



Mathematical Understanding: Learning Number Operation Using Media in The Context of Futsal

Kiki Nia Sania Effendi¹✉, Dany Aulia², Indrie Noor Aini¹, Rina Marlina¹

¹Mathematics Education Department, Universitas Singaperbangsa, Karawang, Karawang, Indonesia

kiki.niasania@staff.unsika.ac.id

²Sports Science Department, Universitas Singaperbangsa, Karawang, Karawang, Indonesia

Abstract. The background of this research is the importance of students' mathematical understanding abilities, but from several studies, it has been shown that the lack of mathematical understanding abilities is caused by a lack of learning media that constructs students' knowledge, one of which is the use of student worksheets which only contain material and practice routine questions. The learning context can be built through various things that are close to students, one of which is sports. Therefore, this study will use futsal as a means of learning mathematics context. This study aimed to determine students' mathematical understanding skills in number operations learning activities using learning media in the context of futsal. This study used a quasi-experimental method with the non-equivalent control group design involving control and experimental classes at one of the junior high schools in Kabupaten Karawang. The instrument used was a test of mathematical understanding ability in which the data was processed in the form of descriptive statistics to see the difference in the average scores of the two classes. The results of the increase in the average value of students who use learning media in the futsal context are greater than the average value of students who do not use learning media in the futsal context in material for number operations. The mathematics learning media used in this study can be implied by being used as a learning media in the futsal context in number operations material to improve students' mathematical understanding abilities in learning mathematics.

Keywords: Learning Media, Futsal, Mathematics, Mathematical Understanding

1 Introduction

The ability to understand mathematics is very important for students to have in learning mathematics because a good understanding can make it easier for students to learn mathematics so that students can solve all problems and decide on a solution well in math problems. The importance of the ability to understand mathematics in students is one of the references for teachers in developing learning in the classroom so that students are actively involved in learning mathematics, not only memorizing formulas, but students are also able to understand the concepts of the material they are studying. Someone who can understand mathematics means that the person already knows what he is studying and the steps that have been taken and can use mathematical concepts both inside and outside the context of mathematics [1]

© The Author(s) 2024

Z. B. Pambuko et al. (eds.), *Proceedings of the 4th Borobudur International Symposium on Humanities and Social Science 2022 (BIS-HSS 2022)*, Advances in Social Science, Education and Humanities Research 778, https://doi.org/10.2991/978-2-38476-118-0_91

The fact that students are not given the opportunity to understand more deeply the mathematics material they will learn. This is because students only focus on getting solutions or answers to these math problems, then hand over the results of their work to the teacher to be corrected and given a grade for the assignment they have done. Therefore, in learning mathematics, most students rely on memorization rather than understanding math problems [2]. Memorization in learning mathematics impacts ignorance of the concept, meaning that when working on questions, they often make mistakes and do not find solutions to problems [3]. This problem is one of the problems that educators and researchers pay attention to in mathematics education. Mathematics education has attracted considerable attention from educators and scholars [4].

Understanding mathematical concepts are two aspects of ability that need to be developed when learning mathematics so that students are able to understand and solve the mathematical problems they are facing [5]. To improve students' views of mathematics and train students' mathematical understanding in learning mathematics, teaching materials are needed that support and direct students to clear and directed learning objectives, namely through student worksheets that are more innovative and interactive and can be accessed at any time. Anywhere and can be understood by students over and over again. This goes hand in hand with technological developments that must be used to facilitate human interests, including in education. The utilization of information and communication technology in the field of education is also not only in the facilities in schools but also in the ability of students to use technology to shape better learning. Using worksheets equipped with videos as learning media can attract students' attention. The existence of this video requires an exciting context and is close to the daily life of students.

Mathematics learning will be more exciting and meaningful if students can be involved in sports activities, where in these activities students can play and learn so that they can train students mathematical understanding in each of these sports activities. One of these sports is futsal because every activity in futsal can teach students understanding, starting from the grouping of members to form a futsal team, the scores of each round of matches, and so on. The existence of a relationship between mathematics and futsal sports shows that learning mathematics will be exciting with the design of teaching materials and the design of learning activities using the futsal context. The sports context helps students express mathematical ideas that students have because they are more comfortable and confident [6]. The relationship between futsal games and mathematics can be seen from the calculation of scores in futsal matches with integer operations in mathematics learning [7]. Learning that begins with a stimulus in the context of futsal makes students more interested in learning and better students' literacy skills because the context presented is interesting to them [8]. This research aims to determine the influence of the use of learning media in the futsal context on students' mathematical understanding abilities. This research is vital because learning mathematics requires learning media that can construct students' knowledge so that students can understand mathematics and learning outcomes are achieved optimally.

