International Journal of Research and Review
Volume 11; Issue: 7; July 2024
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Development of Character-Infused Mathematical Comic Media for Pancasila Student Profile in Improving Problem-Solving Abilities in Fourth Grade Elementary School

Nur Laili Septiani[1], Rochmad[2], Tri Suminar[3]

[1,2,3]Department of Master Elementary Education, Semarang State University, Semarang, Indonesia.

Corresponding Author: Nur Laili Septiani

DOI: https://doi.org/10.52403/ijrr.20240719

ABSTRACT

Mathematical problem solving skills are important for students to have, but in reality, mathematics learning in schools has not been able to develop students' problem solving skills, besides that the integration of Pancasila student profile character education in mathematics learning needs to be maximized. One of the efforts that can be made is the use of innovative learning media and containing character education for Pancasila student profiles. This study aims to (1) develop a mathematics comic media design with character education of Pancasila Student Profile; (2) assess the feasibility of mathematics comic media media with character education of Pancasila Student Profile; (3) test the effectiveness of mathematics comic media with character education of Pancasila Student Profile on problem solving skills in Class IV SD.This research is a development research with the Borg and Gall model. The R&D model in this study consists of 8 stages, namely: (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product trial; (7) product revision; (8) trial use. The test subjects in this study were fourth grade students of SDN 01 Kalipancur. Data collection techniques using tests, questionnaires, and documentation. Data analysis techniques used product feasibility analysis, to determine the effectiveness of using the average test, classical completeness test, two-sample t test, proportion difference test, paired t test, gain test.The results showed that (1) the development process includes the stages of potential and problems, data collection, product design, design validation, design revision, product trials, product revision, trial use so that mathematical comic media with character education Profil Pelajar Pancasila is produced (2) the product in the form of mathematics comic media with character education Profil Pelajar Pancasila is declared feasible by material experts, language and media experts (3) the use of mathematics comic media with character education Profil Pelajar Pancasila is effective in improving students' mathematical problem solving skills. The conclusion of this study is that the teaching materials for mathematics comics containing character education for the Pancasila Student Profile are feasible and effective for students' problem solving skills.

Keywords: math comics, problem solving, character, Pancasila student profile

INTRODUCTION

Mathematics is a fundamental subject in the elementary school (SD)/Madrasah Ibtidaiyah (MI) curriculum. It plays a crucial role in everyday life, and individuals

with a strong understanding of mathematical concepts can better solve real-world problems. Despite the broad Indonesia. According to the Programme for International Student Assessment (PISA) 2022results, Indonesia ranked 70 out of 81 participating countries, with an average score of 366, significantly below the international average of 472. These findings highlight the low problem-solving abilities of Indonesian students. Additionally, Mathematics is often perceived as a difficult subject by students from elementary to secondary levels. National assessments reveal that numeracy skills fall below the minimum competency level for over 50% of students. In the 21st century, Mathematics education aims to develop the 4C characteristics: Communication, Collaboration, Critical Thinking and Problem Solving, Creativity, and Innovation. These competencies align with the National Council of Teachers of Mathematics (NCTM) standards, emphasizing problem-solving, reasoning, communication, connections, and representation. Problem-solving skills are crucial not only in mathematics education but also in other subjects and daily life. However, the actual problem-solving abilities of students often fall short of expectations, especially in non-routine or high-level problem-solving tasks. The low ranking of Indonesian students in the Programme for International Student Assessment (PISA) is attributed to their weaker performance in non-routine problem-solving. Most Indonesian students are accustomed to routine-level problems (levels 1 and 2), while PISA assesses a wide range of problem-solving levels (Inayah, 2018). Consequently, it can be inferred that Indonesian students' mathematical problem-solving abilities remain relatively low. Observations at SD Negeri 01 Kalipancur, Pekalongan, revealed several issues. Students lack seriousness in paying attention to the material during lessons. The limited use of available media, such as small-sized images goals set for Mathematics education in SD/MI, there are still challenges faced in

