

RESULTS OF SCIENCE EXPERIMENTS TO ANALYTICAL THINKING SKILLS OF STUDENTS IN KINDERGARTEN 3 AT RUECHAKON KINDERGARTEN

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Abstract

This classroom was action research as a quasi - experimental research that aims to create and find the effectiveness of science experiment activities of students in kindergarten 3 Ruechakon Kindergarten and to compare the analytical thinking skills of students in kindergarten 3 at Ruechakon Kindergarten before and after using science experiment activities. The population used in this research was 20 students in kindergarten 3 at Ruechakon Kindergarten who are studying in the second semester of the academic year 2023 using a purposive sampling method. The instruments used in this research were the science experiment activity plan with the highest quality ($\bar{x} = 4.8$, S.D. = 0.32) and the analytical thinking assessment form which had an index of congruence (IOC) between 0.67 - 1.00 which passed all criteria. The results of the research were as follows 1) The science experiment activities to analytical thinking of students in kindergarten 3 at Ruechakon Kindergarten with an efficiency of 99.00 / 95.50 which passed the criteria of 80/80 as required and 2) Student in Kindergarten 3 at Ruechakon Kindergarten after using the science experiment activities, the analytical thinking skills were statistically significantly higher than before the activities were conducted at the level of .05.

Keywords: Analytical thinking, Science experiment

Introduction

The current society has changed rapidly in terms of economy, society, politics, culture and environment. Analytical thinking plays an important role in the current and future world society because analytical thinking is something that will provide humans with a foundation for daily life and work. These things are all the results of analytical thinking, combined with creativity and other sciences, helping humans to have creative ideas, think logically, systematically and systematically, and be able to analyze problems or situations carefully and thoroughly. As a result, people in society have to adapt and cope with various changes in order to live in a society that is increasingly complex and full of problems. It is necessary to think and make decisions based on the ability to think as a foundation that has been developed into analytical thinking skills, which are an important skill in life. And working in the 21st century (Phaithoon Sinlarat, 2014) The development of analytical thinking skills should start from early childhood because children aged 2-7 years old are at an age where intellectual development grows rapidly. Therefore, all learners need to develop analytical thinking skills in order to have knowledge and understanding in problem solving, summarizing, and situations that they will

face in the present and the future (Royal Institute, 2013). In addition, the early childhood education curriculum B.E. 2017 has set guidelines for organizing experiences in the form of integration through playing and doing from various experiences. Children will receive development in physical, emotional, social, and intellectual aspects. It mentions organizing experiences for thinking development to develop children's ability to solve problems, summarize, and think logically in mathematics and science by organizing activities for children to observe, talk, and play educational games until they develop mathematical summarizing ideas that are the foundation of further learning (Ministry of Education, 2017).

Ruchakon Kindergarten School is a small private school. It teaches from kindergarten 1 to kindergarten 3. Office of the Private Education Commission. In kindergarten 3, there is 1 classroom. The education is provided to students through 6 main activities: movement and rhythm activities, experience-enhancing activities, creative art activities, corner play activities, outdoor activities, and educational games. The focus is on hands-on learning through play. The researcher observed the behavior from the teaching and learning activities and problem-solving in the activities of kindergarten 3 students. It was found that 20 students had problems with analytical thinking. The problem found was that students had problems with analytical thinking skills. They could not distinguish and classify by considering the physical characteristics of objects that were shared, such as characteristics, sizes, colors, and shapes. If children did not develop this, they would have problems living with others in society.

From this problem, the researcher studied the solution to this problem. From reviewing related documents, it was found that using science experiments to do activities would affect the analytical thinking skills of kindergarten students. Therefore, scientific process skills are an important component of science that needs to be trained until children can use them skillfully. Therefore, the researcher was interested in studying the development of analytical thinking skills of kindergarten 3 students at Ruchakon Kindergarten School. Using the results of the science experiment activities, the objective was to study whether or not the use of science experiment activities can help develop analytical thinking skills. This is to enable students to develop in accordance with the standards and indicators specified in the 2017 Early Childhood Education Curriculum.

