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Implementation of Meaningful Instruction Design Model Assisted by Comic on Students Understanding of Multiplication

Abstract

The meaningfulness of math learning in multiplication material is still lacking. This can be seen from students who do not care when they get low results in multiplication learning and are considered boring for students. In overcoming these problems, it is necessary to have the meaningfulness of mathematics learning, one of which is through the Meaningful Instruction Design model with the help of Comics in achieving a better understanding of the concept of multiplication. The type of research used is pre-experiment with pretest-posttest one group de-sign design. The study population was 25 third grade students selected by random sampling technique with a sample of 20 students. From the results of hypothesis testing, the significance of 0.00 < 5% was obtained so that it was stated that the Meaningful Instruction Design model assisted by Comics had an effect on understanding multiplication. Based on the results of the study, students' understanding of multiplication can increase due to the implementation of the Meaningful Instruction Design model assisted by Comic media. However, to produce new contributions using the Meaningful Instruction De-sign model can be applied to other mathematics materials.

***Keywords**:* Comic; Meaningful Instruction Design Model; Multiplication; Student Understanding

Abstrak

Kebermaknaan pembelajaran matematika pada materi perkalian masih kurang. Hal ini dilihat dari siswa yang tidak peduli ketika mendapatkan hasil yang rendah pada pembelajaran perkalian serta dianggap membosankan bagi siswa. Dalam mengatasi masalah tersebut, perlu adanya kebermaknaan pembelajaran matematika, salah satunya melalui model Meaningful Instruction Design dengan berbantuan Komik dalam mencapai pemahaman konsep perkalian menjadi lebih baik. Jenis penelitian yang digunakan adalah pre-eksperimen dengan desain pre-test-posttest one group design. Populasi penelitian sebanyak 25 siswa kelas III yang dipilih dengan teknik random sampling dengan sampel sebanyak 20 siswa. Dari hasil uji hipotesis diperoleh signifikansi 0,00 < 5% sehingga dinyatakan bahwa model Meaningful Instruction Design berbantuan Komik berpengaruh terhadap pemahaman perkalian. Berlandaskan hasil penelitian, pemahaman perkalian siswa dapat meningkat dikarenakan adanya implementasi model Meaningful Instruction Design berbantuan media Komik. Namun, agar dapat menghasilkan kontribusi baru menggunakan model Meaningful Instruction Design dapat diterapkan pada materi matematika lainnya.

INTRODUCTION

The growth of a nation may be seen from the quality of education, making education one of the most crucial components in the development of civilisation (Sulisworo, 2016). Mathematics has a huge impact on how human intelligence develops in the world of education (Johar et al., 2023). The majority of daily human activities involve mathematics (Thanheiser, 2023). So, it can be said that in any condition mathematics always accompanies life.

Mathematics as one of the compulsory subjects, does not only prioritize the aspect of counting or memorizing formulas (Nilimaa, 2023) but also can help solve problems in everyday life as a thinking process (Utomo et al., 2023). The existence of mathematics functions so that humans can think in an effort to solve problems through a realistic approach (Khasanah & Purnamasari, 2023).

Learning in mathematics can be viewed from different perspectives. Students must be able to reason logically, create strategies for solving structural problems, pay attention to patterns, and generate knowledge based on experience in order to successfully execute mathematics instruction (AlAli et al., 2023). Each student must have sufficient knowledge in various concepts of mathematics and be able to apply them according to student needs (Akinoso, 2023). As a result, the application of mathematics should be

grounded in students' everyday experiences (da Silva Reis & de Araújo, 2023).

Mathematics learning content is generally less attractive to students in the world, especially Indonesia (Setyawan & Purbohadi, 2023). Mathematics learning in Indonesia is still considered difficult and terrible learning (Nanda & Jupri, 2021). The mathematics material presented is still abstract, teacher centred learning only, and the majority are fixated on memorizing formulas only (Ismaimuza, 2023). This will make students passive and if this is allowed to continue without improvement, then the learning process in class will be boring and of course this will have an impact on students' lack of understanding of the concept of mathematics.