and textbook illustrations, hinders effective teaching of mathematical concepts, especially fractions. Additionally, students' low reading interest affects their engagement in learning. Documented data from the 2022 Education Report for SDN 01 Kalipancur indicates that numeracy skills fall below the minimum competency level, with less than 50% of students achieving the required proficiency. Similarly, end-of-semester assessment results show that many students have not met the Minimum Mastery Criteria (KKM) of 71. Challenges include difficulty understanding problem statements, identifying relevant formulas (especially in word problems), and making calculation errors. Effective problem-solving strategies are essential for mathematics education, emphasizing different solution approaches and critical thinking (Winarti et al., 2019). Fractions are a fundamental mathematical concept used extensively in daily life. However, students often struggle with understanding fractions, as observed in Class IV A at SD Negeri 01 Kalipancur, Pekalongan. Their problem-solving abilities related to fractions remain low. For example, only 20% of students correctly solved a problem involving cake portions distributed among family members. The need for effective problem-solving skills is crucial not only in mathematics but also in other subjects and everyday situations. Additionally, character education plays a vital role in shaping students' values and behavior, especially in the digital age, where character development faces challenges (Sulastri et al., 2022). To address these challenges, the researcher proposes developing comic-based learning media infused with character education (Profil Pelajar Pancasila) for teaching fractions in Class IV at SD N 01 Kalipancur, Pekalongan.

This realistic and engaging approach aims to enhance students' understanding of fractions while instilling Pancasila values.

By integrating character education into the curriculum, educators can contribute to Indonesia's educational success (Ihsan et al., 2021). The use of realistic comic media provides an opportunity for students to learn math in a meaningful and context-rich manner, emphasizing problem-solving and practical application.

The implementation of character education through the Profil Pelajar Pancasila can be done using various teaching media, including comics. Originally used for entertainment, comics have now become an attractive alternative for educational purposes. Technical comic books can also be applied across various fields of knowledge. Several studies support the use of comics as effective teaching media. For instance, research on developing chemistry comics showed positive results. Similarly, the development of mathematics and social studies comics received favorable assessments from experts and students.

MATERIALS & METHODS

This research employs the Research and Development (R&D) method to create specific products and test their effectiveness. The R&D method involves scientific steps in designing, producing, and validating the resulting products (Sugiyono, 2016). The researcher utilizes the Borg and Gall development model, which consists of ten stages: problem identification, data collection, product design, design validation, design revision, product testing, product revision, usage testing, product revision, and mass production. However, in the study of mathematics comic media with character education content for "Profil Pelajar Pancasila," the researcher only completes eight development stages due to time and budget constraints. These stages include problem identification, data collection, product design, design validation, design revision, product testing, product revision, and usage testing.

This study follows a structured procedure using two variables: the independent variable (X) and the dependent variable (Y). The independent variable influences or causes changes in the dependent variable (Sugiyono, 2016). In this research, the independent variable is mathematical comics. The dependent variable, on the other hand, is affected by the presence of the independent variable (Sugiyono, 2016), specifically focusing on problem-solving abilities.The population for this study consists of students from SDN 01 Kalipancur, Pekalongan Regency. The sample is drawn from fourth-grade students at SDN 01 Kalipancur using purposive sampling.

The researcher conducted preliminary research through observation, interviews, and analysis of student learning outcomes at SDN 01 Kalipancur Pekalongan. The results indicated low mathematical problem-solving abilities due to suboptimal media usage during the teaching process. The limitations of existing teaching materials prompted the researcher to develop a product aimed at enhancing Mathematics education. Data collection involved observing students, interviewing Class IV teachers at SDN Kalipancur 01 Pekalongan, and analyzing documentation of student learning outcomes in Mathematics. Additionally, the researcher reviewed relevant literature and conducted surveys to assess teacher and student needs related to developing comic-based media for Mathematics instruction. The design of the comic-based learning media aligned with learning objectives (TP) and indicators of learning goal achievement (IKTP) for students. After revising the product based on validation and testing, the comic media underwent usage trials. The study involved all Class IV A and Class IV B students at SDN Kalipancur 01 Pekalongan. The usage trial evaluated the effectiveness of the comic media in improving students' problem-solving abilities, specifically in the topic of addition and subtraction of fractions. Although mass production was not feasible due to time and cost constraints, the researcher ensured that the Mathematics learning needs of Class IV students at SDN