Research Objectives

1. To create and find the efficiency of science experiment activities to develop analytical thinking skills of kindergarten year 3 students at Ruchakarn Kindergarten School with an efficiency according to the criteria of 80/80.
2. To compare analytical thinking skills by organizing science experiment activities of kindergarten year 3 students at Ruchakarn Kindergarten School before and after organizing science experiment activities.

Scope of the Research

This research on the results of organizing science experiment activities to develop analytical thinking skills of kindergarten 3 students at Rusakorn Kindergarten School aims to create and find the efficiency of science experiment activities to develop analytical thinking skills of kindergarten 3 students at Rusakorn Kindergarten School with an efficiency according to the criteria of 80/80 and to compare analytical thinking skills by organizing science experiment activities of kindergarten 3 students at Rusakorn Kindergarten School before and after organizing science experiment activities by using purposive sampling.

Research methodology

1. Population and sample
2. Instruments used for data collection
3. Experimental design
4. Data collection
5. Data analysis and statistics used

Literature Review

This research on the results of organizing science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakarn Kindergarten School aims to create and find the efficiency of science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakarn Kindergarten School. The efficiency is in accordance with the criteria of 80/80 and to compare analytical thinking skills by organizing science experiment activities of kindergarten 3 students at Ruchakarn Kindergarten School before and after organizing science experiment activities.

Research Methodology

Study on the results of organizing science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakarn Kindergarten School

Population and sample

The population used in this research was 20 kindergarten 3 students at Ruchakarn Kindergarten School who were studying in the second semester of the academic year 2023. The purposive sampling method was used because the students had problems with analytical thinking skills. They could not think and classify by considering the physical characteristics of things that were shared, such as characteristics, sizes, colors, and shapes.

Data collection.

1. The researcher collected the data by himself.
2. The researcher assessed the analytical thinking skills of kindergarten 3 students at Ruchakarn Kindergarten School using the analytical thinking skills assessment form for early childhood students that the researcher created. The quality level was determined and used to collect data before organizing the science experiment activities.

3. The researcher began organizing the science experiment activities by collecting data for a period of 6 weeks, 3 days a week: Monday, Tuesday, and Thursday during the play corner activities between 09.30 - 10.00 hrs.

4. After the experiment was completed for 6 weeks, the researcher assessed the analytical thinking skills after organizing the science experiment activities. By using the same assessment form of analytical thinking skills of the 3year kindergarten students at Ruchakon Kindergarten School as the assessment form used before the experiment.

5. The data obtained from the assessment form of analytical thinking skills of the 3year kindergarten students at Ruchakon Kindergarten School before and after the science experiment were analyzed using statistical methods.

Data analysis and statistics used

The researcher used descriptive statistics analysis, including frequency, percentage, mean, standard deviation, and inferential statistics, including t-test.

Research Results

The research study of science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakon Kindergarten School, it can be concluded that the

science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakon Kindergarten School have an efficiency of 99.00/95.50, which passes the criteria of 80/80 as specified. And the kindergarten 3 students at Ruchakon Kindergarten School after receiving the science experiment activities have analytical thinking skills that are significantly higher than before receiving the activities at the statistical level of 0.05.

Discussion

1. The results of the analysis of the creation and efficiency of science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakon Kindergarten School found that the science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakon Kindergarten School had an efficiency of 99.00/95.50, which passed the criteria of 80/80 as specified.

