to find, manage, and utilize existing information in order to get a conclusion and be able to solve everyday problems. This is one of the reasons why mathematics is a subject taught at all levels of education, including junior secondary education (Sholihah & Mahmudi, 2015; Hakim & Windayana, 2016).

However, the facts on the ground show that many students do not like mathematics because they consider mathematics to be a complex and uninteresting subject (Anita, 2014; Rosyidah, 2021). In addition, there are still many who think that mathematics is a difficult and boring subject (Amallia & Unaenah, 2018; Dirgantoro, 2018; Oktaviani et al., 2019).

Based on the results of the mid-semester test scores for class VIII at MTs Kalipucang, it was found that the average

math score for 4 classes was only 61.46 in mathematics. This means that the value of students is less than the KKM that has been set by the school, which is 76. In addition, from the results of observations and interviews with class VIII mathematics teachers at MTs Kalipucang, it can also be seen that during the learning process students tend to be passive, get bored quickly, and only take notes. material delivered without understanding the meaning and benefits of the material studied in everyday life. This is also because when presenting material in class the teacher only conveys the material without being accompanied by learning media that attracts students. Based on the results of interviews with several students of class VIII MTs Kalipucang, they are more willing to learn to use interesting and simple teaching materials as an illustration of learning materials such as math comics, not just ordinary textbooks that contain writing.

Comics are learning media to convey information visually (Negara, 2014; Ntubuo et al., 2018; Pratyaksa, 2020). Comics are educational because they can increase interest in reading and develop vocabulary (Ramliyana, 2016; Negara & Wati, 2019). Over time, comics are not only entertainment but also a means of learning communication and socialization media (Saputro et al., 2016). Thus, the use of comics attracts the attention of students to read the material because of the storyline and the arrangement of the pictures are designed to be attractive in order to increase students' imagination power (Kristianto & Rahayu, 2020).

The ability to read, also known as literacy skills, plays an important role in the academic success of students and affects the acquisition of information related to daily life (Kharizmi, 2021). In mathematics, literacy skills are called numeracy literacy. Numerical literacy is the ability to use numbers, data, and mathematical symbols related to solving mathematical problems (Pangesti, 2018; Mahmud & Pratiwi, 2019; Rohim, 2021). However, the facts on the ground show that students' numeracy literacy skills still tend to

be low. This is shown from the results of the distribution of numeracy literacy tests to class VIII MTs Kalipucang students which showed that as many as 52% of students were in the very low category, 21% in the low category, 15% in the medium category, 7% in the high category, and only 3% in the very high category. So that the numeracy literacy skills of junior high school students need to be improved to show problem solving skills, use data and numbers, operate mathematical symbols, and draw decisions from calculations.

The low numeracy literacy of students can also be caused by a lack of learning motivation in students during the mathematics learning process (Antika, 2015). So that the learning outcomes obtained are less than optimal. Optimal learning outcomes can be achieved with high motivation to learn independently, students will easily understand and follow learning in order to achieve the expected learning effect. Based on the results of filling out the learning motivation questionnaire in class VIII MTs Kalipucang, it was shown that only 46% of students were classified as having high learning motivation, while the other 54% still tended to be low. So it can be concluded that learning motivation needs to be increased as an encouragement for students to carry out learning activities in order to achieve optimal learning outcomes. One of the instruments that can be used to achieve optimal learning objectives is teaching materials (Marhaeni & Suparman, 2018).

From the results of the initial research that has been carried out, the researchers also found that the teacher's worksheet was the main reference. The LKS book already meets the criteria for one book one student, but the LKS book used still contains a collection of questions and does not use data, numbers, and symbols in the questions as a starting point that can stimulate students' numeracy literacy skills. contains writing and without color also makes students not enthusiastic in learning. So it is necessary to develop interesting, interactive teaching materials, and to facilitate

numeracy literacy skills. Therefore, in this study, the teaching materials developed were interactive math comics. Things that are taken into consideration in developing interactive math comics are that the use of interactive math comics has been shown to improve numeracy literacy skills (Putri, 2021; Yani,

2021) and can increase students' learning motivation (Mujawal et al., 2019; Ekowati et al., 2019). Based on the description above, this study aims to determine the improvement of students' numeracy literacy skills using interactive math comics.