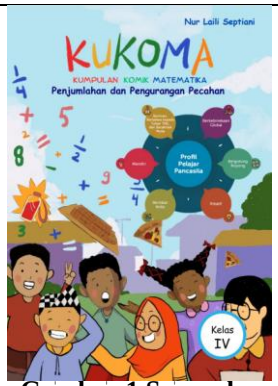
01 Kalipancur Kecamatan Bojong Kabupaten Pekalongan were met.

The researcher collected data from students, teachers, and experts to assess the needs, feasibility, and effectiveness of comic-based mathematics learning media infused with character education (Profil Pelajar Pancasila). Students from Class IV at SDN 01 Kalipancur, Pekalongan, served as data sources for analyzing requirements and evaluating the media. Needs analysis and media assessment data were obtained through questionnaires, while problem-solving abilities were assessed using pretests and posttests. Teachers also participated in evaluating the media. Experts played a crucial role in assessing its effectiveness. The study categorized participants into small-scale and large-scale trial groups, involving both test and non-test techniques. Observations focused on identifying existing issues. Additionally, the method of documentation involved collecting data from various sources, including records, transcripts, and student grades. Closed-ended questionnaires were used for needs analysis, and validation questionnaires were completed by expert.

RESULT

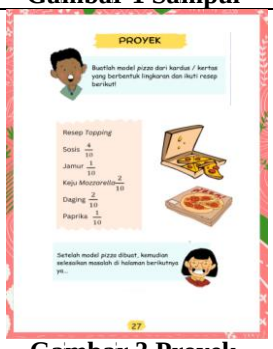
The development research that has been carried out creates a product in the form of comic learning media in mathematics subjects, especially in addition and subtraction of fractions containing character education regarding Pancasila student profiles. The focus of media development is mathematics subjects with the aim of improving problem solving abilities in fourth grade at Kalipancur 1 State Primary School, Pekalongan Regency. The results of the research include: (1) Development of learning media design, (2) Validity of learning media, and (3) Effectiveness of learning media.

Learning media designs are prepared based on data obtained through interviews and questionnaires given to teachers and students. Mathematical comic media was designed with the Procreate application. The reason is that the media developed in the form of character images with dialogue balloons, Procreate, is easier in the coloring and editing processes such as adding text, photos and cropping photos.



Gambar 1 Sampul

Gambar 2 Isi Komik



Gambar 3 Proyek

Gambar 4 Pemecahan Masalah

The comic media developed is combined with the Realistic Mathematic Education (RME) learning model which is adapted to students' realities and environments. Apart from that, there is character education for Pancasila student profiles so that they contain values that can be applied in social life.

Feasibility Test Results

Validation testing of the feasibility of mathematics comic media on adding and subtracting fractions was assessed by material experts, media experts, linguists and practitioners. Validation testing of content suitability components is assessed by material experts and validation testing of presentation components is assessed by media experts. Meanwhile, validation testing of material components, language components and presentation is assessed by practitioners. The validation results of the comic media assessment are presented in the following table:

Table 1 Recapitulation of Feasibility Assessment of Presentation Components and Content Components

Evaluator	Component	Acquisition Score	Total Score	Percentage	Criteria
Validator	Material	56	60	93,33%	Very worthy
	Media	44	48	91,67%	Very worthy
	Language	37	40	92,50%	Very worthy
Practitioner	Material	58	60	96,67%	Very worthy
	Media	46	48	95,83%	Very worthy
	Language	38	40	95,00%	Very worthy

Source: Processed by researchers (2024)

Based on the feasibility results that have been tested by experts, they provide suggestions for improving the mathematical comic media components. Suggestions from media expert validators include display adjustments related to color selection, layout, font type and size, illustrations, expressions and content. Suggestions from material experts are to emphasize images that show fractions, transform images to make them more relevant to mathematical concepts and use communicative numbers for recognition. Suggestions from language experts are adjusting PUEBI and simplifying sentences to make them more communicative for students.