When considering the details, it was found that the efficiency of the process (E1) obtained from the sub-test after completing all 18 science experiment activities in the plan, when the evaluation scores from the analytical thinking skill assessment were combined, the average was calculated, and the percentage was 99.00, indicating that the created science experiment activities had higher efficiency than the criteria (E1) set at 80 percent. This may be because the science experiment activities were created by the researcher from the curriculum and textbooks that the researcher had searched for information. The created science experiment activity plan was appropriate for the age and development of the students. The activities allowed students to practice thinking, planning, memorizing, classifying, and making connections through doing it themselves until they were successful. The steps of organizing the activities were not complicated, easy to understand, easy to remember, and doing it. It was divided into 5 steps: creating interest; Exploration and search stage, explanation and conclusion stage, knowledge expansion stage, and evaluation stage, and let the children observe by the teacher using stimulating questions to promote children's learning about changes in the experiment in various stages. The time spent on organizing the activities is appropriate. The time is within the students' interest range. Students are happy while doing the activities and doing them for real. And the evaluation is consistent with the objectives, which is consistent with Piaget's theory (Prajak Anekritmongkol, 2017), who said that the thinking process of children at this age is not yet at the stage of understanding abstract things. Therefore, techniques that will help children learn are needed. Science experiments are therefore an opportunity for children to learn, to be able to think like scientists, to be able to set up hypotheses and theories, and to see that the reality seen and perceived is as important as thoughts and things that are possible, which is consistent with the concept of (Chaiwat Suthirat, 2018), who mentioned that organizing teaching and learning in the form of inquiry-based teaching is one option used in learning science that will help develop scientific process skills and encourage learners to seek knowledge by themselves. There are 5 important steps in the process of seeking knowledge: Step 1: Creating Interest, Step 2: Exploring and Searching, Step 3: Explaining and Concluding, Step 4: Expanding Knowledge, and Step 5: Evaluating. This will help students to be enthusiastic, interested, and learn happily.

The efficiency results (E2) obtained from the analytical thinking skill assessment after receiving all 6 sets of science experiment activities, by taking the average score and calculating the percentage, the value was 99.00, indicating that the created science experiment activities were more efficient than the criteria (E2) set at 80 percent. This may be because the researcher's tool was an analytical thinking skill assessment that was consistent with the objectives. The assessment can be used to assess analytical thinking skills in reality. The researcher created a tool consisting of the following components: an analytical thinking skill

assessment form that assessed children's analytical thinking skills in terms of component analysis skills and relationship analysis skills. It is an assessment set with easy-to-understand language, clear images, and fun to do. An analytical thinking skill assessment form. When considering the results of the study on the efficiency of science experiment activities of kindergarten 3 students at Ruchakon Kindergarten School, which is equal to 99.00/95.50, which is higher than the criterion of 80/80. It can be seen that the results of the study in this issue are consistent with the concept and theory of John Dewey (John Dewey, 1910, cited in Sompong Dili and Wirot Inthanon, 2020: 7-15), who stated that learning about the occurrence of actions to create learning from actions, practicing thinking, practicing doing, practicing various process skills, experiences that humans encounter or face, which is consistent with the research of (Warunee Kongsammak, 2018) who studied the development of basic science skills in early childhood in observation and classification using experimental activities. It was found that before using the experimental activity plan, the sample early childhood children had basic science skills at a moderate level, both overall and classified by skills. After using the experimental activity plan, the sample early childhood children had the highest level of basic science skills. And after using the experimental activity plan, the early childhood children had higher basic science skills than before using the experimental activity plan, both overall and by skills, with statistical significance at the .01 level.