RESEARCH METHOD

This type of research is an experimental study with a pretest posttest control group design. This research was conducted with two sample classes, namely the experimental class and the control class. In the experimental class, treatment is given by learning using interactive math comics, while in the control class using the LKS book which is usually used by schools. The population in this study were all students of class VIII MTs Kalipucang totaling 80 students. The sample selection was carried out by purposive sampling by considering the average characteristics of the initial test ability. The class with the highest average was chosen as the control class, while the class with the lowest average was selected as the

experimental class. The assumption used is that if students with the lowest average can increase their numeracy literacy skills, then mathematical comics are said to be effective for use in learning. For this reason, the class with the lowest average being the experimental class is class VIII B and the class with the highest average being the control class is class VIII A. For data collection techniques using interviews, observation, and pretest posttest questions on numeracy literacy skills on the material. pythagoras theorem. The data analysis used in this research are: 1) Prerequisite analysis test in the form of normality and homogeneity test; 2) paired sample t-test; 3) test independent sample t-test; 4) test the mean difference

RESULT AND DISCUSSION

The results of the study were obtained using pretest and posttest questions for students' numeracy literacy skills and questionnaires on students' learning motivation during the learning process using interactive math comics. The display of mathematical comics used for learning made interactive with the help of a live worksheet is presented in Figure 1.



Figure 1. Mathematical Comics
After the pretest and posttest questions were given, the researcher carried out a calculation

process assisted by SPSS 25 to conclude the effectiveness of the developed product, along with the testing steps carried out.

A. Analysis Prerequisite Test

As a requirement to test the hypothesis to show the effectiveness of the product, the data obtained are pretest and posttest data, both the control class and the experimental class must meet two assumptions, namely normal and homogeneous.

1. Normality Test

In this study, the data obtained were analyzed using SPSS 25 software for Windows, namely the Kolmogorov Smirnov normality test. The results of the pretest and posttest normality tests in the control and experimental classes are presented in Table 1.

Table 1. Normality Test Results

Aspect	Sig. Value
Pretest experiment class	0,200

Pretest control class	0,080
Posttest experiment class	0,200
Posttest control class	0,145

Table 1 shows that the significance values for the pretest and posttest in the control class and experimental class are normally distributed. Thus, it can be concluded that the distribution of data for the early numeracy literacy skills of students is normal, both in the control class and the experimental class.

2. Homogeneity Test

The second assumption that must be met is homogeneous. The homogeneity test was carried out for the pretest, posttest, initial and final motivation questionnaires for the control class and the experimental class using the Lavene Statistic homogeneity test assisted by SPSS 25 software for Windows. The results of the pretest and posttest homogeneity test are presented in Table 2.

Table 2. Results of Homogeneity Test	
Levene Statistic	Sig.
Pretest	0,552
Posttest	1,043

Based on Table 2, it is known that the Lavene Statistic value is 0.552 with a significance of 0.462. Thus H_0 is accepted ($0.462 > 0.05$). This means that the pretest data for the control class and the experimental class are homogeneous. Then, the homogeneity test was also carried out on the posttest data in the control class and the experimental class. Based on Table 2, it is known that the Lavene Statistic value is 1.043 with a significance of 0.314. Thus H_0 is accepted ($0.314 > 0.05$). This means that the posttest data of the control class and the experimental class are homogeneous.

B. Effectiveness Test

1. Paired Sample t-Test

Paired sample t-test was conducted to compare the mean of two variables in one group. This means that this analysis is useful for testing whether the treatment carried out has an effect or not by considering the average pretest, posttest, and student learning motivation questionnaires. The paired sample t-test was carried out with the help of SPSS 25

for Windows software for the following:

First, the Influence of the Use of Interactive Mathematical Comics on Numerical Literacy Ability. This test was carried out using pretest and posttest data in the experimental class (EC) and the results were obtained as shown in Table 3.

