Improve the ability of understanding mathematics and confidence of elementary school students with a contextual approach using VBA learning media for Microsoft Excel

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Abstract. The main problem of this research is the lack of students understanding the ability and mathematical self-confidence for mathematics learning in elementary school students in Indonesia. Lack of students understanding of mathematics is caused by the learning process in school. Teachers still use conventional learning in the learning process. Also, the basic skills aspects of students also affect the ability of math skills. Furthermore, the learning process with a contextual approach assisted by VBA Learning Media (Visual Basic Application for Excel) gives positive influence on students both regarding mathematical understanding and self-confidence. The data processed in this study is from the post-test score. This score arises from both the experimental class group and the control class group. Then, the data processed using SPSS 22 and Microsoft excel. Data were analyzed using the t-test statistic. The final result of this study concludes achievement and improvement of mathematical understanding ability and Self Confidence students learning with contextual approach supported by VBA (learning media Visual Basic Application for Excel) are better than students who get conventional learning.

1. Introduction

Mathematics is a subject that is often encountered at every level from elementary school to the level of college, because of the importance of the role of mathematics in everyday life in all fields. Mathematics in general everyone says the relationship with numbers and ways of calculation, but the development of mathematics is still very limited because it is not able to provide an overview of the usefulness of mathematics. Therefore the teacher is one of the keys to conveying to students about the benefits of mathematics itself [1].

Difficulty factors students are not able to master mathematics, students are not able to solve problems in understanding indicators as much as 84.62% [2] and there are some important notes that need to be known to students having difficulty understanding text or story problems, wrong guessing from story problems, guessing answers because students are unable to understand, and unable to understand and interpret mathematical symbols. therefore, the ability to understand mathematics must be introduced since elementary school which can be applied to real life situations [3].

To overcome the difficulties of the ability of elementary school students, one of the strategies to convey more effectively is to use ICT-based mathematics learning media that makes it easier for teachers to make it more practical by utilizing basic algorithms [4], economically, and creating more conducive classes [5]. To make mathematics learning media, software is needed enough that can link image forms
that work interactively so that students in addition to understanding the mathematical material, as well as the existence of confidence to solve problems. By using VBA for Microsoft Excel, there are many advantages for a teacher to create a media that can be applied in the classroom by utilizing mathematical functions associated with images, such as learning about opportunities in high school using VBA for Microsoft Excel [6], Microsoft Excel can help in a variety of fields and math games [7]. By utilizing VBA for Microsoft Excel, can be developed into teaching aids for elementary school students to improve the ability to understand the fraction material that is linked in the form of images and the approach used is contextual, namely 1. Constructivism 2. Asking questions (asking) 3. Investigations (finding) 4. Learning communities (learning communities) 5. Modeling 6. Reflection 7. Authentic Assessment. [8] With a contextual approach students can more easily understand the material taught because it uses examples in daily life.

In addition to the contextual approach, learning media are also needed that can facilitate students in understanding the material being taught and increase students' confidence. One of them is by using the VBA programming language (Visual Basic application for Excel).

Based on previous research conducted by [6] It was concluded that mathematics learning with a VBA-assisted contextual approach could improve the mathematical reasoning abilities and dispositions of high school students. Where student activity, achievement and students reasoning abilities and dispositions are better than those, who received conventional learning. With VBA assistance, students are more directly involved in the learning process and make learning mathematics more interactive and fun for students.

Therefore we try to apply mathematics learning with a VBA-assisted contextual approach to improve the ability of elementary school students to understand mathematics and self-confidence.

2. Method
The research design used a quasi-experimental method for two classes, namely the experimental class and the control class. Where the control class uses learning in the usual way while the experimental class is the class that learns using the VBA for Microsoft Excel contextual approach, with the following design [9]:

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How to collect instruments, first, the question is adjusted to the indicators of understanding ability and made five questions based on different levels of difficulty that have been tested for validity, reliability, differentiation and difficulty indexes that have been tested. Second, the questions were given to students during the pre-test along the post-test and were given a questionnaire instrument to know student confidence. Then the comprehension ability instrument is processed using normality, homogeneous and T-Test to see the difference in average and the increase in average, as well as the questionnaire of confidence.