Concept understanding is one of the important basic stages in learning mathematics (Langdon et al., 2023). One of the objectives of mathematics learning that is expected to emerge is the ability to understand concepts (Inganah et al., 2023). Students who have a good understanding of concepts will know more about mathematical material (Sahara et al., 2023). In concept understanding, teachers can give students several problems and then give different problems but with the same characteristics. This is done so that students' understanding of mathematical concepts is not only limited to the practice problems given.

Understanding mathematical concepts must be instilled from an early age starting from the learning of mathematics. Mathematics is taught at every level of education, even in the lower grades. The mathematics learning that most often makes students fail is on multiplication material in the lower grades (B. A. Putri et al., 2023). This is because the cultivation of mathematical concepts of multiplication material that is often given by teachers is based on verbal explanations only (Isnawan et al., 2023).

Although the multiplication material is simple, if there is no significant improvement, it will have an impact on the understanding of mathematical concepts in other materials. This indicates that, understanding the concept of multiplication can be said to be the initial foundation in learning mathematics at a more advanced stage. Therefore, understanding the concept of multiplication needs to be considered if students do not understand. Learning related to multiplication also needs to be considered, where students are not only fixated on memorizing formulas, but are able to find ways to multiply two numbers to get the right results. This will also provide opportunities for students to be able to think further about student understanding.

The ideal condition that should occur when teaching the concept of multiplication is that students are freed to be creative in finding answers to problems given by the teacher, supported by a pleasant learning atmosphere and able to make students active. However, the reality that occurred during the observation activities carried out in class II SDN 1 Kradenan, Klaten, the learning of multiplication material explained by the teacher was abstract. For example, the teacher explains multiplication by lecturing, then students are told to imagine the multiplication results mentioned by the teacher. In addition, based on the interview, the teacher optimizes learning by memorizing instead of finding a way to answer the given problem. Based on the above problems, the meaningfulness of learning that should be obtained by students, especially low-grade students, has not yet occurred. Another thing that was found during the implementation of learning mathematics multiplication material, the teacher has not used media that attracts students' attention to actively learn. The characteris-

tics of low-grade students really like learning accompanied by play (Aldila & Rini, 2023) especially learning mathematics which is known as boring learning.

The meaningfulness of learning is very important especially in mathematics learning (Polman et al., 2021). The meaningfulness of learning will make students more interested in learning something and also have an impact on student memory (Mendoza, 2020). The meaningfulness of learning can be obtained by integrating learning with students' daily lives, a pleasant learning atmosphere, and learning problems presented by teachers based on contextual problems. This will certainly make it easier for students to understand every learning concept given by the teacher. However, based on the problems found in mathematics learning, which always gets the title of boring and scary learning for most students in Indonesia, it indicates that the meaningfulness of mathematics learning in Indonesia itself is still not visible, especially at SDN 1 Kradenan class II as the research subject.

To be able to provide meaningfulness of learning in overcoming the above problems, a learning model that is able to provide meaningfulness of learning is needed, such as through the implementation of a meaningful instruction design model. Through the implementation of the meaningful instruction design model, it is able to instil students' understanding of concepts about mathematics (Yuliani & Pratiwi, 2020). The application of the meaningful instruction design model is able to create effective, active and meaningful learning for students so that it can stimulate students' long-term memory in terms of remembering (Ristinawati, 2020). An enjoyable learning environment and experiences that students have felt while learning are the main objectives of developing this meaningful instructional design model (Ratnawati et al., 2020).

As evidence that the Meaningful Instruction design model is able to provide meaningfulness to mathematics learning, research conducted by Prihatiningtyas & Husna (2023) in their research said that the MID model has an effect on students' mathematical problem solving skills on the material of linear equations of three variables. In research by Irwan & Murti (2023) that the MID model with the RME approach was successful in improving students' mathematics learning outcomes in division material. And research by Zulfikar et al (2023) states that students' mathematical connection skills get good results due to the implementation of the MID model. Based on these three studies, it can be believed that the MID model is able to provide the best results on students' understanding of mathematical concepts.