Table 3. Paired Sample t-Test in the EC		
Data	t	Sig.
Pretest and posttest	14,537	0,000

Based on Table 3 shows that sig. 2 tailed $<$ significance level ($0.000 < 0.05$) and t count $>$ t table ($14.537 > 2.086$), then H_0 is rejected. This means that there is a difference between the average pretest value and the average posttest value in the experimental class. The average value of the pretest of numeracy literacy skills before treatment was 62 while the posttest average value of numeracy literacy skills after treatment was 85. This indicates an increase from before treatment to after treatment with interactive math comics of ($85-62=23$).

Second, the Influence of the Use of School Media (LKS) on Numerical Literacy Ability. This test was carried out using pretest and posttest data in the control class (CC) and the results were obtained as shown in Table 4.

Table 4. Paired Sample t-Test in the CC		
Data	t	Sig.
Pretest and posttest	6,270	0,000

Table 4 shows that sig. 2 tailed $<$ significance level ($0.000 < 0.05$) and t count $>$ t table ($6.270 > 2.101$), then H_0 is rejected. This means that there is a difference between the average value of the pretest and the average value of the posttest in the control class. The average value of the pretest for numeracy literacy skills before treatment was 70, while the posttest average value for numeracy literacy skills after treatment was 86. This indicates an increase from before treatment to after treatment with school media of ($86-70=16$).

2. Test Independent Sample t-Test

The effectiveness test was conducted to determine which learning was more effective between learning using interactive

math comics and direct learning on numeracy literacy skills and students' learning motivation. This test was carried out on posttest data on numeracy literacy skills and students' learning motivation after using mathematical comics. The results of the independent test for posttest data on students' numeracy literacy abilities are presented in Table 4.

Tabel 4. The Effectiveness Test

t	Sig.
2,214	0,004

Based on Table 4 shows that the significance (2-tailed) < significance (0.004 < 0.05) then H_0 is rejected. So that the use of interactive math comics is more effective than the use of school media on students' numeracy literacy skills.

3. Test the Average Difference

The effectiveness test was also carried out using the difference in the average increase in the pretest (PE) and posttest (PO) of students in the control class and the experimental class. To see how far the difference in the average increase in the two classes is, an analysis is carried out to find out the difference in the increase in numeracy literacy (NL) skills and can be seen in Table 5.

Tabel 5. Result Description of NL Ability

Aspect	EC		CC	
	PE	PO	PE	PO
Number of students	21	21	19	19
Average score	62	85	70	86
Lowest value	47	71	54	77
The highest score	80	100	89	100
Average increase	23		16	

Table 5 shows that the average increase in the control class towards numeracy literacy

skills is $x = 86 - 70 = 16$, while the average increase for the experimental class towards numeracy literacy skills is $y = 85 - 62 = 23$.

Based on Table 5, it can be concluded that the use of interactive math comics can improve students' numeracy literacy skills. The results of this increase can also be seen from the number of students in the experimental class who completed more than the control class. The product feasibility results show that interactive math comics can improve students' numeracy literacy skills. These results are in line with research conducted by Putri (2021) and Yani (2021) which stated that the use of interactive math comics has been shown to improve students' numeracy literacy skills. Then the research conducted by Mujawal et al. (2019) and Ekowati et al. (2019) which states that the use of interactive math comics has been shown to increase students' learning motivation towards increasing mathematics learning using math comics.

In general, the research results show that the use of mathematical comics is effective in increasing students' numeracy literacy skills. This is because mathematical comics are presented based on interesting story concepts, interactive forms of daily conversation so that they can increase students' learning motivation. In math comics, the questions presented also stimulate students' numeracy literacy skills because they are presented with information in the form of numbers, data, and symbols related to mathematics.

In addition, by learning to use mathematical comics students are required to be able to analyze various information in the form of graphs, tables, charts, and the ability to draw conclusions. Therefore, this study concludes that the use of mathematical comics in mathematics learning is effective in improving students' numeracy literacy skills.

