



The Effectiveness of Contextual Teaching and Learning (CTL) in Improving Students' Numeracy Skills and Learning Motivation in Junior High School

Lestari Fathan Asri; Jailani

Department of Mathematics Education, Yogyakarta State University, Indonesia

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Abstract

This study aims to describe the effectiveness of contextual and scientific learning in improving students' numeracy skills and learning motivation in material of SPLDV in junior high school. This research is a quasi-experiment with pretest-posttest nonequivalent control group design. The population in this study was grade VIII junior high school students in Mukomuko, Bengkulu, Indonesia. The samples in this study were students of class VIII A as the experimental and students of class VIII B as the control class. The instruments used in the research was numeracy skill test and learning motivation questionnaire. Data was analyzed using T^2 Hotteling's for one sample, followed by one sample t-test. Then data was analyzed using T^2 Hotteling's for two independent samples, followed by an independent sample t-test. The results showed that: (1) contextual learning (CTL) was effective in improving students' numeracy skills and motivation on the material of SPLDV in junior high school, (2) scientific learning was not effective in improving students' numeracy skills and learning motivation on the material of SPLDV in junior high school, and (3) the differences in effectiveness type of learning occur in numeracy skills, with contextual learning better for improving students' numeracy skills.

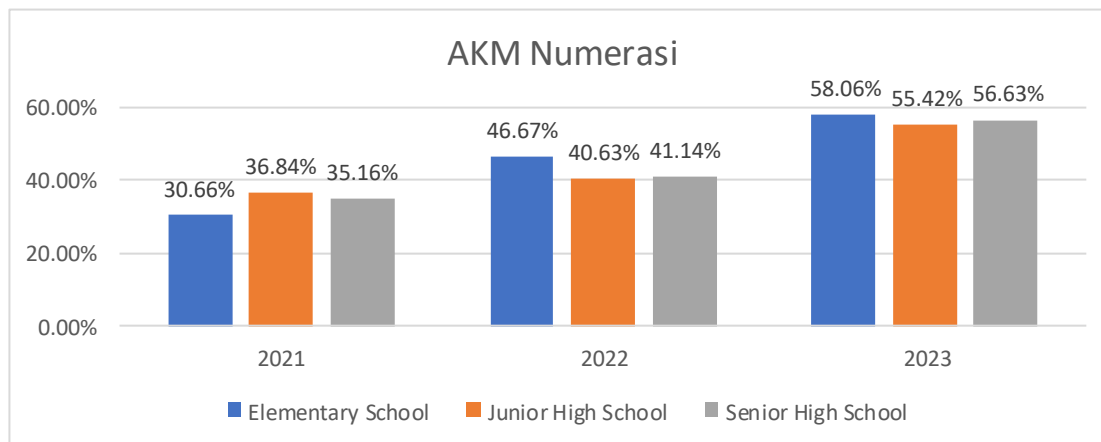
Keywords: Contextual Learning; Learning Motivation; Numeracy Skills; Scientific

Introduction

Mathematics is a science that underlies various other sciences and has an important role in real world life. The purpose of learning mathematics in Kurikulum Merdeka is to equip students to have the ability to understand mathematics and procedural skills, reasoning and mathematical proof, problem solving, mathematical communication and representation, mathematical connections, and mathematical disposition. So that mathematics is expected to be mastered by students as a provision for fundamental understanding (Kemendikbudristek, 2024). One of the basic math skills that are important for students to have is numeracy. Numeracy (mathematical literacy) is the ability to apply mathematical concepts and skills to solve practical problems in a variety of daily life contexts (Kemendikbud, 2017).

OECD (2022) states that mathematical literacy is an individual's ability to reason mathematically and formulate, use and interpret mathematics to solve problems in a variety of real-world contexts.

Numeracy skills are important to form rational reasoning in daily activities. In addition, numeracy skills are also one of the abilities measured in the Asesmen Kompetensi Minimum (AKM). However, based on data from Rapor Pendidikan Indonesia, the results of the National Assessment in 2022 by Pusat Asesmen Pendidikan show that the achievement of learning outcomes in junior high school numeracy skills throughout Indonesia is below the minimum competency, namely more than 50% of students have not reached the competency limit for numeracy. In 2023, the numeracy competency of students has increased in the medium category, namely 55.42% reached the numeracy drinking competency. However, numeracy skills at the junior high school level in the last 2 years have a lower percentage of numeracy skills than the elementary and high school levels which can be seen in Figure 1. This means that the ability of students to think using mathematical concepts, facts and tools to solve everyday problems in various types of contexts still needs to be improved.