2 Method

The type of research used is experimental research with the design used a non-equivalent control group design. Where the design chosen is not random, but the researcher can choose and determine for himself the class that is used as the experimental class and the control class. The participants were selected from two intact classes (already-formed groups) and received either an intervention (the treatment group) or not an intervention (the control group) [9]. The population in this study were class VII students of public junior high schools in Karawang regency. The research samples were two class VII. The sample selection was carried out by purposive sampling technique. The experimental class was given treatment by learning using learning media in the futsal context, while the control class did not use learning media in the futsal context. Data collection techniques used interviews, observation, and giving pretest-posttest questions about students' mathematical understanding abilities. The steps carried out in this research are:

- Try out the instrument to test the ability to understand mathematics and process the data from the test results by testing the validity, reliability, discriminating power, and testing level of difficulty of the instrument.
- Pretest the mathematical understanding abilities of the experimental class and the control class
- Implementation of mathematics learning media in the context of futsal material for number operations in the experimental class and without using learning media in the context of futsal in the control class
- Posttest the mathematical understanding abilities of the experimental class and the low control class
- Analysis of the data on the results of the mathematical understanding ability test with the normality test, homogeneity, and Effect Size calculation test. Calculation of the effect size using the formula and its interpretation in Table 1 [8].

$$d = \frac{\bar{x}_t - \bar{x}_c}{S_{pooled}}$$

Table 1. Interpretation of effect sizes

d	Interprets
$d \leq 0,2$	low
$0,2 < d \leq 0,8$	medium
$d \geq 0,8$	high

3 Results And Discussion

The research was carried out at a junior high school in Karawang Regency using two classes, namely class 7G as an experimental class (a class whose learning uses futsal context learning media) and 7E, a control class (a class whose learning does not use futsal context learning media). The material used in this study is material for integer

and fractional operations. Data processing that has been carried out up to descriptive statistical tests is in the form of the average value of the pretest and posttest of the experimental class and the control class. The results obtained are shown in Table 2.

Table 2. Average Score of Experimental and Control Class

Class	Pretest Average Score	Posttest Average Score	Increase in Average Score
Experi- mental	10.26	23.22	12.96
Control	11.47	21.28	9.81

Based on the pretest scores in Table 2, the average scores of the two classes in this study were not much different. In the experimental class, the average value was 10.26, and in the control class 11.47. This shows that the initial abilities of students in the two classes are the same. The pretest obtained by students tends to be small and there are some students whose final score is zero. This shows that students' understanding of integer and fractional operations is still low. Most students have not made logical formal observations, so it seems that students have not realized the link between a set of theorems and demand that statements be justified or verified through logical arguments [9]. Based on the student's answers, it showed that students did not understand how to subtract or add up negative numbers, students also did not understand questions in the form of stories, and these students still could not translate story problems into mathematical formulas. The understanding activity carried out by students in answering questions and writing down the information obtained is said to be the ability to define concepts verbally based on prior knowledge.

In addition to integer operations, students also experience difficulties in working on word problems about fraction operations, in which students still cannot change the shape of fractions, sort fractions, simplify fractions, and students are also confused about how to distinguish which is the numerator and denominator of a number. fractions. This is in line with the opinion of students who have difficulty equating the denominator (concept of fractions), such as in subtraction and addition operations, so many students still experience errors in solving these math problems. It is very important to know and understand the concept of fractions, especially in equating the denominator, because it will affect the solution to the next stage [10].

Learning using learning media in the form of Student Worksheets accompanied by animated videos makes students very happy and eager to learn because they don't feel bored learning when using videos with sound and animation. Learning with interesting learning media will make students more enthusiastic, interested, enthusiastic, and interested in learning high because students don't feel bored when watching videos because 50% of students will understand and be more interested in learning what students have seen and heard. Learning to use worksheets in which there is a video also makes it easier for students to understand the concept of the material in mathematics [11]. Video is interactive multimedia that is effective, efficient, and feasible, can trigger students' critical thinking processes, increase conceptual understanding and facilitate problem-solving, as well as brief allocations to the learning process [12]. Student worksheets that are made also use the context of everyday life, namely the context of futsal

games, in which students will better understand learning operations on integers and fractions. Student understanding built through contexts close to students' daily lives and related to the material being studied will make it easier for students to understand the material, and their understanding will last longer [13]. The media developed is in the form of worksheets that contain futsal animated video illustrations. Worksheets are made in an interesting manner, accompanied by work steps and exercises to hone students' abilities in solving a problem in learning activities.

Based on the posttest values in table 2, the experimental class has increased even though the value is still small, and the effect size calculation results with a result of 0.16 show a low affect interpretation. However, the experimental class students experienced an increase in average scores, which were better than the control class's average scores. When viewed from the highest score, the pretest obtained 37.5, while the posttest obtained 60. Learning that succeeds in achieving maximum learning objectives is influenced by various factors, not only the use of appropriate learning media. The reason for this small percentage increase is that there are several obstacles, including inadequate facilities and infrastructure at the research site, there are still some students who do not understand the learning flow at each meeting, and there are still many students who do not understand the previous basic mathematical concepts that support the continuity of learning in the material in the study, resulting in hampered learning and less than optimal learning outcomes. However, this also shows that learning using learning media in the form of worksheets in the context of futsal collaboration with video illustrations is able to increase student understanding even though with a relatively low increase, the use of worksheets in learning can increase student responses to learning and affect achievement, especially in learning mathematics [14]. Challenges in the 21st century require teachers to create and develop learning activities that support students' creativity and critical thinking [15]. The use of learning media is very influential on the implementation and learning outcomes, so it can be used as an alternative to solving problems in learning mathematics.