CONCLUSION

This study concludes that the use of interactive math comics has proven to be effective in improving students' numeracy literacy skills. This is supported by the results of data analysis where based on the independent sample t-test test shows that the significance (2-tailed) is less than the significance of (0.004 < 0.05) for numeracy literacy skills, which means that the use of interactive math comics is more effective than classes with use of school worksheets. In

addition, based on the average difference test also shows that the increase in the average for the experimental class is greater than the increase in the average increase for the control class (23 > 16). Therefore, the numeracy literacy ability and learning motivation of students can be increased by using interactive math comics when learning in class. This is because mathematical comics are presented based on interesting story concepts, interactive forms of daily conversation so that

they can increase students' learning motivation. In math comics, the questions presented also stimulate students' numeracy literacy skills because they are presented with information in the form of numbers, data, and symbols related to mathematics. In addition, by learning to use mathematical comics students are required to be able to analyze various information in the form of graphs, tables, charts, and the ability to draw conclusions. Therefore, this study concludes that the use of mathematical comics in mathematics learning is effective in improving students'

numeracy literacy skill.

Based on the research results obtained, there are a number of suggestions for improvement of further research, namely the use of interactive math comics to improve numeracy literacy skills and students' learning motivation based on certain approaches, can be applied with other platforms that are easily accessible even without an internet network, and pictures of characters in interactive math comics can be made more diverse so that students are more interested in the learning media develop.

REFERENCE

- Amallia, N., & Unaenah, E. (2018). Analisis kesulitan belajar matematika pada siswa kelas III sekolah dasar. *Attadib Journal Of Elementary Education*, 3(2), 123-133.
- Anita, A. (2014). *Pengaruh Media Komik Terhadap Hasil Belajar Matematika Siswa pada Konsep Faktor dan Kelipatan (Kuasi Eksperimen di SDN Muhara 02 Citeureup)*. Jakarta: Universitas Islam Negeri Syarif Hidayatullah Jakarta.
- Antika, R. (2015). *Pembelajaran Matematika Kontekstual Untuk Meningkatkan Literasi Matematis dan Motivasi Belajar Siswa SMP*. Doctoral dissertation, Universitas Pendidikan Indonesia..
- Dirgantoro, K. P. S. (2018). Kompetensi guru matematika dalam mengembangkan kompetensi matematis siswa. *Scholara: Jurnal Pendidikan Dan Kebudayaan*, 8(2), 157-166.
- Ekowati, D. W., Astuti, Y. P., Utami, I. W. P., Mukhlisina, I., & Suwandayani, B. I. (2019). Literasi Numerasi di SD Muhammadiyah. *ELSE (Elementary School Education Journal): Jurnal Pendidikan dan Pembelajaran Sekolah Dasar*, 3(1), 93-103.
- Ernest, P. (2015). The social outcomes of learning mathematics Standard, unintended or visionary. *International Journal of Education in Mathematics, Science and Technology*, 3(3), 187-192.
- Hakim, A. R., & Windayana, H. (2016). Pengaruh penggunaan multimedia interaktif dalam pembelajaran matematika untuk meningkatkan hasil belajar siswa SD. *EduHumaniora: Jurnal Pendidikan Dasar Kampus Cibiru*, 4(2).
- Kharizmi, M. (2021). Kesulitan siswa sekolah dasar dalam meningkatkan kemampuan literasi. *Jurnal Ragam*, 2(3), 102-108.
- Kristianto, D., & Rahayu, T. S. (2020). Pengembangan media pembelajaran e-komik untuk meningkatkan kemampuan pemecahan masalah matematika kelas IV. *Jurnal Pendidikan Tambusai*, 4(2), 939-946.
- Mahmud, M. R., & Pratiwi, I. M. (2019). Literasi numerasi siswa dalam pemecahan masalah tidak terstruktur. *Kalamatika: Jurnal Pendidikan Matematika*, 4(1), 69-88.
- Marhaeni, N. H., & Suparman. (2018). Analisis Kebutuhan Bahan Ajar Matematika Berbasis Problem Based Learning Untuk Mengembangkan Kemampuan Pemecahan Masalah Siswa SMA Kelas XI. *Prosiding Seminar Nasional Pendidikan Matematika Ahmad Dahlan 2018*. 2018. Yogyakarta: 3 November 2018. Hal. 118 - 123
- Mujawal, W., Bani, A., & La Nani, K. (2019). Penggunaan Media Komik dalam Pembelajaran Matematika untuk Meningkatkan Motivasi dan Hasil Belajar Siswa pada Materi SPLDV. *Delta-Pi: Jurnal Matematika dan Pendidikan Matematika*, 7(1).
- Negara, H. S. (2014). Penggunaan Komik Sebagai Media Pembelajaran Terhadap Upaya Meningkatkan Minat matematika Siswa Sekolah Dasar (SD/MI). *TERAMPIL: Jurnal Pendidikan dan Pembelajaran Dasar*, 1(2), 250-259.
- Negara, H. S., & Wati, N. (2019). Analisis kemampuan komunikasi matematis pada pembelajaran Think Pair Share (TPS) berbantu komik matematika. *AKSIOMA: Jurnal Matematika dan Pendidikan Matematika*, 10(1), 24-34.
- Ntobuo, N. E., Arbie, A., & Amali, L. N. (2018). The development of gravity comic learning media based on gorontalo culture. *Jurnal Pendidikan IPA Indonesia*, 7(2), 246-251.
- Oktaviani, T., Dewi, E. R. S., & Kiswoyo. (2019). Penerapan pembelajaran aktif dengan metode

