Using fractional card media and math games to increase students’ activities and learning outcomes

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Abstract. This study aims at improving the mathematics learning outcomes using fractional card media and math games of the fourth graders of elementary school. The problems investigated were: 1) the students’ activities in learning mathematics, 2) the teacher’s teaching activities, and 3) the students’ learning outcomes. This research is a classroom action research and is carried out in two cycles. Each cycle consists of 4 stages: planning, implementing, observing, and reflecting. The data collection was done using observation and test. The result of the research showed an increase from one cycle to the next cycle in terms of students’ learning activities, the ability of teacher to manage classrooms, and students’ learning outcomes. The use of fractional card media and mathematical games succeeded in increasing students’ learning activities and outcomes. It is seen from the observations on the students’ activities in the first cycle. It was average 37 and categorized enough. It increased to 47.2 in the second cycle and it was categorized good. In Cycle 1, the students’ learning outcomes was 70.5 and increased to 82.7 in Cycle 2. The classical completeness reaches 94.5% which is categorized excellent.

Keywords: learning activities, learning outcomes, fractional card, math games

1. Introduction

It is very important for students to learn mathematics starting from elementary school. This aims at guiding them to think logically, analytically, systematically, critically, and creatively, as well as leading them to be able to cooperate [1], [2]. Mathematics listed in the elementary school curriculum is mathematics that has been selected, simplified, and adapted to the stages of elementary school students' thinking development. Mathematics especially at the elementary school level should be taught in a fun way and a joyful atmosphere which is far from pressure and fear. One that can be used is to present the learning material learning media and games. A research conducted shows that mathematics games provide a positive contribution to student learning activities and outcomes [3], [4].

Media plays an important role in the learning process because learning media can be a means to bring abstract concepts closer together. Learning media have an effect on increasing student enthusiasm and student activities. Mathematical activities that are usually considered abstract by students become more concrete when it is conducted using learning media [5], [6].

Learning media is a strategic component of delivery that is loaded with messages that will be conveyed to students through people, tools, or materials. Media as “all means of communication,
whatever its format[7], [8]. The contribution of learning media are: (1) delivery of learning can be more standardized; (2) learning can be more interesting; (3) learning delivery time can be shortened; (4) the quality of learning can be improved; (5) the teacher’s role changes in a positive direction [9].

Learning media can be used to support learning activities, among others: focus the students, reminding previous material (material prerequisites) with the aim that the new material can be understood well, achieving learning goals or objectives desired in the students, help the learning process through examples and elaborations visually, helping deliver a new material or make the material more memorable, the media can be used to provide feedback related to test or practice, and increase retention and transfer [10]–[12].

Learning media is a tool that can be used to convey the message to the students for the purpose of learning can be achieved. Each learning medium used has unique characteristics, so it needs careful planning in using the media in learning. Understand is defined as constructing the meaning of instructional messages, including oral, written, and graphic communication. Children are saturated with media images [13], [14]. When children come to school they bring with them knowledge of and interest in the media that becomes incorporated into their writing, drawings, discussions and games [15].

Learning is a process of changing behavior through experience and training. This means that the realization of the learning objectives is a change in behavior concerning knowledge, skills, attitudes, even including all personal aspects [16], [17]. There are three learning outcomes obtained by students who are taught by using problem-based learning models, namely inquiry into problem solving skills, adult learning model regulation, and independent learning skills [18].

The purpose of this study is to improve the students’ learning outcomes of mathematics especially in fraction numbers of the fourth grade at SDN 2 Pancor Lombok Timur NTB by using fractional card and math games. The action hypothesis in the study is that the students' understanding and learning outcomes will increase; equal to or higher than 85% of students are able to solve problems related to fractions when learning using fractional card media and mathematical games in fourth grade of SDN 2 Pancor in the academic year 2018-2019.

2. Method

This research is a classroom action research collaboratively involving the subjects of the instructional process including teacher, students, and other subjects such as principal and the researcher. The research design used is the Kemmis & Taggart model which consists of several cycles [18], [19]. In each cycle consists of the stages of planning, action, observation, and reflection

2.1. Research Subject

The subjects in this study were the fourth graders of SDN 2 Pancor, East Lombok, NTB. The number of students is 39: 13 male and 24 female. The actions given to the research subjects focused on the use of fractional card media and mathematical games.

2.2. Data Collection

The data collection was done through observation including observation on the instructional management and students’ activities and tests of learning outcomes which is taken from daily tests.

2.3. Data Analysis

The data from the observation were collected using a Likert scale with five criteria and analyzed using descriptive statistics with an average score [20]. The classical learning completeness is found by calculating each student's score [21].

3. Result and Discussion

This research was carried out in 2 cycles. Cycle I consisted of 4 meetings for the learning process and 1 meeting for evaluation. Cycle II consisted of 5 meetings for learning process and 1 meeting for evaluation.
3.1. Cycle I
Cycle I was carried out in four meetings. The learning objectives are focused on the students’ comprehension on the elements of fractions, knowing the equality of ratio numbers, and knowing how to determine equality of ratio numbers. From the results of recorded observations of students’ and teacher’s activities during the learning process from the first meeting to the fourth meeting in general the data is presented in Table 1.

