Application of algebraic tile media with gasing: Ability to understand mathematical concepts and student creativity

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Abstract. This study aims to determine the effect of the GASING strategy with algebraic tile media on students' understanding of mathematical concepts and creativity. This study uses a quasi-experimental type with Posttest Only Control Design and uses data collection instruments in the form of concepts understanding questions and creativity in the form of descriptions. The results of this study indicate: (1) there is an effect of GASING mathematics learning with algebraic tile media on the ability to understand mathematical concepts; (2) there is an effect of GASING mathematics learning with algebraic tile media on student creativity; (3) there is an effect of the GASING strategy with algebraic tile media on the ability to understand mathematical concepts and student creativity simultaneously. The explanation regarding the results of the study explains that the Treatment using the GASING strategy with algebraic tile media in the experimental class is proven to be better in increasing the ability to understand mathematical concepts and student creativity compared to conventional activities. This is following the hypothesis which states that there is an effect of the GASING strategy with algebraic tile media on students' understanding of mathematical concepts and creativity.

Keywords: Creativity, Gasing Mathematics, Understanding of Mathematical Concepts

1. Introduction

Science in the world of education is very broad, one of which is mathematics. Mathematics needs to be understood and mastered by all levels of society, from elementary school to tertiary education. As a science that involves thinking logic in understanding Mathematical concepts, high abilities are needed [1]. Meanwhile, until now students are still weak in understanding mathematical concepts. Students tend to memorize the concepts they have learned without understanding the problem being asked, whereas Mathematics emphasizes the concept [2,3]. This means that to solve problems and apply them in everyday life, students should first understand mathematical concepts [4]. Also, without having the ability to understand concepts, students will find it difficult to develop creativity in solving different problems [5,6]. Thus, the ability to understand concepts and creativity is closely related.

Creativity does not emerge by itself, but some factors influence it from the outside, namely students' motivation and awareness, as well as the learning environment [7,8]. Creativity ability is involved in the process of understanding the concept of variables, coefficients, or constants of algebraic problems [9]. For that, teachers need to build a pleasant learning atmosphere. One strategy...
that supports this is GASING [10]. The meaning of the acronym GASING (Easy, Fun, and Fun) is easy as a learning process that introduces students to mathematical logic that is easy to learn and remember, fun means students learn without coercion, and fun as satisfaction in the learning process because of the use of tools props and games [11]. Algebraic tile media is one of the teaching aids that can increase interest and motivation, so it is suitable if applied with the GASING strategy [12]. Students themselves still have difficulty understanding algebraic problems, such as division and multiplication operations in linear equations [13]. While GASING itself is very suitable to be applied to help students understand algebraic problems [14,15].

The application of GASING in learning will certainly affect the development of students' concept understanding abilities [16] because students do not only memorize but find the formula or concept itself [17] so that learning outcomes will also increase [18]. In previous studies, the effect of GASING on student creativity and the influence of algebraic tile media on understanding mathematical concepts and student creativity had not been studied. Thus, it is necessary to study the effect of GASING with algebraic tile media on students' ability to understand mathematical concepts and creativity.

2. Research Method
This research was conducted at SMP Negeri 4 Pesisir Selatan, with the research flow as shown in Figure 1 below.

Understanding indicators (NCTM) [19] can be seen in Table 1 below.

| No | Indicators of Concept Understanding |
|----|-----------------------------------|
| 1  | Restating a concept               |
| 2  | Classifying objects according to certain properties according to the concept |
| 3  | Providing examples and non-examples of concepts |
| 4  | Presenting concepts in various forms of mathematical representation |
| 5  | Developing necessary or sufficient conditions of a concept |

2
While indicators of creativity [20] can be seen in Table 2.

| No | Indicators of Concept Understanding |
|----|-----------------------------------|
| 6  | Using, utilize and select specific procedures |
| 7  | Classify concepts or algorithms into problem-solving |

| No | Indicators of Creativity |
|----|--------------------------|
| 1  | Fluency, namely Students can respond to questions with more than one correct answer |
| 2  | Flexibility, namely Students can solve questions in several different ways |
| 3  | Novelty, namely Students can find different ways or answers |

The hypotheses or allegations of the formulation of the problem based on theoretical studies while in this study can be seen in Table 3 below.

| Hypothesis |
|------------|
| 0A= There is no influence of algebraic tile media with GASING mathematics learning strategy on the ability to understand mathematical concepts |
| 1A= There is an influence of algebraic tile media with GASING mathematics learning strategies on the ability to understand mathematical concepts |
| 0B= There is no influence of algebraic tile media with GASING mathematics learning strategies on student creativity. |
| 1B= There is an effect of algebraic tile media with GASING mathematics learning strategies on student creativity. |
| 0C= Algebraic tile media with GASING mathematics learning strategies cannot simultaneously influence the ability of students to understand concepts and creativity. |
| 1C= Algebraic tile media with GASING mathematics learning strategy can simultaneously influence the students' ability to understand concepts and creativity. |

Decision criteria:
If a significance value is accepted, or vice versa.