(Source: Rapor Pendidikan Indonesia 2023 & 2024)

One of the causes of low numeracy skills is the learning process that is less integrated into mathematical literacy questions, as well as connection questions with mathematical problem solving (Salim & Prajono, 2018). Another cause is because mathematics learning in schools has not fully fostered students' numeracy skills (Salvia et al., 2022). Another factor that can also cause low mathematical ability of students is learning motivation.

Motivation is the internal state that activates, integrates, and sustains behavior, where it has an effect on how learners learn or behave towards subject matter (Hodgson, 2017, p. 150). Motivation holds the key to school engagement and learning outcomes (Hagger & Hamilton, 2018). Therefore, learning motivation is important for learners to have. Based on research by Kasipahu et al (2022) states that there is an effect of learning motivation on numeracy skills, the higher the motivation of students to learn, the higher their numeracy skills. But in reality, most students are still not motivated in learning mathematics because according to students, math subjects are boring and difficult subjects. This was also conveyed by the math teacher, where most students were less enthusiastic when the math lesson took place, so it took a lot of energy for the teacher to motivate students.

Algebra is one of the contents tested in AKM Numeracy. Based on the last UN results, algebra material has a fairly low presentation of correct answers, for example in the indicator of determining the value of variables from a system of linear equations of two variables, the presentation of students at the District / City level who answered correctly was only 25.30%. Research by Kristanti et al. (2022) states that students' errors in solving algebraic problems are not able to understand the problem referred to in the question, do not understand the arguments used to solve the problem, do not understand the laws and rules, or formulas that apply in solving problems, including concept errors. Other researchers, Indah et al. (2022) revealed that students' errors in solving the problem of the system of linear equations of two

variables, namely students cannot find the final answer to the problem, there are students who are still less careful in reading the problem, and are still weak in making mathematical models of the given story problems. This shows that students' understanding of algebraic content is still relatively low, so it needs to be improved. Therefore, teachers are expected to master and be able to create learning activities that motivate students and contain elements. One of the learning alternatives that can be used is contextual learning (CTL).

Contextual Teaching and Learning (CTL) is a teaching and learning concept that helps learners to connect subject matter with real world situations and motivates learners to make connections between knowledge and its application in life (Berns & Erickson, 2001:3). In line with Sears & Hersh (1998:14) who define contextual learning as a learning where learners use understanding and skills in various contexts, both inside and outside school, to solve simulated or real-world problems. Contextual learning is also a student centered learning concept. The main characteristic of context-based learning is the use of real-world context as the starting point of learning (Taconis et al., 2016, p. 1). Context-based learning has been widely used in education to improve the quality of education (Gökalp & Adem, 2020, p.659). So contextual learning is expected to train students to find problem solutions in the context of real world life. Based on research by Afni & Hartono (2019) stated that the use of contextual learning strategies is very important for educators and students in improving mathematical literacy skills, because contextual learning can be used to connect real-world situations with mathematics so that students can understand and solve problems. In line with research by Junianto (2019) which shows that the CTL approach is effective in terms of students' interest in learning and mathematical literacy. In addition, the use of the CTL approach can also increase students' learning motivation. In line with the results of research by Sinaga et al. (2023) that the application of the Contextual Teaching and Learning (CTL) model can increase learning motivation in comparison learning materials at Free Methodist 1 Medan Junior High School.

Based on some of the descriptions above, contextual learning can be used as an effort to make learning in the classroom more effective and achieve learning objectives and improve numeracy skills. So the research aims to describe the effectiveness of contextual learning in improving numeracy skills and student learning motivation.

Method

This research is a quasi-experimental research with a pretest-posttest nonequivalent control group design. The population in this study were all students of class VIII SMP Negeri in Mukomuko. While the subjects of this study were students of class VIII A and VIII B. In this design there are two groups, the group that applies contextual learning as the experimental class and the group that applies scientific learning as the control class. The data collection steps used are collecting data before being given treatment, by giving a pretest of numeracy skills and a questionnaire of learning motivation, carrying out research actions by giving treatment in the form of contextual learning and scientific learning, then collecting data after being given treatment in each class by giving a posttest of numeracy skills and learning motivation. Instrument validation uses content validation by asking for consideration to at least two experts (expert judgment), two mathematics education lecturers. In terms of content validity, the test instruments and questionnaires are suitable for use according to experts. The results of the calculation of the reliability of the numeracy test instrument and learning motivation are 0.67 and 0.82, respectively.

