A comparative study: Multimedia interactive use on contextual and cooperative approaches in increasing mathematical understanding

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Abstract. Students’ abilities are not limited to just knowing the mathematics theory and concepts, but a deeper understanding needs to be had by students. The characteristic of contextual and cooperative approaches have distinct advantages. The study tries to quantify achieving contextual and cooperative approaches by using multimedia interactive in improving student math comprehension. Research shows increased student's mathematics comprehension over contextual classes 0.71 in the high category and the cooperative class 0.38 in the moderate category. Increased mathematical understanding of students with classes uses a contextual approach higher than the class that uses a cooperative approach. The primary key of the contextual approach can link lesson materials with the real world or student experience. A cooperative approach requires students’ characteristics in high-level activity, learning skills, and great learning motivation.

1. Introduction

Learning is a process to help learners learn activities to have the desired competence. The learning system is made up of several interconnected and influential components to achieve the purpose of learning. A teacher’s function is required to be able to integrate the whole learning component so that the learning process can run effectively and efficiently. One possible effort is to combine learning approaches with learning media. Several studies have been conducted in interactive multimedia design for learning but it is still limited to multimedia trials: describe the concept and framework of interactive multimedia courseware, test the feasibility of interactive multimedia courseware by experts and practitioners and test student responses to the use of interactive multimedia courseware [1–3].

A factual approach is a concept of the way of learning by connecting lesson materials to everyday life or real-world conditions. CTL is a learning concept that helps teachers link between the learning material and the real-world situations of students and encourages students to make connections between their knowledge and its praxis in their daily life as a family or community members [4,5]. There are seven principles in contextual or contextual teaching and learning (CTL) that is: (a) constructivism, (b) inquisitiveness, (c) inquiry, (d) society learning an authentic assessment, (f) reflection, and (g) modelling [6,7]. The application of contextual teaching-learning has made a positive contribution and high learning result [8,9].

Students’ learning is expected not only to be cognitive and psychomotor ability, but students need to cooperate. Cooperative learning is a learning approach that encourages learners to cooperate with other students, as well as discussions in their classroom learning activities under management directed...
by a teacher [10,11]. Learners are given opportunities to communicate and interact with their friends in achieving the purposes of learning and teachers act as the motivator and facilitator of learners' activities [12,13].

The development of information technology provides the world of education to be harnessed to better implementation of learning. It should be the institution of education to introduce information technologies in cultivated learning to contribute and influence positive [14–16]. The multimedia interactive parts of information technology will increase efficiency, motivation, and facilitate active learning, experimental learning, consistent, by learning-centered on students [17]. Studies on the application of interactive multimedia have made a significant and effective impact on learning [18,19]. The contextual and cooperative approach of this study presents its effective results in the attainment of a student's mathematical understanding. Mathematical understanding (conceptual understanding) is one of the skills that is the purpose of mathematical learning. Students' abilities are expected not only to know mathematical theories and concepts, but deeper insights need to be had by students. The characteristics of both contextual and cooperative approaches have distinct advantages. A contextual approach is oriented in the learning process by connecting the lesson materials with the real world. The cooperative approach, in turn, exposes the students' function of cooperation and interaction with other students. The study attempts to compare quantitatively the achievements of these two approaches (contextual and cooperative) in improving student math comprehension.

2. Methods
The study is a comparative study using a quantitative approach [20]. The data-gathering technique uses the test results of learning about mathematical understanding and cluster samples of random samples on elementary school V students with 36 students. Engineering and data analysis with prerequisite tests (normal and homogeneity tests) and hypothetical tests (independent t-test).

Figure 1. Flow chart of the study (A total of 36 students class V used interactive multimedia to contextual group and cooperative group).
3. Results and discussion
In this study, the number of classes is divided into 2 groups, whereas classes use contextual and class use cooperative approaches on both classes given multimedia interactive treatment with pre-test and post-test stages.