3. Result and Discussion
To know the difference in conceptual understanding and creativity, the Tests of Between-subject Effect analysis is used. The results can be seen in Table 4 below.

| Type III Sum of Squares | Mean Square | F | Sig. |
|-------------------------|-------------|---|------|
| Corrected               | Understanding the concept | 660.017 | 1 | 660.017 | 8.651 | .005 |
| Model                   | Creativity | 5005.067 | 1 | 5005.067 | 30.581 | .000 |
| Intercept               | Understanding the concept | 230516.017 | 1 | 230516.017 | 3021.476 | .000 |
|                         | Creativity | 214084.267 | 1 | 214084.267 | 1308.051 | .000 |
| Strategy                | Understanding the concept | 660.017 | 1 | 660.017 | 8.651 | .005 |
|                         | Creativity | 5005.067 | 1 | 5005.067 | 30.581 | .000 |
| Error                   | Understanding the concept | 4424.967 | 58 | 76.293 |
|                         | Creativity | 9492.667 | 58 | 163.667 |
Based on table 4, it shows the results of the Manova test for concept understanding and creativity. These results show in the strategy line at the significance number, so it is rejected. Thus, concept understanding is influenced by the GASING strategy with the help of algebraic tile media. This result is in line with previous research that there is an effect of GASING mathematics with the increasing ability of students to understand mathematical concepts [11,15,16]. The fun and fun stages of the GASING strategy motivate students to enjoy the learning process so that students easily understand the concepts and solve the problems presented [18]. GASING learning is following Dewey's constructivist theory [21], students are actively involved in the learning that occurs, especially the concrete stages through learning tile media. With the existence of direct student involvement, students can find concepts from the inductive evidence process [22]. Thus, the application of the GASING strategy with the help of algebraic tile media can improve student learning outcomes [23].

Whereas in the strategy line, the significant figure is seen so it is rejected. Thus, creativity is influenced by the GASING strategy assisted by algebraic tile media. Students are increasingly creative in solving problems, but students who have a strong understanding of mathematical concepts do not necessarily have high creativity. This is caused by the difficulty of students in solving problems from contextual to mathematical sentences. Students tend to solve problems procedurally. Therefore, it is necessary to emphasize a strong understanding of concepts, so that there are no misconceptions of algebra and difficulties in solving non-routine algebra problems [24]. Creativity in the learning process is very dependent on the creativity and activities of the teacher in developing material and a conducive learning environment (hamalik), one of which is GASING.

Furthermore, to find out the difference in conceptual understanding and creativity between the experimental and control classes simultaneously (together), the Manova test was carried out. This analysis was carried out with the help of SPSS 25. The results can be seen in Table 5 as follows:

| Effect          | Pillai's Trace | Wilks' Lambda | Hotelling's Trace | Roy's Largest Root |
|-----------------|----------------|---------------|-------------------|-------------------|
| Intercept       | .991           | .009          | 113.004           | 113.004           |
| Method          | .471           | .529          | .889              | .889              |

| Value          | F    | Hypothesis Df | Error Df | Sig. |
|----------------|------|---------------|----------|------|
| .3221E3        | 3.221E3 | 2.000        | 57.000   | .000 |
| .3221E3        | 3.221E3 | 2.000        | 57.000   | .000 |
| 113.004        | 113.004 | 2.000        | 57.000   | .000 |
| 25.327         | 25.327 | 2.000        | 57.000   | .000 |
| 25.327         | 25.327 | 2.000        | 57.000   | .000 |

a. Exact statistic
b. Design: Intercept + Method
Based on table 5, the significance value is obtained, so it is rejected. So it can be concluded that the GASING mathematics learning strategy with algebraic tile media affects the understanding of mathematical concepts and creativity simultaneously. This is because the application of GASING learning always uses media or props that can stimulate concept understanding so that students foster student creativity in solving problems. Props as a semi-concrete learning model before students continue learning to the abstract stage [25]. GASING mathematics learning also affects students' creativity, because with GASING students are invited to imagine or find out for themselves related to the material being studied [26].

4. Conclusions and Suggestions

Based on data analysis and discussion of the results of research regarding the application of GASING learning with algebraic tile media on understanding mathematical concepts and student creativity in class VIII of SMP Negeri 4 Pesisir Selatan, the subject of algebraic operations, it is found that: (1) There is an effect of learning GASING mathematics with algebraic tile media on understanding mathematical concepts; (2) There is an effect of GASING mathematics learning with algebraic tile media on creativity; (3) The application of the GASING mathematics learning strategy with algebraic tile media can affect the ability to understand mathematical concepts and creativity of students simultaneously.

The results of this study should be an alternative means for teachers in learning because this method is proven to be able to develop mathematical conceptual understanding and increase student creativity. To apply learning with GASING, sufficient preparation is needed, and the media or props must be carefully considered because not all materials can be easily presented with visual aids.

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