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Developing reasoning ability for 5-6 years old children in Vietnam – A case study of ambient awareness activities through STEAM education

Van Thị Minh Tu[1], Chu Thi Hong Nhung[2], Bui Thi Thanh Huong[3], Nguyen Thieu Da Huong[4], Hoang Thi Huyen[5]

Abstract

Reasoning is one of the basic and especially important thinking operations and qualities in helping 5-6-year-old children to actively and deeply perceive the surrounding nature and society. In addition, it also contributes to the formation in children of concepts about the world around them and prepares them for the necessary competencies to help them enter the First Grade of Primary school. The research team selected the STEAM education method to form and develop reasoning ability for 5-6 years old preschool children by learning about the surrounding living environment. Based on building a methodology on the reasoning ability of 5-6-year-old children, the research team deployed to test the 5E model in STEAM education in an experimental class (30 children) and a control class (30 children). children) at Kindergarten in Hanoi City, Vietnam. As a result, the process and content develop the reasoning ability of 5-6-year-old children through activities of recognizing and interacting with the surrounding environment. The results of this study are a valuable and feasible reference source for replication.

Keywords: STEAM, 5-6 years old, reasoning ability, kindergarten, environmental education.

1. Introduction

The reasoning is one of the basic and especially important thinking operations and qualities in helping 5-6 year-olds children to be aware of the surrounding nature and society actively and profoundly; contributes to forming in children ideas about the surrounding world, forming attitudes, beliefs, and personality values, and at the same time, helping children to actively control their behavior, especially by preparing the necessary conditions. so that children can participate in

[1] University of Education, Vietnam National University, Hanoi
[2] University of Education, Vietnam National University, Hanoi
[3] School of Interdisciplinary Studies, Vietnam National University, Hanoi
[4] University of Education, Vietnam National University, Hanoi
[5] Hanoi Metropolitan University

learning activities in high school and problems encountered in life effectively. However, the reasoning ability of 5-6 year-olds children is still emotional, sometimes lacking in logic, especially in inductive, deductive, and similar reasoning. Paying attention to research to develop children's reasoning ability right from this age is one of the urgent tasks today to prepare children well for first grade.

STEAM activity in preschool is an activity with many advantages for the development of reasoning ability for 5-6 year-olds children. Because 5-6 year-olds children are always curious and love to explore the world around them, in STEAM activities, children already have a clear initiative and subjectivity. In the process of participating in this activity, children can use their life experiences and understanding of experiences, to explore, discover and make appropriate inferences about surrounding objects and phenomena. However, in practice, preschool teachers have not taken advantage of this activity in developing children's reasoning ability; The relationship between the development of reasoning ability and the well-organized STEAM activities for children has not been found.

Therefore, to develop reasoning ability for 5-6 year-olds children through STEAM activities, it is necessary to apply STEAM activities effectively in preschool. We have identified a model of developing reasoning ability for 5-6 years old children based on the progress of 5E lessons in STEAM.

2. Literature review

2.1. Overview of research on children's reasoning ability through STEAM activities

In research on the concept and role of STEAM in education, many authors highly appreciate the role of STEAM in developing basic competencies for learners, especially the ability to think and understand the world. STEAM is very suitable for children of preschool age because the characteristics and properties of STEAM are very close to children.

According to Mar. Yakman G. (2008) STEAM is an integrated interdisciplinary model including Science, Technology, Engineering, Art, and Math that plays a great role in forming basic competencies for learners [1].

Lindeman, KW (2014) argues that STEAM education is a typical socio-cultural model that provides children with learning situations and allows them to actively construct knowledge and acquire skills through exploration, discovery, cooperation, and problem-solving [2].

Baek. Y et al (2011) determined that steam education emphasizes the importance of creative problem-solving skills to be competitive in the global era and prepare for any challenge in the future [3].

Van Meeteren (2015) believes that STEAM is not difficult for preschoolers because preschoolers have a natural passion and curiosity about the world around them, are persistent and determined when building designs, and try to overcome a problem naturally when things don't go the way the child wants [4].

Bagmati, et al. (2010) argue that providing hands-on experience is meaningful to children and will have a positive effect on children's perception and orientation to STEAM activities [5].

Dejarnette, N. K. (2018) argues that STEAM learning experiences allow children to explore, ask questions, stimulate curiosity, explore, form creative ideas, and express those ideas through the design and presentation of products [6].