3. Results and discussion
From the results of the study, before conducting experiments on the two classes, an initial test was conducted to see the ability of students' understanding of fractional material and obtained the average of both classes, namely 2.85 for the control class and 2.80 for the experimental class with a maximum value of 20, from the data illustrating that the average ability of students in low fraction material, this is in line with Tian and Siegler [10] that students' understanding ability is still bad about fractions and decimals. However, from the second initial test on average, there was no difference from the average t-Test difference test with a significant value of 0.939> 0.05 after the data was normal with significant values of Kolmogorov-Smirnov 0.124 and 0.170> 0.05 and continued homogeneous test data from both class 0.922> 0.05.
To deal with this, the researcher provides steps to improve students’ understanding ability because of the importance of fractions and decimals in basic knowledge to deal with the further mathematical material; it is necessary to pay attention to students’ difficulties when working on fractions.

Figure 1. (a) Students’ errors about comparisons, (b) students’ errors in fractions. (c) student errors in story problems.

In figure 1 (a) students only understand integers which state that there is a large number which means that it is larger than a small number but cannot interpret the meaning of fractions. Figure 1 (b) students have not been able to construct fractional shapes into drawing shapes, and students have not been able to explain the reason why the shape of the picture is an illustration of a fraction. Figure 1 (c) students try to portray the fractional form of the distribution of sponge cake distributed, but students have the opinion that 3/6 parts are more than 2/4 parts which should be the same answer.

Table 1. Findings of students’ difficulties in fraction material at pretest.

| NO | Difficulties                      | The number of students | Percentage |
|----|-----------------------------------|------------------------|------------|
| 1  | Give a reason for the answer      | 21                     | 84%        |
| 2  | Link fractions with images        | 18                     | 72%        |
| 3  | Comparing between fractions       | 20                     | 80%        |
| 4  | How to process in counting        | 24                     | 96%        |

Table 1 shows the factors of student difficulties that cause students to be weak in their understanding of fractions, the data numbered 25 elementary school students. From the findings, it becomes a reference for how to overcome students’ difficulties in learning fractions, namely using mathematics learning media using Visual Basic Application for Microsoft Excel, which aims to make students learn about fractions [6,11].

Figure 2. (a) Determine fractional comparisons (b) Determine fractional processes (c) Fractional addition operations Using VBA for Microsoft Excel.
Figure 2 shows the mathematics learning media with fractional material, figure 2 (a) fractional learning media about the comparison using three glasses determines the height of water associated with fractions, (b) explains the reason for the fraction comparison and the way of processing to the final result, (c) gives a picture to combine different fractions with the contents of the glass then the process of finding the fractions from the count operation based on the image.

Figure 3. Students try fractions using VBA media for microsoft excel.

Figure 3 shows the mathematics learning media using VBA for Microsoft Excel to create activeness for teachers and students to discuss and each group has ventured to present the results in front of the class. In addition to enhancing students' understanding ability, students also feel confident about solving fractions. With the contextual approach assisted by Visual Basic Application for Microsoft Excel, the atmosphere of learning mathematics in fraction subject is more fun and more interactive, this helps the learning and teaching process in the classroom more effectively. Visual Basic Application for Microsoft Excel brings concrete images into several examples so students can conclude about the concept of fractions which is one indicator of reasoning ability. Table 2 explained the stages of a contextual approach that is assisted by VBA for Microsoft Excel to improve the understanding level of the student.

| No | Contextual Approach | Assisted by VBA for Microsoft Excel | The Ability of Student Understanding | Invention |
|----|---------------------|------------------------------------|-------------------------------------|------------|
| 1  | Constructivism, students are rebuilt with their knowledge based on their experiences | Students are given a description of a divided glass that shows knowledge of fractions | Students observe several examples to draw material conclusions that have been obtained. (Indicator: restate the concepts learned) | Initially, students did not understand the fractions because they could not distinguish fractions and integers. |
| 2  | The inquiry, students, search and collect a lot of data on each problem | Delivering the game about the description of the number of fractions then sorting fractions | Students provide explanations for composing fractions by identifying images (Indicator: Correlating objects based on whether or not the requirements form the concept) | Students begin to understand about fractions seen from student activities to solve problems from student worksheets. |
| 3  | Questioning, students are active to ask about the concept of fractions. | Presenting images in the form of fractional concepts available to provoke student questions | Students learn from the picture and give questions (Ability to provide examples of concepts in an algorithmic manner) | Students begin to develop questions from the questions prepared in the Student Worksheet. |
Table 2. Cont.

