THE DEVELOPMENT OF GRADE 3 STUDENTS' MATHEMATICAL CREATIVE THINKING BY USING GAME 24.

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ABSTRACT

Creative thinking is an individual ability to create new innovation. A good creative thinking must be happened from training for continuously development. The objectives of this study were to develop the mathematical creative thinking through Game24 for grade 3 students and to study the opinions toward Game24 of grade 3 students. The sample group of this study was 28 grade 3 students who were studying in the semester 2, academic year 2018 at Demonstration School, Suan Sunandha Rajabhat University which was derived from the simple random sampling technique. The instruments for collecting data were the creative thinking evaluation form, the questionnaire and the interview. The data were analyzed by the application of mean ($\bar{X}$) and Standard Deviation (S.D.). The data obtained from the interview were analyzed by content analysis, conclusion, and description.

The findings revealed that the overall of students' mathematical creative thinking was at a high level, with an average of 2.18 (S.D. = 0.04). The highest average was fluency with an average of 2.36 (S.D. = 0.74). According to the evaluation of students' opinions towards Game24, it was found that the overall image was at the highest level, with an average of 4.74 (S.D. = 0.25). In term of each item, it was found that the item with the highest average was Game24 encouraged the students to plan for finding the answers with the average value of 4.96 (S.D. = 027). According to an interview of the students'opinion towards Game24, it found that most students wanted to play Game24 because it was exciting, challenging, fun, and new for the students. Furthermore, the students can find the answers in various ways, they can practice calculating and finding the answer faster. However, they needed more time to think for finding the answers and wanted more time to play Game 24.

Keywords: Development, Mathematical creative thinking, Game 24

INTRODUCTION

Mathematics was important to success in learning in the 21st century because mathematics supported humans to be creative, think logically, systematically, analyze problems carefully, anticipate, plan, make decisions, and apply them in real life [1]. Mathematics was a tool for finding new knowledge of many science subjects. It required mathematics to explain. Because of mathematics was an abstract subject, so many people viewed mathematics as a difficult subject to understand. In order to make students understand the content of each subject, it was necessary to use a variety of teaching strategies, including the use of teaching materials to help students understand the abstract faster. The learning management of mathematics according to the basic education core curriculum in 2551 aimed to develop learners to have quality according to learning standards that emphasized advanced thinking ability which consisted of analytical thinking, synthetic thinking, creative thinking, critical thinking, and systematic thinking, in order to create the concept of knowledge by oneself [2].

Creative thinking was one of the five skills and mathematical processes, which were the sixth subject in the basic education core curriculum in 2008, mathematics, separating mathematical skills and processes into one subject, but did not fully get attention, because in this matter was about the characteristics of skills and processes. Their contents were not as like as the other 5 subjects. In the interview with the math teacher on this subject, the answer was that skills and processes were important but not equal to other subjects, so they did not give much importance, more focused on teaching only the contents. But when the basic education core curriculum in 2008 was revised (revised in 2017), in this revision, the 6th subject was dissolved and teachers instructed to use the mathematical skills and processes to build students' self-knowledge and one of the mathematical skills and processes was creative thinking consisted of fluency, flexibility, originality, and delicacy. These were necessary for students in the 21st century.

Game24 was a mathematical game in which the numbers (digit) were assigned 4 numbers from 1 to 9 to compete in the calculation by using all 4 digits to do mathematical operations (add, subtract, multiply, divide) by not repeating numbers and must use all the numbers. The result of the operation must be equal to 24. This game was a challenging game for players, suitable for practice in the calculation. In addition, it could be used to develop students' creative thinking very well, suitable to encourage students to play as a basis for calculation. In another way, it was to create a positive attitude towards mathematics. Therefore, the researcher was interested to develop creative thinking of grade 3 students with Game24 to become more creative.

MATERIALS AND METHODS

1. Sample group

The sample group of this study was 28 grade 3 students who were studying in the semester 2, academic year 2018 at Demonstration School, Suan Sunandha Rajabhat University

2. Research instruments

The instruments for collecting data were the creative thinking evaluation form, the questionnaire and the interview.

3. Data collection

The data were collected by assessing the students' mathematical creative thinking before and after playing Game24 and let the students answer the questionnaires and interview the students'opinions toward the Game24

4. Data analysis

The data were analysed as follows: analysing the students' mathematical creative thinking evaluation form and the questionnaires by using mean ($\overline{X}$) and Standard Deviation (S.D.). Analysing data of an interview by using content analysis, conclusion, and description.