The data analysis techniques used in this research are descriptive and inferential analysis. Descriptive analysis was used to describe the situation before and after treatment in both classes in terms of the dependent variable. Inferential analysis was conducted to draw conclusions based on the data that had been obtained during the research process. Inferential analysis consisted of effectiveness test and difference test of the effectiveness of contextual and scientific learning on numeracy ability and learning

motivation on the material of system of linear equations of two variables. Contextual and scientific learning is effective if: 1) the average score of students' numeracy skills is more than 66 and 2) the average score of students' learning motivation is more than 66.

The data obtained during the study must first fulfill the assumption test before going through the analysis process. The assumption test that must be met is the multivariate normality test with the Henze-Kizler test and univariate normality using the Shapiro-wilk test with a significance level of 5%. If the significance value obtained is more than 0.05, it can be said that the data is normally distributed.

After the assumption test is fulfilled, one sample mean vector test and one sample t-test with a significance value of 0.05 are conducted to analyze the effectiveness of contextual and scientific learning on numeracy skills and learning motivation. Furthermore, a two-sample mean vector test was conducted to analyze the difference in effectiveness between contextual and scientific learning, followed by an independent sample t-test to see which learning is more effective on numeracy skills and learning motivation.

Result and Discussion

Results

The results of this study consist of the results of the effectiveness test and the effectiveness difference test between the experimental group with contextual learning and the control group with scientific learning. The results of the effectiveness test using the one-sample mean vector test are presented in Table 7.

Table 1. Hotteling T^2 test

Learning	Hotteling T^2	Critical Value	p -value
Contextual	8,789	6,956	0,012
Scientific	3,899	6,997	0,142

Based on Table 7, in contextual learning, the $p - value = 0.012 < 0.05$, this indicates that H_0 is rejected, meaning that there is a difference in the average numeracy skills and learning motivation of students in the contextual class after being treated. While in the control class with scientific learning, the $p - value = 0.145 > 0.05$, so that H_0 is accepted, meaning that there is no difference in the average numeracy skills and learning motivation of students in the scientific class after being treated. Furthermore, it is necessary to conduct further tests to find out which average components are significantly different, by using the one sample t-test test. The results of the one sample t-test test in each class can be seen in Table 8.

Table 2. One Sample T-Test Contextual and Scientific Class

Class	Variable	t_{test}	t_{table}	Exp.
Contextual	Numeracy Skills	2,479	1.701	Effective
	Learning Motivation	0,044	1.701	Not Effective
Scientific	Numeracy Skills	-1,664	1.703	Not Effective
	Learning Motivation	-0.020	1.703	Not Effective

Table 8 shows that in the experimental class with contextual learning for the numeracy ability variable has a value of $t_{test} = 2.479 > t_{table}$, so it can be concluded that H_0 is rejected, meaning that the average numeracy ability of students is more than 66, in other words, contextual learning is effective in improving numeracy skills. While for the learning motivation variable, the value of

$t_{test} = 0.044 < t_{table}$, so it can be concluded that H_0 is accepted, meaning that the average score of students' learning motivation is less than or equal to the maximum score of 66, in other words contextual learning is not effective in increasing learning motivation.

Based on Table 8 also shows that in the scientific class for the numeracy ability variable, the value of $t - test\ value = 1.664 < t\ table$ is obtained, so it can be concluded that H_0 is rejected, meaning that the average numeracy ability of students is less than or equal to 66, in other words, scientific learning is not effective in improving numeracy skills. Meanwhile, for the motivation variable, $t - test\ value = 0.020 < t\ table$, so it can be concluded that H_0 is accepted, meaning that the average motivation of students to learn is less than or equal to the maximum score of 66, in other words, scientific learning is not effective in increasing learning motivation.

This is consistent with the results of the descriptive analysis, which showed that the average scores in the experimental and control classes were not significantly different. The descriptive analysis showed that mathematics learning with contextual and scientific learning had a positive impact on numeracy skills. This is evident from the students' initial conditions before and after the treatment, as presented in Table 9.