4 Conclusion

The effect of using learning media in the context of futsal can be seen from the increase in the average posttest score of students' mathematical understanding abilities. The effect size calculation shows a low effect value. However, the increase in the average score of students whose mathematics learning uses learning media in the futsal context is better than students whose mathematics learning does not use teaching media in the futsal context. Learning media in the futsal context is one of the supporting media for learning mathematics theoretical operations material to improve students' mathematical understanding abilities.

Acknowledgments. This research was funded by the Universitas Singaperbangsa Karawang through the Hibah Prioritas Unsika 2022, which is managed by the Institute of Research and Community Service of Universitas Singaperbangsa Karawang.

Reference

1. Alan, U.F.; Afriansyah, E.A. Kemampuan Pemahaman Matematis Peserta Didik Melalui Model Pembelajaran Auditory Intellectually Repetition Dan Problem Based Learning. *J Pendidikan Mat* **2017**, *11*.
2. Sariningsih, R. Pendekatan Kontekstual Untuk Meningkatkan Kemampuan Pemahaman Matematis Peserta Didik SMP. *Infin J* **2014**, *3*, 150.
3. Nursaadah, I.; Risma, A. Analisis Kemampuan Pemahaman Matematis Peserta Didik SMP Pada Materi Segiempat Dan Segitiga. *J Numer* **2018**, *5*, 1–9.
4. Attard, C.; Ingram, N.; Forgasz, H.; Leder, G.; Grootenboer, P. *Mathematics Education and the Affective Domain*; Makar, I.K., Dole, S., Visnovska, J., Goos, M., Bennison, A., Fry, K., Eds.; Research in Mathematics Education in Australia 2012-2015, 2016;
5. Purwasih, R. Peningkatan Kemampuan Pemahaman Matematis Dan Self Confidence Peserta Didik MTs Di Kota Cimahi Melalui Model Pembelajaran Inkuiri Terbimbing. *J Ilm STKIP Siliwangi Bandung* **2015**, *9*, 16–25.
6. Sanchal, A.; Kuiti, T. Students' Attitudes Towards Learning Mathematics : Impact Of Teaching In A Sporting Context. *Teachers and Curriculum* **2017**, *17*, 89–99.
7. Effendi, K.N.S.; Zulkardi; Putri, R.I.I.; Yaniawati The Potential Effects on Junior High School Mathematics Learning: The Reading Texts for Learning Stage of the School Literacy Movement. *Proceeding International Seminar on Applied Mathematics and Mathematics Education* **2019**.
8. Effendi, K.N.S.; Zulkardi; Putri, R.I.I.; Yaniawati Developing Mathematics Worksheet Using Futsal Context for School Literacy Movement. *Journal on Mathematics Education* **2019**, *10*, 203-214.
9. Assuah, C. K., Mantey, G. K., & Osei, L.; The Effect of Think-pair-share Learning on Junior High School Students' Achievement in Algebraic Expressions: Pre-test-Post-test Non-equivalent Control Group Design. *Asian Journal of Probability and Statistics* **2022**, *20*, 46-55.
10. Thalheimer, W.; Cook, S. How to Calculate Effect Size from Published Research Articles: A Simplified Methodology. **2002**.
11. Yao, X. Characterizing Learners' Growth of Geometric Understanding in Dynamic Geometry Environments: A Perspective of the Pirie–Kieren Theory. *Digital Experiences in Mathematics* **2020**, *6*, 293–319.
12. Aminah, K.K.R.A. Analisis Kesulitan Siswa Dalam Menyelesaikan Soal Cerita Matematika Topik Pecahan Ditinjau Dari Gender. *JTAM | Jurnal Teori dan Aplikasi Matematika* **2018**, *2*, 18–25.
13. Murtiyasa, B.; Agustin, A.F. Pengembangan Video Pembelajaran Yang Berorientasi Pada Peningkatan Minat Belajar. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika* **2022**, *11*, 986–999.
14. Sumini Pendekatan Steam Berbasis Video Pembelajaran Pada Materi Bangun Datar Sisi Banyak. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini* **2022**, *2*, 8–19.
15. Effendi, K.N.S.; Aini, I.N.; Maryati, M. Pengabdian Kepada Masyarakat: Belajar Matematika Menggunakan Media Pembelajaran Dengan Konteks Futsal. *Abdimas PHB* **2022**, *5*, 73–79.
16. Sinurat, F.M.I. Penggunaan Lembar Kerja Peserta Didik Untuk Meningkatkan Prestasi Belajar Matematika Pada SMKN 1 Cikarang Selatan. *Indonesian Journal of Educational Development* **2022**, *2*, 80–88.
17. Putra, Z.H.; Dahnilsyah; Aljarrah, A. A Praxeological Analysis of Pre-Service Elementary Teacher-Designed Mathematics Comics. *Journal on Mathematics Education* **2021**, *12*, 563–580.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