However, increased student understanding can not only be improved using learning models alone, but there is a combination of learning models and learning media to achieve more optimal results. The use of media that is attractive to students, especially in the lower grades, will make it easier for students to gain knowledge (Milawati et al., 2023). Media that can be felt, held, and seen by students are more relevant for low-grade students, for the example the comic (Meaders et al., 2023). Comic media-assisted learning is very entertaining for students because in comics there are elements of humour that usually occur in students' real lives (Wahyuni & Lestari, 2023). Comic media can be used as an alternative to delivering teaching materials with images that attract students' attention accompanied by learning information (Annisa & Dewi, 2020). The existence of daily life connections contained in comics will make it easier for students to understand the concept of multiplication (Widyasari & Cahyani, 2021).

Several researchers conducted by

(Desi, 2021; Irwan & Murti, 2023; Rosita, 2018; Yuliani & Pratiwi, 2020) have not used collaboration with learning media, such as comics. Research that combines meaningful instruction design models assisted by comics on understanding of mathematical concepts that have been developed is still rare. Therefore, researchers want to conduct experiments using meaningful instruction design models assisted by comics on students' understanding of multiplication concepts. It is hoped that the findings of this research can be input in improving the quality of learning in the classroom, especially in mathematics learning.

METHOD

This study uses a type of pre-experimental research with a pretest-posttest one group design. The choice of pre-experiment design is because it is an initial study of the implementation of the Comic-assisted MID model and generalization has not been made on the results obtained. In this design there is no control class and only applies the giving of pretest, giving action in the form of implementing a meaningful instruction design model assisted by comics for 3 face-to-face meetings, and at the end a post-test is given. This research was conducted at SDN 1 Kradenan in class II on multiplication material. The population of grade II students was 25 students who were randomly selected to obtain a research sample. After a simple randomization process there were 20 students as research subjects.

The characteristics of grade 2 students at SDN 1 Kradenan can be said to be passive when learning activities are carried out, especially in learning mathematics. When the teacher asks questions to students, students have not been able to express their opinions or provide answers. However, when outside of math learning activities, such as Indonesian language when observations were made, it turned out that students could be more active. It turns out that after being traced that students prefer learning that is not only fixated on lectures, but relates learning activities to students' daily lives, such as when going to school, playing with friends around, and other things. In addition, the delivery of material that is often given by teachers is too high in grammar, so it needs to be simplified and followed by an explanation using the students' local language. The characteristics of grade 2 students at SDN 1 Kradenan can be said to be passive when learning activities are carried out, especially in learning mathematics. When the teacher asks questions to students, students have not been able to express their opinions or provide answers. However, when outside of math learning activities, such as Indonesian language when observations were made, it turned out that students could be more active. It turns out that after being traced that students prefer learning that is not only fixated on lectures, but relates learning activities to students' daily lives, such as when going to school, playing with friends around, and other things. In addition, the delivery of material that is often given by teachers is too high in grammar, so it needs to be simplified and followed by an explanation using the students' local language. But not only in explaining using simple language, when given questions, students also find it easier to understand the meaning of questions with simple language related to students' daily lives.

The research instrument used is a test item consisting of 4 questions with essay type and 6 questions with matching type "right" or "wrong" which are included in the comic. Before being given to students, the questions were first validated, and all questions were declared valid and reliable. Data analysis techniques used

were descriptive and inferential analysis. Descriptive analysis is seen through the acquisition of means, variance, and standard deviation. In the inferential analysis, it was done to test the hypothesis. The first step taken is to test the normality of the data and the homogeneity of the data as a condition for conducting parametric statistical tests with the criteria if the Significance value is more than 5%, then the data is considered normally distributed, and the data variance is homogeneous. Hypothesis testing is carried out using the paired sample test with the criteria, if the Sig. 2-tailed is less than 5%, then it is stated that there is an effect of the implementation of the meaning-full instruction design model assisted by comics on understanding the concept of multiplication of grade II students.