Table 1. The Result of Observation on the Students’ Activities in Cycle 1.

| Meeting | I  | II | III | IV |
|---------|----|----|-----|----|
| Observer| 1  | 2  | 1   | 2  |
| Score   | 34 | 33 | 35  | 40 |
| Mean    | 33,5 | 35 | 39  | 40,5 |

Mean score in Cycle 1: 37

Category: Fair

Based on Table 1, the results obtained are that the average score of all activities is 37 in the range of scores $32 < X \leq 40$. This score is considered fair category. Because the category of students’ activities for this cycle is in fair category, not in accordance to the predetermined criteria, it is used as a consideration to continue the research to the next cycle.

Table 2. The Result of Observation on the Teacher’s Activities in Cycle 1.

| Meeting | I  | II | III | IV |
|---------|----|----|-----|----|
| Score   | 32 | 34 | 34  | 37 |
| Mean score in Cycle 1 | 33.5 |
| Category: Good |

The teacher's ability to manage instruction with fractional card media and math games is scored $= 25$ and $s = 6.6$. In Table 2, the achievement indicator of teacher’s activity is 33.5 in the range of 33.3 $< X \leq 39.9$ in the good category. This means that the implementation of learning is classified as active criteria.

Evaluation is done with the aim at finding out whether students have mastered the taught material well. To find out students’ learning outcomes, a test consisted of 10 questions was administered. The student learning outcomes in the first cycle can be seen in Table 3.

Table 3. The Students’ Learning Outcomes in Cycle I.

| Category               | Score |
|------------------------|-------|
| Highest score          | 100   |
| Lowest score           | 50    |
| Gained score           | 2610  |
| Number of student-testee | 37 |
| Mean score             | 70,5  |
| Percentage of classical completeness | 78% |

In this first cycle, the students’ mean score was 70.5. The highest score was 100 and the lowest was 50. The percentage of completeness reached only 78%. The results obtained in the first cycle indicated that the average score of the students’ learning outcomes is quite good, but there are still 8 students who have not completed the minimum completeness criteria that have been set which is 70. While the percentage of classical completeness has not yet reached the classical completeness criteria set in accordance to indicator of success.

3.2. Cycle II
The action in Cycle II is focused on the students’ ability to determine the forms of fractions and
change ordinary fractions to other forms or vice versa. Cycle II was carried out in five meetings. The data regarding the students’ learning activities and teacher’s activities from the first meeting to the fifth meeting are presented in tables.

### Table 4. The Result of Observation on the Students’ Activities in Cycle II.

| Meeting | I | II | III | IV | V |
|---------|---|----|-----|----|---|
| Observer | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Score    | 40 | 40 | 43 | 41 | 46 | 49 | 52 | 50 | 56 | 55 |
| Mean     | 40 | 42 | 47.5 | 51 | 55.5 |

Mean score in Cycle 2: 47.2

Category: Good

Based on Table 4, the result of the observation showed that the students’ activities in Cycle II reached score 47.2 in the range of $40 < X \leq 48$. This is categorized good. Because the category of the students’ activity in Cycle II is in good category which means that the indicator has been reached, action can be stopped at Cycle II.

### Table 5. The Result of Observation on the Teacher’s Activities in Cycle II.

| Meeting | I | II | III | IV | V |
|---------|---|----|-----|----|---|
| Score   | 38 | 39 | 41 | 45 | 52 |
| Mean score in Cycle II | 43 |
| Category | Very good |

Table 5 shows that the achievement indicator of teacher’s activity reached 43 in the range $39.9 < X$. It was categorized very good. This means that the instructional process was active. Success criteria for teacher’s activities are met.

### Table 6. The Students’ Learning Outcomes in Cycle II.

| Criteria                        | Score |
|---------------------------------|-------|
| Highest score                   | 100   |
| Lowest score                    | 60    |
| Gained score                    | 3060  |
| Number of student-testee        | 37    |
| Mean score                      | 82.7  |
| Percentage of classical completeness | 94.5% |

The results of the analysis in the second cycle showed that the students’ average score was 82.7. The highest score was 100 and the lowest score was 60. The percentage of completeness reached 93.3%. Additionally, the students’ learning outcomes was classified very good. It is seen from the increase in the number of students who reach the minimum completeness and the obtained learning outcomes. Out of 37 students, only 1 student did not reach minimum completeness. Besides, the percentage of classical completeness reached criteria set as indicators of the success of the action.

### 4. Conclusion

Based on the results of research conducted, it can be concluded that 1) the use of fractional card media and mathematical games can improve students’ understanding and students’ activities. This can be seen from the increase of the average score of students’ activities. It was from 37 in fair category to 47.2 in good category; 2) the use of fractional card media and math games improve the students’
mathematic learning outcomes in fraction of the fourth grade at SDN 2 Pancor in the academic year 2018-2019. The student learning outcomes in the first was 70.5 and in the second cycle it increased to 82.7. The percentage of the classical completeness also increased from 78% in the first cycle to 94% in the second cycle.

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