2. The results of the comparative analysis of the analytical thinking skills of the 3rd year kindergarten students at Ruchakon Kindergarten School found that after receiving the science experiment activities, their analytical thinking skills were significantly higher than before receiving the activities at a statistical level of .05. This is because from the assessment of analytical thinking skills before receiving the activities, the students had an average score of 8.75 out of 30 points, with a standard deviation of 0.85. This may be because the 3rd year kindergarten students lacked analytical thinking skills. They could not think and classify by considering the physical characteristics of the things that they shared, such as characteristics, size, color, and shape, which resulted in low scores from the analytical thinking skills assessment before receiving the activities. From the assessment of analytical thinking skills after receiving the activities, the students had an average score of 19.10, with a standard deviation of 0.91. From the comparison of the differences in scores after the science experiment activities, it was found that they were significantly higher than before receiving the activities at a statistical level of .05. This may be because the students received 18 analytical thinking skills development activities, allowing them to learn and practice skills in thinking and classifying by considering the physical characteristics of the things that they shared, such as characteristics, size, color, and shape, thinking, classifying, and listening to reasons more. When considering each individual, it was found that There were 17 children who developed from the improved level to the good level. This was because the children were more interested in doing activities, wanted to do them, were more observant, dared to express themselves, dared to speak up, and dared to try more. It was also found that there were 3 children who developed from the fair level to the good level. This was because the children were more interested in doing activities, wanted to try new things, were curious and wanted to find answers, and used reasoning or physical relationships to analyze problems more. This is consistent with the research results of (Chuleeporn Songwansri, 2019) who studied the development of early childhood thinking potential with the integrated knowledge manual set. It was found that the comparison of analytical thinking of kindergarten 1 students before and after receiving experiences using the integrated knowledge manual set of science was different. The analytical thinking ability of kindergarten 1 students after receiving experiences using the integrated knowledge manual set of science was significantly higher than before the experiences at a

statistical level of .01, which is consistent with the research results of (Ratchanee Suksawat, 2019) who studied the science process skills of early childhood students in the Little Scientist House Project, Thailand, Academic Year 2019, Kalasin Primary Educational Service Area Office 3. It was found that 1) the science process skills of preschool students in Kindergarten 3, academic year 2019 before and after organizing activities under the Scientist House Project, Thailand, overall and in every aspect, namely observation, classification and measurement, were significantly different at the .01 statistical level; and 2) the science process skills of preschool students in Kindergarten 3, academic year 2019 before and after organizing activities under the Scientist House Project, Thailand, overall and in every aspect, namely observation, classification and measurement, were significantly different at the .01 statistical level. This is also consistent with the research by (Daoruang, Thammasirikwan & Kunlaphadon, 2019) who studied the results of organizing science activities according to the Montessori teaching method to develop analytical thinking skills of preschool children. It was found that the study of analytical thinking skills of preschool children in terms of classification and relationship finding were at a very good level. Analytic thinking skills after learning were significantly higher than before learning at the .05 statistical level, which was in line with the hypothesis. And the evaluation of the satisfaction of preschool children towards science activities based on the Montessori teaching method was at a high level, with an average score of 2.74 and a standard deviation of 0.09, and it was also consistent with the research results of (Waiyaroop, Siwasakunrat, Thongsuk & Lalee, 2024) who studied the development of problem-solving skills of kindergarten 2/2 students at Wat Wetwan Thammarat School by organizing creative art activities through the engineering design process. It was found that the creative art activities through the engineering design process to develop problem-solving skills of kindergarten 2/2 students at Wat Wetwan Thammarat School had an efficiency of 84.10/80.42, which passed the specified criterion of 80/80. After participating in the creative art activities through the engineering design process, kindergarten 2/2 students at Wat Wetwan Thammarat School had higher problem-solving skills than before participating in the activities with a statistical significance level of .05.

Recommendations

From the study of the results of organizing science experiment activities to develop analytical thinking skills of kindergarten 3 students at Ruchakarn Kindergarten School, the researcher has the following recommendations:

1. Recommendations for applying the research results

Teachers who use the science experiment activity plan should study the activity plan to understand it, prepare sufficient media and equipment for the number of students, and adjust the innovation to fit the context of students, schools, and the current situation. Teachers should experiment before the actual experiment. If there are any shortcomings, they can correct them and adjust the experiment plan as appropriate.

2. Recommendations for further research

- 2.1 The development of science skills in science communication should be studied using science experiment activities.

- 2.2 The development of analytical thinking should be studied using other activities, such as cooking activities, etc.

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