Quigley. C.F., Herro. D (2016) argues that STEAM prepares children to categorize the world's problems with critical thinking, and innovation based on a spirit of cooperation and active communication [7].

According to Kropp (2014) affirming that approaching STEAM is not too difficult for preschoolers because children are always persistent and show their interest when giving ideas, always trying to overcome difficulties that arise. according to their will during operation [8].

Nancy K. Dejarnette (2018) argues that children can exchange, discuss plans and give ideas for simple technical designs. Developing children’s creativity and problem-solving, scientific inquiry, and critical thinking, promoting other cognitive processes [9].

Research on the process of organizing STEAM activities for preschool children focuses on specific steps from identifying topics and goals, creating an environment, and guiding children to evaluating the effectiveness of the activity.

Zhang Mengmeng, Yang Xiantong, and Wangxinghua (2019) presented a process for designing STEAM educational activities including 5 steps: topic selection, goal setting, setting environment, guiding young children's activities, assessment, and regulating activity [10].

English LD, King.D (2015) argues that the overall goal of STEAM education is to create an understanding of the steam industry, and at the same time create interest and active participation of learners in this field by put learners in meaningful learning situations, closely related to their living environment and applicable [11].

According to Alice A. Christie (2016), a STEAM consultant in the US, there are 8 characteristics of STEAM: cross-program approach, technology integration, project-based learning and problem-solving, learning inquiry-based learning, career and university preparation, accurate and relevant programming, innovative learning environments, and high levels of student engagement [12].

Dejarnette, NK (2018) argues that the commonly used teaching methods for STEAM education are project teaching, design-based learning, science-oriented 5E processes, and blended learning formed by the cross-integration of different methods [13].

When et al. (2018) argue that regardless of the model, the STEAM classroom has six elements in common: real-life situations, core problems, design plans, implementation plans, improvement plans, communication, and product presentation [14].

In Vietnam, STEAM education in general and STEAM education for preschool children have been studied by many scientists such as Nguyen Huu Hau, Tran Viet Cuong, Tran Trung Tinh, Hoang Thi Phuong, Nguyen Tuan Vinh, Dang Ut Phuong, Hoang Quy Tinh, Nguyen Thi Bich Thao, Nguyen Thi Huong. The teacher training documents of the University of Pedagogy 2 and the Central College of Pedagogy agree that STEAM education for preschool children is a necessary prerequisite to help children prepare necessary skills for STEAM activities at all school levels. Next, the authors pointed out some specific ways and activities to educate STEAM for preschool children. Hoang Thi Phuong in the study "Features of STEAM education for preschool children" has analyzed preschool children's ability to approach STEAM components, how to combine these elements in children's activities, and notes when designing preschool educational activities. From there, it is possible to creatively apply the STEAM educational model to the educational process of children at different levels depending on the conditions of each school [15].

Tran Viet Nhi, Nguyen Tuan Vinh, and Nguyen Thi Bich Thao in the article "Strengthening STEAM educational capacity for preschool teachers" have proposed the content and form of STEAM capacity building for preschool teachers. including the cognitive capacity of STEAM education, the capacity to organize STEAM educational activities, and the capacity to evaluate STEAM educational activities [16].

Dang Ut Phuong and Hoang Quy Tinh with the article "STEAM awareness capacity of preschool teachers to meet the requirements of educational innovation". The authors have proposed specific ways to improve the awareness of STEAM education for preschool teachers [17].

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2.2. Overview of awareness of the surrounding environment and reasoning characteristics of 5-6-year-old children

The reasoning of 5-6-year-old children is generated when they encounter situations that cause some troubles and they base on dealing with those situations to develop. [19]. The reasoning of 5-6-year-old children is still full of emotions, unstable, and sometimes unlogical. This is proportional to their life experience, language as well as to their own practical experiences [20]. Children 5-6 years old may think about the mentioned object and maybe beyond their ability, experience in real life or not relevant to their own experience but they already know through stories [21].

5-6-year-old children can perform reasoning in three ways: deductive reasoning, inductive reasoning, and similar reasoning. Depending on children's knowledge and experience about each specific object, they

will use different types of reasoning. The reasoning ability of 5-6-year-old children is shown in deductive reasoning which is more logical and appropriate than inductive SL and similar SL. Because these reasoning patterns in children are easily influenced by similar external factors, not the nature of the subject [22].