The flow in the research method used can be seen in Figure 1:

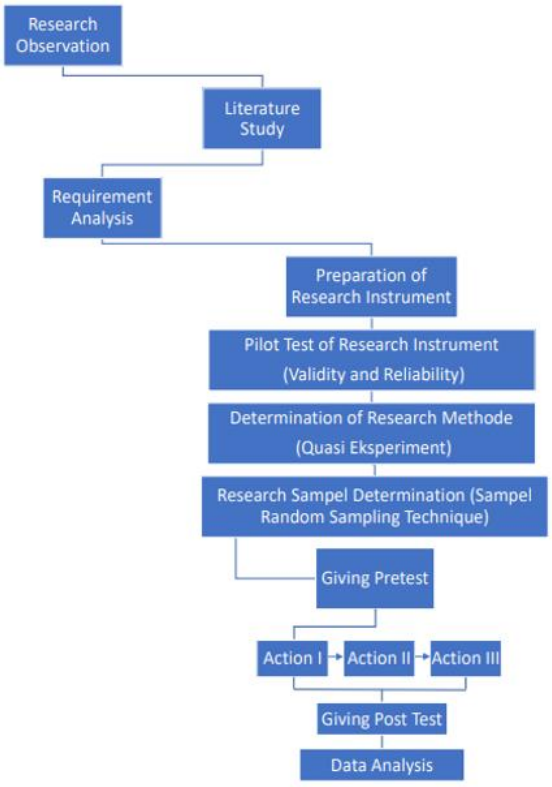

Figure 1. Research Flow Chart

RESULTS AND DISCUSSION

Result

Before entering the core of learning, the teacher always gives apperception to students first. The apperception is related to students' experiences when they are sick. Things that the teacher asks, such as: "When you are sick, what are the things you do?". Many students answered, "Just lie down, watch television". However, the answer was still not enough, and the teacher asked again like "so that you can recover from illness, what should you do?". Students answered, "Go to the doctor to ask for medicine". Then, the teacher continued to provide stimulus to students, "If you take medicine, have you ever seen any instructions for taking medicine?". Students answered, "Once ma'am, it says 2 x 3". "Do you know what 2 x 3 is", the teacher asked. However, no student answered the question.

Then, the teacher explains that the 2 x 3 in the medicine seen by students is an instruction that students should do regarding how often and how much students should take the medicine in 1 day. After that, the teacher explains that this time we will learn about multiplication. The teacher tells the meaning of multiplication is the same as addition repeatedly. For example, 2 x 3 means 2 medicines are taken 3 times a day. Things related to the concept of multiplication continue to be given by the teacher to students until students are believed to begin to understand the concept of multiplication. This can be seen when the teacher asked questions again at the next meeting, students began to respond to the teacher with the correct answers. So, on the third meeting after being given an understanding of the multiplication material again, the teacher gave a test to students. The test will be analyzed descriptively and inferentially to see whether the model used by the teacher has been successful in improving

students' understanding of multiplication.

Descriptive data analysis as the first step in data analysis. Interpretation of this data refers to the results of Means, Variance and Standard deviation. The calculation results are shown in Table 1.

Table 1. Descriptive Statistics

Data	Means	Deviation Standar	Varians
Pretest	31,00	14,105	94,829
Postest	80,00	13,377	33,248

Referring to the results above, there is a difference in the average understanding of the concept of student multiplication which increased by 49.00. This indicates that there is an increase in students' understanding of the concept of multiplication because of the implementation of meaningful instruction design assisted by comics.

The next step is to test the prerequisites of parametric assumptions through normality and homogeneity testing. The requirement is that if the Significance value obtained from the calculation is more than 5%, then the data is declared normally distributed and the data variance is homogeneous, so that hypothesis testing can be carried out through parametric statistical tests. The normality test uses Shapiro wilk because the data available as a research sample is less than 30. The results of these calculations are shown in Table 2.

Table 2. Results of Shapiro Wilk Normality Test and Homogeneity Test

Data	Shapiro Wilk	Based On Mean Homogenity Test
Pretest	0,278	0,935
Posttest	0,071	

According to the results taken in table 2, the Shapiro wilk results for both pretest and post-test show a significance value of more than 0.05. If interpreted these results that the resulting data is normally distributed. Based on the homogeneity test results seen from the results based on mean, the Significance value obtained is 0.935 more than 0.05. So that the data indicates that the variance of the existing data is humogen.