Effectiveness Test Result

The effectiveness of mathematics comic media on problem solving abilities in this research was tested using several data analysis techniques. The analysis technique used is analysis of learning completeness, classical completeness, the average difference between the experimental class and the control class, as well as analysis of the N-Gain value in the experimental class and the control class. Before carrying out the learning process by applying mathematics comic teaching media, students in the experimental class and control class were first given a pretest to find out their problem solving abilities before applying the comic media that had been created.

Table 2 Results of Initial Data Analysis for Experimental Class and Control Class

Class	Total Number of Student	Average Value	Highest Score	Lowest Value
Experiment	27	59,94	82	36
Control	27	54,20	87	31

Source: Processed by researchers (2024)

Based on the table above, it can be concluded that the initial problem solving abilities of students in the experimental class and control class are in the low category.

After carrying out the pretest, learning was then carried out in the experimental class

and control class for six meetings. In the experimental class the learning process applies the Realistic Mathematic Education (RME) model using mathematical comic media, while in the control class the learning process applies the Realistic Mathematic Education (RME) model without using mathematical comic media. After carrying out the learning process six times, students in the experimental class and control class worked on the same posttest questions.

The results of the Homogeneity Test obtained a Sig value. 0.588 > 0.05 then H0 is homogeneous. In an effort to find out more about increasing pretest scores to posttest scores, it is necessary to carry out an N-Gain gain test, as follows:

Table 3 N-Gain Results for Experimental Class and Control Class

Kelas	***Rata-rata***		**N-Gain**	**Kriteria**
	Pretest	***Postest***		
Eksperimen	59,94	79,23	0,5443	Sedang
Kontrol	54,20	62,25	0,2659	Rendah

Source: Processed by researchers (2024)

Based on the data in Table 3, N-Gain Results for the Experimental Class and Control Class, it can be seen that the increase in pretest scores to posttest scores in the experimental class and control class is included in the medium criteria. In the experimental class, the increase in pretest scores to posttest scores was higher than in the control class; this was indicated by the higher N-Gain in the experimental class.

DISCUSSION

Researchers conducted a literature study and analysis of student needs regarding the development of media needed by elementary school students. Finally, the researchers decided to develop learning media in the form of mathematics comics which included character education for the Pancasila Student Profile in accordance with the current Merdeka Curriculum. Comic media is a visual communication medium that has the advantage of conveying information in a popular, interesting, interactive and communicative manner. This is possible because comics integrate images and writing, which are strung together in an image storyline making the information easier to understand. The text presented is easier to understand and the storyline is easier to implement and remember (Rahmatin et al., 2021). Apart from that, comics can increase reading interest and provide learning motivation to students, improve cognitive learning outcomes and the use of illustrations in comics can improve students' analytical skills (Wicaksono et al., 2020).

The use of the Realistic Mathematical Education (RME) model in the developed comic media is able to integrate learning material with students' daily lives. Through comic media, students can understand and reason about learning in everyday life, improve social cultural literacy skills so they can communicate well in the surrounding environment (Kearns & Kearns, 2020).

The media developed is then validated by expert validators. The results of the assessment by the material expert validator obtained a validity percentage of 93.33%, which is included in the very feasible category. The assessment indicators used as guidelines include accuracy of goals, suitability to level of thinking, support, impact, motivation and learning assistance. The results of the content feasibility assessment by material experts are in accordance with the theory put forward Sudjana (2015:4) the choice of learning media needs to pay attention to, (1) support for the content of the learning reading, and (2) according to students' thinking abilities.

Validation from language experts obtained a feasibility percentage of 92.50%, which is included in the very feasible category. The

assessment indicators include sentence clarity, conversational language style and vocabulary according to the student's abilities. This assessment is in accordance with the theory put forward by (Hamdani, 2011) states that the most important criterion in selecting media is in accordance with the learning objectives or competencies to be achieved.