- permainan bingo untuk meningkatkan hasil belajar matematika. *Jurnal Mimbar Ilmu*, 24(1), 47–52.
- Pangesti, F. T. P. (2018). Menumbuhkembangkan literasi numerasi pada pembelajaran matematika dengan soal HOTS. *Indonesian Digital Journal of Mathematics and Education*, 5(9), 566-575.
- Pratyaksa, I. G. T. (2020). Komik Online Sebagai Media Penyuluhan Agama Hindu Bagi Generasi Milenial. *Maha Widya Duta: Jurnal Penerangan Agama, Pariwisata Budaya, dan Ilmu Komunikasi*, 3(2), 21-29.
- Putri, B. A. (2021). *Analisis Kemampuan Literasi Numerasi Siswa Smp Dalam Menyelesaikan Soal Cerita Pada Materi Aljabar*. Doctoral dissertation, Universitas Muhammadiyah Malang.
- Ramliyana, R. (2016). Penerapan media komik pada pembelajaran BIPA (studi kasus pada peserta Korea tingkat pemula di Universitas Trisakti Jakarta). *Jurnal SAP (Susunan Artikel Pendidikan)*, 1(1), 8–17.
- Rohim, D. C. (2021). Konsep Asesmen Kompetensi Minimum untuk Meningkatkan Kemampuan Literasi Numerasi Siswa Sekolah Dasar. *Jurnal Varidika*, 33(1), 54-62.
- Rosyidah, U., Setyawati, A., & Qomariyah, S. (2021). Analisis Kemampuan Penalaran dan Kemampuan Pemahaman Konsep Matematis Mahasiswa Pendidikan Matematika Pada Mata Kuliah Aljabar Dasar. *SJME (Supremum Journal of Mathematics Education)*, 5(1).
- Saputro, G. E., Haryadi, T., & Yanuarsari, D. H. (2016). Perancangan Purwarupa Komik Interaktif Safety Riding Berkonsep Digital Storytelling. *ANDHARUPA: Jurnal Desain Komunikasi Visual & Multimedia*, 2(02), 195-206.
- Sholihah, D. A., & Mahmudi, A. (2015). Keefektifan experiential learning pembelajaran matematika MTs materi bangun ruang sisi datar. *Jurnal Riset Pendidikan Matematika*, 2(2), 175-185.
- Yani, F. (2021). *Pengaruh Pendekatan Kontekstual (Contextual Teaching And Learning, Ctl) Dengan Berbantuan Media Komik Bergerak Terhadap Kemampuan Literasi Numerasi Siswa Kelas Rendah*. Doctoral dissertation, Universitas Pendidikan Indonesia.