![Interactive multimedia display.](image)

The following presents the results of the pre-test and post-test on contextual and cooperative approach.

| Interactive Multimedia | Contextual Classroom | Cooperative Classroom | Scores Max |
|------------------------|----------------------|-----------------------|------------|
|                        | Pre-test             | Post-test             | Pre-test   | Post-test |
| Mean                   | 44.85                | 85                    | 45.25      | 72.5      | 100       |
| Score Max              | 60                   | 90                    | 55         | 80        | 100       |
| Score Min              | 25                   | 75                    | 35         | 65        | -         |

Based on Table 1, post-test averages in contextual classes by 85 and a cooperative class of 72.5. The average mathematical understanding of contextual classes is greater than the cooperative class. Post-test is a final test on students after applied contextual and cooperative approach treatment. Increased student math understanding is obtained based on increased pre-test scores to the post-test by making normalized gain tests. Here are the results of increasing student math understanding in contextual and cooperative classes.

| Classroom     | N  | Mean | Gain Tern | Category |
|---------------|----|------|-----------|----------|
| Gain          |    |      |           |          |
| Contextual    | 18 | 41.28| 0.71      | High     |
| Cooperative   | 18 | 26.76| 0.38      | Medium   |
Increased student mathematics comprehension based on Table 2, the contextual class of 0.71 in the high category, and the cooperative class of 0.38 in the moderate category [21]. The use of a contextual approach is more effective in improving students' understanding of mathematics than with the cooperative approach. Subsequent tests of data normality gain obtained data as follows.

Based on data normality tests in table 3, the contextual class gained a value of 0.63 > 0.05, which means data in contextual normally distributed classes. The cooperative class obtained a probability value of 0.329. By comparison with significant value 0.05 then 0.299 > 0.05 means that a drop of data over the cooperative class is a normal distribution. The result of the homogeneity test in the contextual and cooperative class obtained the probability value of 0.281. When compared to significant value 0.05 then 0.281 > 0.05 means that the data in both classes are homogeneous. Based on the statistical test of the hypothesis using the independent t-test with an SPSS 20 on the table obtained data that probability value is. When compared with the value of 0.000 <0.05 which means ho is rejected and ha accepted. It may be concluded that a contextual approach significantly increases the understanding of the students rather than cooperative learning.

Student math comprehension with class use a contextual approach higher than the cooperative use class. Contextual approaches can visualize lesson materials connected to life or the real world. As the theory of Thorndike connectionism, learning needs to connect the individual/student experience with the object learned to be a fundamental part [22]. As well as Edgar dale that one's learning results come from personal experience (concrete), a reality that exists in one environment [23]. Research results on the application of contextual learning indicate that students' learning outcomes increased [8]. Contextual teaching and learning (CTL) is a model of learning that provides a systematic learning process to enhance students' critical thinking ability and help teachers to make connections between learning materials and student world situations and encourage students to link their knowledge and practical knowledge into their lives as a family or community members [24].

The use of a cooperative approach is not ineffective in enhancing the student's math understanding but there is a flaw in the way students cooperate in his or her learning activities. Teachers need to understand the overall characteristic of the learners' activation in learning [25]. The student has a different behavioural diversity that influences his or her learning activities in class. Cooperative learning demands the level of activation and learning skills of the students in the classroom, the students' high scientific stance, considerable time, their effectiveness depends largely on the student's learning motivation, learning skills, and high performance of the teacher [26–28].

4. Conclusion
Increased student math comprehension in contextual classes by 0.71 in the high category and cooperative class 0.38 in the moderate category. Student math comprehension with class use a contextual approach higher than the class that uses a cooperative approach. A key to the effectiveness of a contextual approach to improving students' mathematical understanding by connecting individual/student experiences to objects learned. Unlike a cooperative approach requires a student's characteristics in high activation levels, student learning skills, and high student learning motivation.

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