The validation results from media experts obtained a feasibility percentage of 91.67%, which is included in the very feasible category. The assessment indicators include suitability to instructional objectives, learning topics, display quality and motivation, readability, practicality, and suitability to students' thinking abilities. The assessment obtained is in accordance with the theory put forward by Asyhar (2012:81) states that the choice of media must be appropriate to the topic being taught, and practical to use.

The assessment of the validity of comic media was carried out by practitioners with the results of the material component assessment getting a score of 58 with a percentage of 96.67%, the media component getting a score of 46 with a percentage of 95.83% and the language component getting a score of 95.00%. Apart from validators and practitioners, mathematics comic media received responses from students and teachers regarding the results of small-scale trials through distributing questionnaires. The percentage result is 97% with very good criteria. Meanwhile, the teacher response questionnaire on all aspects received a positive response of "Yes" with a percentage of 100% of very good criteria. Based on the data presentation, it was concluded that comic media is very good for applying in mathematics learning, especially in adding and subtracting fractions. In line with the research results İlhan et al. (2021) that comics can help increase learning success and develop positive student behavior. This is because students who have experience reading comics can understand and decipher the information better (Golding & Verrier, 2020).

A large group trial was carried out to determine the effectiveness of mathematics comic media on students' problem solving abilities. The data analyzed were pretest scores and posttest scores in the experimental class and control class. Mathematics learning in the experimental class applies the Realistic Mathematical Education (RME) model and applies mathematical comic media, while in the control class uses the Realistic Mathematical Education (RME) model without applying mathematical comic media. In the results of the initial data analysis related to the pretest score data, results were obtained which showed that the problem solving abilities of students in the experimental class and control class were both in the low category (because they were below 70). The average value of problem solving ability in the experimental class was 59.94 while in the control class it was 54.20.

After carrying out a pretest in the experimental class and control class, learning activities were carried out six times with the same material, namely concepts and adding fractions with the same denominator at the first meeting. Addition with different denominators at the second and third meetings. Subtracting fractions with the same denominator at the fourth meeting, then at the fifth and sixth meetings the material presented was subtracting fractions with different denominators.

Students then do a posttest with the aim of knowing the results of each student's problem solving abilities. The posttest results show that the average problem solving ability of students in the experimental class is 79.23 and is included in the high problem solving ability category. Meanwhile, in the control class the average problem solving ability was 62.25, including the moderate problem solving ability category.

Based on these results, it can be seen that the increase in problem solving abilities of

students in the experimental class is better than students in the control class. Furthermore, the pretest and posttest data were analyzed using average completeness analysis, classical completeness analysis, average difference analysis, difference proportion analysis and N-Gain analysis to determine the effectiveness of mathematics comic media on students' problem solving abilities.

In the average test for the experimental class, the average results of the problem solving abilities of students in the experimental class who applied the mathematics comic media exceeded the previously determined Actual Pass Limit (BLA) of 70. The average problem solving ability of students in the experimental class was higher than that of students in the control class with an average difference of 16 points. The application of Realistic Mathematical Education (RME) which encourages students to play an active role in learning fosters learning initiative, self-confidence, responsibility and independence from other people which are characteristics of independent learning (Nurul Afidah et al., 2023).

The results of the N-Gain Test showed that the increase in pretest scores to posttest scores in the experimental class was in the medium category, while in the control class from pretest to posttest scores there was an increase in the low category. The difference in N-Gain values shows that the increase in pretest scores to posttest scores that occurred in the experimental class was better than the control class. In line with the results of research by (Ariesta & Purwanti, 2019) that the use of comics can improve elementary school students' problem solving abilities. According to (Muhaimin et al., 2023) The combination of images and text in comics can improve students' understanding of the material being studied. Through guidance from teachers, comics function as a bridge to foster interest in reading according to students' level of thinking İlhan & Şin, (2024) which states that comics have a positive impact on users such as increasing motivation, learning by having fun, developing empathy, encouraging the formation of reading habits.

