

The Development of Grade 3 Students' Mathematical Creative Thinking by Using Game 24

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Abstract

Creative thinking is individual ability to create new innovation which is more functional and suitable. A good creative thinking must be happened from training for development continuously. The objective of this research was to develop mathematical creative thinking through Game24 for Primary 3 students. The sample group of this research was 28 Primary 3 students at Demonstration School, Suan Sunandha Rajabhat University, semester 2, academic year 2018 by simple sampling with classroom criterion. The instruments used in this research were creative thinking evaluation form, questionnaire towards Game24 and opinion interview form towards Game24. The data was analyzed by using mean (\bar{x}), Standard Deviation (S.D.) and questionnaire analysis by using means of conclusion and depiction.

The result of this study found that the creative thinking ability of Primary 3 students was higher in overall image with an average score of 2.18 in term of each item, it found that the average score of fluency was 2.36, 2.21 for flexibility, 2.07 for originality and delicacy accordingly. The overall image of students' opinion towards Game24 was in the highest level with an average of 4.74 in term of each item, it found that the item with the highest average score, 4.96, was to play Game24 encouraged the students to plan in finding the answers and Game24 offered the students use their own thinking freely. According to an interview the students' opinion towards Game24, it found that the students wanted to continue playing Game24 because it was exciting, challenging, fun and relevant to self-training. Everyone had a chance to get success in thinking which benefit for mathematics studying.

Keyword: creative thinking, game 24

Introduction

Mathematics was important to success in learning in the 21st century because mathematics helped humans to be creative, think logically, systematically, analyse problems carefully, anticipate, plan, make decisions, and apply them in real life. (Ministry of Education, 2017: 15) 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 emphasised 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. (Ministry of Education, 2008: 56-57)

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 practise 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.

Research objectives

1. To study the creative thinking development of grade 3 students.
2. To study the opinions of grade 3 students towards playing Game24.

Research Methodology

This research was an integrated research. The purpose was to develop the creative thinking of students by using quantitative research methods to assess students' mathematical creative thinking and students' opinions. Using a qualitative research methodology to interview the opinions of students towards playing the game. The samples used in this study were 28 grade 3 students of Demonstration School of Sunandha Rajabhat University, semester 2, academic year 2018.

For data collection, the researcher collected data by the researcher assessing the creative thinking of students before and after playing Game24 and let the students answer the questionnaires and interview the opinions towards the Game24. The research instruments consisted of tools for collecting quantitative data such as the mathematics creative thinking assessment of students before and after studying. The tools used for collecting qualitative data was the interview form of students' opinions towards playing Game24. For data analysis, the researcher analysed the data as follows: Analysing the mathematics creative thinking assessment form of the students and a questionnaire on the development of students' creative thinking towards the Game24 by using the average value and standard deviation. Analysing data of an interview form by summarisation and descriptive writing.

Research results

The researcher presented the results of data analysis according to the research objectives as follows:

Part 1 : Assessment result of mathematical creative thinking of students

Table 1 Score of mathematical creative thinking of students

Text	\bar{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 assessment 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 evaluation results of students opinions on the Game24

2.1 The evaluation result of students' opinions on playing Game24 from the questionnaire

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

Text	\bar{X}	S.D.	Meaning
1. Game24 encouraged students' originality.	4.54	1.15	Highest
2. Game24 helped practice addition, subtraction, multiplication, and division skills.	4.75	0.81	Highest

Text	\bar{X}	S.D.	Meaning
3. Game24 encouraged students to learn well and have long-term memory.	4.50	0.87	High
4. Students were fun and enjoyed when playing Game24.	4.75	0.70	Highest
5. Game24 helped training students to solve problems.	4.57	0.98	Highest
6. Playing Game24 encouraged the students to plan in finding the answers.	4.96	0.27	Highest
7. Playing Game24 made students have more effort.	4.82	0.56	Highest
8. Game24 encouraged students to present their thoughts and expressions.	3.82	0.75	High
9. Game24 promoted attracting students to participate in learning activities.	4.79	0.92	Highest
10. Game24 offered the students to use their own thinking freely.	3.86	1.02	High
Total	4.74	0.25	Highest

According to the evaluation of students' opinions towards playing 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 playing Game24 encouraged the students to plan in finding the answers, which was the highest level, with the average value of 4.96 (S.D. = 0.27). Playing Game24 made students have more effort was at the highest level, with an average value of 4.82 (S.D. = 0.56).