Reasoning in 5-6-year-old children begins to be realized by internal language and is revealed to the outside quite clearly by appropriate conclusions that can be expressed in the verbal or non-verbal form (images, symbols). There is a close relationship between reasoning and language. In children with developed language, actively participating in the communication process, it is easier to make correct premises, close arguments, and lead to more logical conclusions and vice versa [23].

Thus, the reasoning ability has been clearly expressed in 5-6-year-old children and has its characteristics. Although the reasoning is based on external, intuitive signs and has difficulty when reasoning about relationships, internal attributes, the novelty of things, and phenomena. If we give appropriate education and attention, the reasoning ability of 5-6-year-old children will be increasingly developed.

2.3. Standards of awareness about the surrounding environment of 5-6-year-old children

On July 23, 2010, the Ministry of Education and Training of Vietnam issued a Circular promulgating the Regulations on the development standards for 5-year-old children with 02 standards and 07 indexes on cognitive standards of 5-6-year-old children about the surrounding environment as follows:

Standard 20: Children show some knowledge about the natural environment: (1) Index 92. Name groups of plants and animals according to their common characteristics; (2) Index 93. Recognize changes in the development of plants, animals, and some natural phenomena (4) Index 94. Say some outstanding features of the seasons of the year where children are living; (5) Index 95. Predict some simple natural phenomena that are about to happen. Standard 21: Children show some understanding of the social environment: (1) Index 96. Classify some common utensils according to their materials and uses; (2) Index 97. Name some close public places where the child lives; (3) Index 98. Name some popular occupations where children live [24].

3. Research method

3.1. Research Methods

Theoretical research methods: a review of related documents, statistical methods, document analysis, and generalization to build the methodological basis of reasoning ability of 5-6-year-old children, process and content of environmental awareness education by STEAM. method STEAM modeling method: research based on STEAM general education model in education to deploy and organize activities to develop reasoning ability for 5-6-year-old children in preschool. Experimental method: To test the effectiveness of the model, we conducted a case study at a preschool, in Hanoi city.

3.2. Case study

With 60 preschool children at Hoa Hong Experimental Kindergarten, including 30 children in the control group and 30 children in the experimental group. The author used a survey to collect raw data. The results obtained and analyzed are integrated with other research methods (observation, interviews, etc.) to make necessary and accurate scientific conclusions).

3.3. Research steps

Step 1: Literature review

Step 2: Establish the scientific foundation for developing the reasoning ability of 5-6-year-old children through STEAM education

Step 3: Evaluate the effectiveness of the model for developing reasoning ability for 5-6-year-old children through STEAM education

Step 4: Test the model of developing reasoning ability for 5-6-year-old children through STEAM education through a project

Step 5: Propose the model development plan

4. Results

4.1. Reasoning ability of 5-6-year-old children

4.1.1. Concept of reasoning ability of 5-6-year-old children

According to Hoang Phe (2010) in the Vietnamese dictionary, a possibility is something that can appear or can happen under certain conditions. Thus, the reasoning skills of 5-6-year-old children will appear and be expressed to the outside through different activities when meeting favorable conditions.

According to psychology: The ability to reason is something that people have through absorbing historical and social experiences and expressing them outside by making conclusions about surrounding things and phenomena.

According to pedagogy: The reasoning ability of 5-6 year-olds children is considered as the initial manifestation of the child's reasoning ability, helping them to carry out learning activities later in high school. Thus, in essence, the reasoning ability of 5-6-year-olds is something that can be quantified.

From the above analysis, we believe that the reasoning ability of 5-6-year-olds children is the expression of the thinking process, applying the knowledge and experience that the child has accumulated inside to the outside by the results. argue in a deductive, inductive, analogous manner or by appropriate gestures or posture.

4.1.2. Reasoning structure of 5-6-year-old children

Reasoning is an action in the brain that is expressed externally by words, actions, gestures, and gestures. Therefore, the inferential structure includes speech, the logical sequence of operations when acting, the processes that regulate the action, the pace of execution, and the time structure. To be able to reason, 5-6-year-old children need to have appropriate knowledge and life experience. The usual structure of inference is as follows:

In terms of form: Any inference consists of three components: premise, argument, and conclusion:

A premise consists of pre-existing statements that are used to link together to derive new judgments. Each inference can have one or more statements that are closely related.