CONCLUSION

Based on the results of research that has been carried out, analyzed and discussed in accordance with relevant theories, it can be concluded that the product in the form of mathematical comic media containing character education, Pancasila Student Profiles, was designed based on students' needs and was declared very suitable both in terms of material, presentation and Language. The use of learning media in the form of mathematical comics containing the character education of Pancasila Student Profiles through Realistic Mathematical Education (RME) is effective in improving the problem solving abilities of fourth grade primary school students to the medium category. The average completion of the problem solving abilities of students who use mathematical comic media containing character education, Pancasila Student Profile with Realistic Mathematical Education (RME) has increased, where the posttest score is higher than the pretest score.

Declaration by Authors

Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Ariesta, F., & Purwanti, E. (2019). Build Critical Thinking Skills of Elementary School Students Through Comics social Science Based-Problem. https://doi.org/10.4108/eai.26-1-2019.2282933
2. Asyhar, R. (2012). Kreatif Mengembangkan Media Pembelajaran. Referensi.
3. Golding, S., & Verrier, D. (2020). Friesen, J., Van Stan, J. T., & Elleuche, S. (2018). Communicating science through comics: A method. Publications, 6(3), 1–10.

https://doi.org/10.3390/publications6030038 . J. Graph. Nov. Comics, 1–13. https://doi.org/https://doi.org/10.1080/21504857.2020.1786419
4. Hamdani. (2011). Strategi Belajar Mengajar. Pustaka Setya.
5. İlhan, G. O., Kaba, G., & Sin, M. (2021). Usage of Digital Comics in Distance Learning During COVID-19. International Journal on Social and Education Sciences, 3(1), 161–179. https://doi.org/10.46328/ijonses.106
6. İlhan, G. O., & Şin, M. (2024). Reflections of " Use of Comics in Social Studies Education " Course : The Opinion and Experiences of Teachers Reflections of " Use of Comics in Social Studies Education " Course : The Opinion and Experiences of Techers. SANE Journal : Sequential Art Narrative in Education, 2(8).
7. Kearns, C., & Kearns, N. (2020). The role of comics in public health communication during the COVID-19 pandemic. J. Vis. Commun. Med, 43(4), 139–149. https://doi.org/https://doi.org/10.1080/17453054.2020.1761248
8. Muhaimin, M. R., Ni'mah, N. U., & Listryanto, D. P. (2023). Peranan Media Pembelajaran Komik Terhadap Kemampuan Membaca Siswa Sekolah Dasar. Jurnal Pendidikan Dasar Flobamorata, 4(1), 399–405. https://doi.org/10.51494/jpdf.v4i1.814
9. Nurul Afidah, L., Wardono, Stevanus, & Waluya, B. (2023). Systematic Literature Review: Literasi Matematika dan Kemandirian Belajar Pada Pendekatan Matematika Realistik. PRISMA, Prosiding Seminar Nasional Matematika, 7, 821–828. https://journal.unnes.ac.id/sju/index.php/prisma/
10. Rahmatin, U., Katili, M. R., Hadjaratie, L., & Suhada, S. (2021). Pengembangan Media Komik Untuk Pembelajaran Materi Logika dan Algoritma Komputer. Jambura Journal of Informatics, 3(1), 11–19. https://doi.org/10.37905/jji.v3i1.10367
11. Sudjana, N. (2015). Media Pengajaran. Sinar Baru Algensido Offset.
12. Wicaksono, Wahyu, J., Japar, M., & Utomo, E. (2021). Development of Digital Based Comic Media for Primary V-Class Student Learning. International Journal of Multicultural and Multireligious Understanding, 8(4), 532.

How to cite this article: Nur Laili Septiani, Rochmad, Tri Suminar. Development of character-infused mathematical comic media for pancasila student profile in improving problem-solving abilities in fourth grade elementary school. *International Journal of Research and Review*. 2024; 11(7): 176-184. DOI: *https://doi.org/10.52403/ijrr.20240719*

******