2.2 Evaluation of students' opinions from the interview form

Table 3 Results of interviewing students' opinions towards playing Game24

Interview issue(s)	Interview Result(s)
1. Do students want to continue playing Game24? And why?	<ul style="list-style-type: none"> - The students wanted to play Game24 in all grades because it was a game that promoted thinking and challenged thoughts. - It was a training plan for calculating and finding the answer faster. - It was an idea to find answers in many ways. The difficulty is alternating. Having fun playing the Game24. - Encouraged originality. - Anyone can play Game24. - Needed some other answers.

Interview issue(s)	Interview Result(s)
2 How about the time taken to play Game24?	<ul style="list-style-type: none"> <li>- The students wanted to spend more time of playing the game. <li>- They feel stressed if they do not have enough time to play.

According to evaluating students' opinions about playing Game24 from the interview, it was found that most students wanted to continue playing Game24, because it was a game that promoted thinking, challenged thoughts, practised planning for finding answers, calculated faster, encouraged creative thinking. However, they needed more time to think and wanted questions that were not very difficult.

Conclusion and Discussion

Conclusion

1. The overall image of mathematical creative thinking of the students was at a high level, with an average of 2.18. In term of each item, it was found that the item with the highest mean value was fluency, it was at a high level, with an average of 2.36, followed by flexibility, it was at a high level, with an average of 2.21. 2 items having the same mean values were originality and delicacy. They were at the same high level, with an average of 2.07.

2. Students' opinions towards playing Game24, overall, was at the highest level, with an average of 4.74. In term of each item, from the highest average to the least average, it was found that the item with the highest average was playing Game24 encouraged the students to plan in finding the answers, which was the highest level, with the average value of 4.96, followed by playing Game24 made students have more effort, with the average value of 4.82. Game24 promoted attracting students to participate in learning activities, had an average of 4.79. Game24 helped practice addition, subtraction, multiplication, and division skills, had an average of 4.75. Students were fun and enjoyed when playing Game24, had an average of 4.75. Game24 helped training students to solve problems, had an average value of 4.57. Game24 encouraged students' originality, had an average of 4.54. Game24 encouraged students to learn well and have long-term memory, had an average of 4.50. Game24 offered the students use their own thinking freely, had an average of 3.86. Finally, Game24 encouraged students to present their thoughts and expressions, had an average level of 3.82.

3. From interviewing students' opinions about playing Game24, it was found that most students wanted to continue playing Game24 in other grades, because it was a game that promoted thinking, challenged thoughts, practised planning for finding answers, calculated faster, encouraged creative thinking. However, they needed more time to think and questions that were not very difficult in order to encourage them to think in the future.

Discussion

1. The overall mathematical creative thinking of the students was at a high level. In which students have fluency skill at the highest level, followed by flexibility, originality, and delicacy, respectively. 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.

2. For the students' opinions on playing Game24, it was found that the overall image was at the highest level. Playing game allowed students to make plans to find answers, followed by playing Game24 made students have more effort, promoted attracting students to participate in learning activities, helped practice addition, subtraction, multiplication, and division skills, were fun and enjoyed, which were consistent with Sunant Muangpan (2015) who said that Game24 gave students the opportunity to practise and express themselves, had fun and concentration, had calculation skills, had a good attitude towards studying mathematics, including higher grades (school-record). 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 (2017) which indicated that factor of the learning conditions is positively related to the learning achievement motivation of students.

3. According to the interview of the students' opinions towards playing the Game24, it was found that most of the students wanted to continue playing the Game24 in other grades, because it was a fun game promoting thinking, challenging skill, practising planning for finding answers, calculating faster, making creative thinking that might come from being determined to do it, focusing on things they like, practice, repetition, until becoming a skill resulting, which was consistent with Yuphaphan Khotpat (2005). And Sunan Muangpan who said that Game24 gave students the opportunity to practise and express themselves, had fun and concentration, had calculation skills, had a good attitude towards studying mathematics, including higher grades (school-record).

Recommendations

1. If students just start to play Game24, teachers should choose easy questions first so that students understand the rules and methods of playing the game before increasing the level of difficulty.

2. Teachers should encourage and ensure all students that everyone can play Game24.

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