Based on the results of the two prerequisite tests, the significance value is more than 5%, so hypothesis testing can be carried out using para-metric statistics. This hypothesis test uses the paired sample test. The results are shown in Table 3.

Table 3. Paired Test

Uji T	Mean	Deviation Standart	df	Sig. 2-*tailed*
Pretest-Postest	49,00	12,096	19	0,000

Referring to the results taken in table 3 by looking at the Significant value. 2-tailed, it is stated that there is an effect of the implementation of the meaning-full instruction design model assisted by comics on the understanding of the concept of multiplication of grade II students of SDN 1 Kradenan, Klaten.

Discussion

Based on descriptive and inferential data analysis, it was found that the implementation of the meaning-full instruction design model assisted by comics has a positive effect on the understanding of the concept of multiplication of grade II students at SDN 1 Kradenan. In addition to the positive effect, it turns out that the implementation of the meaningful instruction design model assisted by comics can improve students' understanding of concepts related to multiplication material.

The positive effect on understanding the concept of multiplication is due to the learning process that is carried out actively and meaningfully for students by integrating learning media in the form of

comics in which there are fun stories based on students' real lives. The implementation of meaningful learning provides opportunities for students to build their own knowledge (Salin & Mahmor, 2018). The collaboration between meaningful learning and real-life based learning media, such as comics, in fact makes it easier for students to retain the knowledge they have (Kurniawan & Suryana, 2015). Meaningful learning has a significant effect on improving students' mathematical abilities (Koskinen & Pitkäniemi, 2022).

The implementation of the learning process using the meaningful learning model assisted by comic media begins with connecting students' experiences with new ideas. This was done when the teacher gave an apperception by asking students about their experiences when they were sick. The question relates to what events or things students experience when taking medicine. The questions continued to be asked until finally the students again revealed that "when taking medicine, I saw instructions to drink like 2 x 1". Then the teacher asked again "do you understand the meaning of the 2 x 1 instruction in the medicine prescription?", there were several students who gave answers, such as "meaning, 1 medicine is taken 2 times", who answered "two times taking medicine in 1 day" then there was also the answer "1 medicine is taken 2 days". After getting these answers, the teacher then stimulates students related to multiplication material based on the answers that students have given in the apperception activity. Students' ideas are accommodated to get the correct answer and the teacher organizes students into small groups and distributes comics to students to read. The comics already contained learning materials related to the concept of multiplication. The new ideas are poured into the comics that students read.

The teacher gives students the opportunity to read the comics interspersed with learning guidance to students through the groups that have been formed. After finishing reading the comic, the teacher begins to re-explain the material related to multiplication in the comic. What happened was that students easily understood the basic concepts of multiplication. Through students' experiences that are integrated into learning, it turns out to make it easier for students to build their knowledge (Sy et al., 2023). The mathematics learning process is qualified, if the teacher is able to integrate the experience possessed by students into the new knowledge conveyed by the teacher (Bhagwonparsadh & Pule, 2023). Although students have not yet reached the level of mathematical disposition, the experiential learning approach will give learning meaning for students, which will also have a positive impact on enhancing students' mathematical understanding (Putri et al., 2019). Students' memories can be strengthened through learning that is relevant to their daily lives, making them better equipped to reflect on what they have learned, so that it can be said to be meaningful learning.

The second stage in the implementation of the meaningful instruction design model is the reconstruction stage. Students' daily lives, as well as student activities and experiences, are used to reconstruct knowledge that is important to them (Khanal, 2023). Knowledge reconstruction is done by the teacher by taking all the students' answers. This gives students the freedom to express their opinions in front of the class. Only then does the teacher ask students to talk further about the topic studied. The teacher begins to straighten out students' wrong answers by using comics as learning re-

sources for students to re-read. Mathematics learning will be more meaningful and preferred by students if it creates a learning environment that is close to students. This can be achieved by means of student learning activities, their everyday life, or their experiences (Maharani et al., 2018). The implementation of the meaningful instruction model of this design does prioritize the meaningfulness of learning to students, one of which is through the integration of experience so that they are able to master the concept of mathematics (Zulfikar et al., 2023). Meaningful learning will lead to students' long term retention related to mathematics learning (Van Rensburg et al., 2023). Students' curiosity will rise and their knowledge will improve over time as a result of meaningful learning (Andres & Núñez, 2023).