RESULTS AND DISCUSSION

The results are according to the research objectives as follows:

Part 1 : The students' mathematical creative thinking

Table 1 Score of students' mathematical creative thinking

Text	X	S.D.	Meaning
1. Fluency	2.36	0.74	High
2 Flexibility	2.21	0.80	High
3. Originality	2.07	0.83	High
4. Delicacy	2.07	0.83	High
Total	2.18	0.04	High

According to the evaluation of mathematical creative thinking of students, it was found that students have overall mathematical creative thinking at a high level, with an average of 2.18 (S.D. = 0.04). In term of each item, it was found that the item with the highest mean was fluency, it was at a high level, with an average of 2.36 (S.D. = 0.74), followed by flexibility, it was at a high level, with an average of 2.21 (S.D. = 0.80) and the 2 items with the least mean were originality and delicacy, they were at a high level, with an average of 2.07 (S.D. = 0.83).

Part 2: The students'opinions toward Game24

2.1 The students' opinions toward Game24 from the questionnaire

Table 2 Mean and standard deviation of students' opinions towards Game24

Text	X	SD.	Meaning
1. Game24 was a novelty for the students.	4.54	1.15	Highest
2 Game24 helped practice the addition, the subtraction, the multiplication, and the division skills.	4.75	0.81	Highest
3. Game24 encouraged the students to learn well and have long-term memory.	4.50	0.87	High
4. Students were fun and they enjoyed when playing Game24.	4.75	0.70	Highest
5. Game24 helped training students to solve problems.	4.57	0.98	Highest
6. Game24 encouraged the students to plan for finding the answers.	4.96	0.27	Highest
7. Game24 made the students have more effort.	4.82	0.56	Highest
8. Game24 encouraged the students to present their thoughts and expressions.	3.82	0.75	High
9. Game24 supported the students to participate in learning activities.	4.79	0.92	Highest
10. Game24 offered the students to freely use their own thinking.	3.86	1.02	High
Total	4.74	0.25	Highest

According to the evaluation of students' opinions towards Game24, it was found that the overall image was at the highest level, with an average of 4.74 (S.D. = 0.25). In term of each item, from the highest average to the least average, it was found that the item with the highest average was Game24 encouraged the students to plan for finding the answers, which was the highest level, with the average value of 4.96 (S.D. = 027). Next was Game24 made the students have more effort with an average value of 4.82 (S.D. = 0.56) and Game24 supported the students to participate in learning activities with the average value of 4.79 (S.D. = 092) respectively.

2.2 The students' opinions toward Game24 from the interview

Table 3 The students' opinions towards Game24

Interview issues	Interview results
1. Do the students want to playing Game24 ? And why ?	The students wanted to play Game24 because of these reasons: - The students can find the answers in various ways. - It was a way to practice calculating and finding

Interview issues	Interview results
	the answer faster. - It was fun when playing Game24. - It was a new game for the students.
2. How about the time taken to play Game24 ?	- The students wanted to spend more time of playing Game24. - The students feel stressed when they have to find the answers with the limited time.

According to an interview of the students'opinion towards Game24, it found that most students wanted to play Game24 because it was exciting, challenging, fun, and new for the students. Furthermore, the students can find the answers in various ways, they can practice calculating and finding the answer faster. However, they needed more time to think for finding the answers and wanted more time to play Game 24.

CONCLUSION

According to the evaluation of mathematical creative thinking of students, it was found that students have overall mathematical creative thinking at a high level, In term of each item, it was found that the item with the highest mean was fluency followed by flexibility and the 2 items with the least mean were originality and delicacy. The research results showed that Game24 could improve the creative thinking of students and they enjoyed playing the game. This might be because the students were not worried about the content that they had to learn. They felt that they were playing along with being motivated. Including reinforcements from the teacher autographs in the case that students could think of new ways to find answers.

According to the evaluation of students' opinions towards Game24, it was found that the overall image was at the highest level. In term of each item, it was found that Game24 encouraged the students to plan for finding the answers. Next was Game24 made the students have more effort and Game24 supported the students to participate in learning activities respectively. The results were consistent with Sunant Muangpan [3]. who said that Game24 gave the students the opportunity to practice and express themselves, had fun and concentration, had calculation skills, had a good attitude towards studying mathematics.

According to an interview of the students'opinion towards Game24, it found that most students wanted to play Game24 because it was exciting, challenging, fun, and new for the students. Furthermore, the students can find the answers in various ways, they can practice calculating and finding the answer faster. The results illustrated that Game24 promoted students' creative thinking, challenging skill, practicing how to find the answers faster in various ways, and calculating faster. The results were consistent with Yuphaphan Khotpat [4] who claimed that Game24 gave students the opportunity to practice and express themselves, had fun and had concentration, had calculation skills, had a good attitude towards studying mathematics. In addition, Game 24 is as a condition to motivate the students to think in various ways to find the answer. This consistent to Tanawat Srisiriwat's study [5] which indicated that factor of the learning conditions is positively related to the learning achievement motivation of students.

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