Table 3. Average of Contextual dan Scientific Class

Description	Numeracy Skills		Learning Motivation	
	Pre	Post	Pre	Post
Contextual	19,83	71,84	61,72	66,07
Scientific	22,92	61,31	62,04	65,96

Based on Table 9, there is an increase in the average score of numeracy skills before and after treatment in each class. In the experimental class, it was found that the average score of learners' numeracy skills increased by 52.01 from the initial average score before treatment, while in the control class, the average score of learners' numeracy skills increased by 38.39. Based on the results that have been obtained, numeracy skills in both classes have both increased and show that the numeracy skills of students in the experimental class with contextual learning are higher than the average score of the control class with scientific learning.

In the learning motivation variable, there was an increase in the average score of students' learning motivation before and after being treated in each class although it was very low. In the experimental class with contextual learning, the average score of students' learning motivation increased by 4.34 from the average score before treatment. While in the control class with scientific learning the average score of students' learning motivation increased by 3.93.

Discussion

Learning the system of two-variable linear equations (SPLDV) in the experimental class with contextual learning aims to get students actively involved in solving problems related to everyday life or in the context of the real world and to increase learning motivation. Contextual learning emphasizes learning based on everyday contextual problems that are close or can be imagined by students when solving these problems. Based on the one sample mean vector test results, it shows that contextual learning is effective in improving numeracy skills and learning motivation simultaneously. Furthermore, based on the results of the one sample t-test, the results show that contextual learning is effective in improving numeracy skills but not effective for learning motivation. While in scientific learning, from the one sample mean vector test, it is found that scientific learning is not effective on numeracy skills and learning motivation simultaneously, the one sample t-test also shows that scientific learning is not effective on each dependent variable. Furthermore, based on the two-sample mean vector test, it is found

that there is a difference in effectiveness between contextual and scientific learning on learning motivation. An independent sample t-test was conducted, where it was found that contextual learning was more effective in improving numeracy skills, but contextual learning was not more effective than scientific in improving learning motivation.

Contextual learning is quite successful in improving numeracy skills because the learning steps are based on real-world contextual problems. In contextual learning, students are directed to find their own mathematical concepts based on contextual problems. During the learning process, students are also directed to be actively involved in the problem solving process with group activities, where most students are quite active and follow the learning well, although there are still some students who need to be reminded by the teacher to stay focused on learning. In addition, the process of applying and transferring also helps students to better understand the material that has been obtained. Similar with research by Junianto (2019) which states that the CTL approach is able to improve mathematical literacy because it helps students know the usefulness of the material learned in their daily lives. Afni & Hartono (2020) also stated that the most prominent stages in contextual learning to improve numeracy are the experiencing, applying, and cooperating stages. When students directly experience the problem-solving process, the understanding of the solution will be more embedded in their memories, then applying the understanding gained to other problems and working together, discussing in groups makes learning more meaningful.

Scientific learning is not effective in improving numeracy skills and learning motivation in this study can be caused by several things. One of the things felt by the researchers themselves is the time constraints that result in several stages of learning not being carried out optimally, besides that it is also related to classroom management during the learning process, although most students follow the learning well, there are still some students who need to be repeatedly directed to learning activities. In addition, in group activities, students tend to discuss things outside the lesson with their group mates, so it takes a lot of time to create a conducive classroom atmosphere during the learning process. Another obstacle found by researchers is that there are students who also have difficulty linking material with real-life contextual problems such as activities on LKPD so that students only wait for direction and guidance from the teacher to solve without trying to discuss with their group mates. Research by Niswah & Putri Nur Malasari (2023) also states that the factors that cause the ineffectiveness of scientific learning on learning motivation are related to internal factors such as students' self-ability and external factors such as peers. One of the internal factors is self-ability, where there are some students who really don't like math or counting lessons, thus making students lazy to follow the learning process. External factors such as peers also influence, where students are more likely to play and not focus when learning activities take place, especially learning activities carried out in groups. It also makes teachers need efforts to get students to refocus on learning activities. In addition, Haq et al. (2019) conducted research related to the problems of implementing the scientific approach, where one of the obstacles is that teachers find it difficult to carry out classroom management, manage time, monitor the implementation of the learning process, and find it difficult to organize the learning process. This can be one of the factors causing the lack of effectiveness of scientific learning in increasing learning motivation.

Conclusion

Based on the results of hypothesis testing and discussion, the following conclusions were obtained: 1) contextual learning is effective in improving students' numeracy skills and learning motivation in the material of two-variable linear equation systems in junior high school; 2) scientific learning is not effective in improving students' numeracy skills and learning motivation in the material of two-variable linear equation systems; and 3) differences in the effectiveness of learning types occur in numeracy skills, with contextual learning being better at improving students' numeracy skills.

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