| No | Learning Community | Presenting images that help to solve problems | Students are able to work on calculation questions and find concepts in equalizing the denominator (Indicator: the ability to apply the concept algorithmically) | Students develop different ways of concept |
|----|-------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| 4  | Modeling, one student is appointed to work on one of the questions to become an example. | Presenting images and counting operations to help solve problems. | Students are able to work on the steps and get the right results (Indicator: the ability to apply the concept algorithmically) | Students are able to work on questions independently. |
| 5  | Reflection, the teacher gives other questions about fractions and provides opportunities for students. | Presenting interactive media operated by students. | Students can present the concept of images associated with fractions (Indicator: the ability to present concepts in the form of mathematical representations). | Students develop the concept of fractions with the images provided in student worksheets. |
| 6  | Authentic Assessment, the teacher gives an assessment of group presentations. | Presenting interactive media operated by students. | Each group presents the results in the form of images associated with fractions (Indicator: the ability to present concepts in the form of mathematical representations). | Student activity to express opinions and answer friend's questions from other groups. |

*Figure 4.* Student mastery complete solving questions.

Figure 4 shows students have understood the concept of fractions, (a) students have been able to give reasons in fraction comparisons and (b) students have been able to construct fractional shapes into pictures, here students can interpret fractions. to see students' difficulties after being given mathematics learning media using VBA for Microsoft Excel can be seen in table 3.
Table 3. Findings of students' difficulties fraction material at postest.

| NO | Difficulties                          | The number of students | Percentage |
|----|---------------------------------------|------------------------|------------|
| 1  | Give a reason for the answer          | 5                      | 20%        |
| 2  | Link fractions with images            | 3                      | 12%        |
| 3  | Comparing between fractions           | 2                      | 8%         |
| 4  | How to process in counting            | 3                      | 12%        |

Table 3 shows that the ability of students 'understanding of comparing fractions has been better than before, students' difficulties have decreased and mastery of fraction material above 79% of students, that means there is an increase in the ability to understand fractional material after using mathematics learning media using VBA for Microsoft Excel with the aim of measuring the ability of elementary school students to understand the concept of fractions [12].

From the results obtained, after conducting research for the control class and experimental class, there was an increase in the class average of 10.70 for the control class and 16.25 for the experimental class. And the average experimental class is better than the control class, seen from the significant value of the t test 0.000 < 0.05 after the value data is processed by the test number 0.133 for the experimental class and 0.200 for the control class, both are 0.05 and then homogeneous test with a significant value of 0.936 > 0.05 second homogeneous data. And the results of the students' self-confidence questionnaire from all 15 questions for each of the highest score questions are 4, and the lowest value is 0, from all the questionnaires that have a very high positive response can be seen in table 4.

Table 4. Very high responses to the self-confidence questionnaire.

| No | Question Angket Self-confidence                                      | Average | Percentage |
|----|-----------------------------------------------------------------------|---------|------------|
| 1  | I am able to work on questions about fractional material myself      | 3.90    | 97.5%      |
| 2  | I always look for the right answer when there is group work about fraction material | 3.90    | 97.5%      |
| 3  | I always work on time about fraction material                        | 4       | 100%       |
| 4  | I dare to argue about fraction material                               | 3.90    | 97.5%      |

Table 4 shows that students have mastered the ability to understand fractions, students try to find answers and are able to cooperate well, a sense of responsibility in students, students are able to express opinions from the results of the answers.

4. Conclusion
Based on the results of the discussion it can be concluded that a contextual approach using Application of Excel VBA Learning Media can Improve Mathematical understanding ability and self-confidence student in elementary school. This makes students more active, confidence and fun in learning math.

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