The last step in the implementation of the meaningful instruction design model is the production stage. This stage provides students with freedom for themselves both through the task given and must be able to be implemented in everyday life. At this stage the teacher and students both identify the drinking rules listed on the medicine packaging brought by the teacher. Students are free to explore their knowledge in interpreting the rules of taking medicine, to create an understanding for the students themselves related to the concept of multiplication. The teacher also gives assignments to students to explore things related to multiplication not only found in the rules for taking medicine, but in other things in the student's environment. The implementation of this meaningful instruction design model turns out to help students reflect on the concept of mathematics in the environment around students (Ristinawati, 2020). In addition, through the implementation of the meaningful instruction design model, students are able to demonstrate the understanding of mathematics concept, such as multiplication that students already understand which is obtained from direct student experience (Rosidah et al., 2018). Students are better able to develop a framework for using mathematical ideas in their daily lives when they are engaged in meaningful learning (Ratnawati et al., 2020). The teacher recalls all the ideas that the pupils have learnt and simplifies them at the conclusion of the learning process. Students that participate in this reflection exercise are better equipped to remember the lessons they have previously learned.

It is clear from the previous description that the meaningful instruction design model may make learning enjoyable and meaningful for students, particularly when it comes to subjects like mathematics that are perceived by them as being challenging. Students will learn more effectively and more easily because of meaningful learning. As a result of reading comics that include the notion of multiplication with students' real-life experiences, learning becomes more enjoyable and facilitates students' ability to integrate the concept of multiplication into their memory. Students benefit from learning using this meaningful instruction design model, particularly in terms of achieving student learning outcomes. Students will more easily absorb the material obtained from the teacher, because the learning is based on the experience of the students themselves.

This section is an elaboration of the findings written in the results section of the study. In qualitative research, this section describes the meaning of the findings of this study. In quantitative research, this section explains the inference from statistics presented in the results section. In CAR research, this section describes the

process of research reflection and a summary of actions that illustrate learning success.

Implication of Research

This research was conducted as an improvement effort related to the lack of understanding of student concepts related to multiplication material caused by the lack of use of learning media that is in accordance with the characteristics of students and learning explanations are not based on students' daily lives. Through initial experimental actions using meaningful instruction design models assisted by comic media can easily help teachers in overcoming the same problems. This experiment is also an effort for teachers to find learning models that utilize learning media so that learning can be more effectively implemented.

This research can also be used as input to teachers that if the understanding of mathematical concepts of students' multiplication material is low, then they should use the meaningful instruction design model assisted by comic media so that these problems can be resolved. In addition, this research can also be developed through implementation in other mathematics learning materials so that it is not only focused on one mathematics material but many mathematics materials that experience problems and can be improved through this comic-assisted meaningful instruction design model.

Limitation

The limitation of this study is the type of research used. The absence of control variables can easily affect the dependent by any aspect, whether students at home get additional tutoring. In addition, the 20 research subjects are still lacking in generalizing the research results to other schools and the limitations of teachers in implementing learning with meaningful instruction design models assisted by comics in accordance with the learning syntax.

CONCLUSION

This research reveals the effect of the comic-assisted meaningful learning design model on students' understanding of multiplication concepts. There are several things that need to be considered if you want to use this model, namely: (1) there needs to be preparation and understanding related to the MID model whether it is supported by the existence of other learning tools or not, (2) if misconceptions occur to students immediately to be guided, such as 2 x 3 which should be 2 + 2 + 2, while 3 students answer 3 + 3. From the description above, it reveals that students understand the concept of multiplication, but due to the lack of student accuracy, it has an impact on errors. Thus, further attention is needed so that the cultivation of concepts to students does not occur misconceptions. In addition, new things found as a result of the application of the meaningful instruction design model assisted by comic media are student activeness in the classroom is increasing, the learning atmosphere is also livelier and more fun and adds references related to learning models that are meaningful to students' lives collaborated with interactive comic media so that students can easily understand mathematical concepts.

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