The argument is a way of making logical connections between given statements to derive new judgments. The association of arguments in 5-6-year-old children governs the truthfulness and logic of new judgments.

A conclusion is a new judgment drawn from the premise through logical arguments. There is a relationship between the premises and the conclusion. The correctness of the conclusion depends on the correctness of the premises and the correctness of the argument. Therefore, there are appropriate conclusions, there are inappropriate conclusions, and there are conclusions that are coincidental.

According to Nguyen Nhu Hai (2011) in the Textbook of General Logic, Education Publishing House, Hanoi, an inference is considered correct when it ensures three conditions: it must have all the premises. The premises must be true and the reasoning process must follow the

logical rules and laws of specific arguments. When one of these conditions is violated, the child cannot make valid, true, and logical inferences.

4.1.3. Criteria for assessing the reasoning ability of 5-6 years old children

• Based on the above-mentioned expressions of reasoning ability of 5-6-year-old children, the assessment of children's reasoning ability should be done specifically through 4 criteria:

• Criterion 1: Children can recognize the object of inference through

• Specific characteristics, external visual

• Abstract feature inside

• Criterion 2: Children discover logical problems (make a statement about the problem)

• Criterion 3: Children demonstrate the ability to reason through

• Identify cause-and-effect relationships

• Can classify objects

• Sort by rules

• Criterion 4: Expression of reasoning ability by spoken language or gestures, gestures

4.2. STEAM activities with developing reasoning ability for 5-6-year-olds

4.2.1. Features of STEAM activities for 5-6-year-olds

STEAM is an activity that always attracts the attention, interest, and positive attitude of 5-6-year-olds because it satisfies the curiosity and the need to experience and explore the surrounding things and phenomena. of children. In particular, children are very active in STEAM activities with many practical experiences with real objects or with simple and interesting science experiments. Children begin the idea of STEAM by always questioning the world around them. For example: "What are the outstanding features of the summer?", "Why do cars run?"

STEAM focuses on experiences in children's activities in preschool and is suitable for children's characteristics. Children at this age develop intuitive thinking and start forming thinking maps, so STEAM activities help children exploit the strengths of activities and thereby develop children's thinking abilities.

Children participate in STEAM when they already have some incomplete information about things and phenomena. Children observe, experiment, and explain, exchange, and discuss their understanding in different ways of what they observe. In particular, through STEAM activities, children realize that the world can be discovered through their investigations and discoveries.

STEAM activities in 5-6 years old children are different from STEAM activities of adults in their academic nature, complexity, and novelty of activities. STEAM for 5-6-year-olds is about discovery, and rediscovery and must always be associated with specific visual aids, tools, or real objects. Most of the content of children's STEAM activities are close objects and phenomena around the child. Before the object is discovered, 5-6 years old children apply their knowledge and experiences about that object to conclude things and phenomena. Therefore, these conclusions are often intuitive and emotional.

Thus, with the above characteristics and advantages, STEAM activities are one of the effective means to educate and develop the reasoning abilities of 5-6-year-old children.

4.2.2. Content to develop reasoning ability for 5-6-year-olds through STEAM. activities

Reasoning ability is a specific area in the human mind in general and 5-6 years old children in particular. Based on the content and expected results in the ECE Program [29], the Development Standards for 5-year-olds [24], and based on the development characteristics of 5-6-year-old children, the requirements for children when entering In grade 1, this study builds the content of developing literacy skills for 5-6-year-old children in association with the children's practical activities, specifically as follows:

Increase knowledge and experience, build correct and logical premises with increasing quantity and quality of premises.

Teach children how to implement SL in a deductive, inductive, and similar way to ensure logic and correctness.

Teach how to make different arguments using words or actions to express opinions logically and ensure accuracy by:

+ Using and coordinating the senses to observe, compare, classify, and group objects with characteristics, similarities, and differences to conclude surrounding things and phenomena at different levels. concrete, abstract, direct, or indirect.

+ Recognize cause-effect relationships and other relationships of surrounding objects. Find out the correlation between objects.

+ Identify transitive relationships between specific objects.

+ Detect sorting rules and sort by rules.

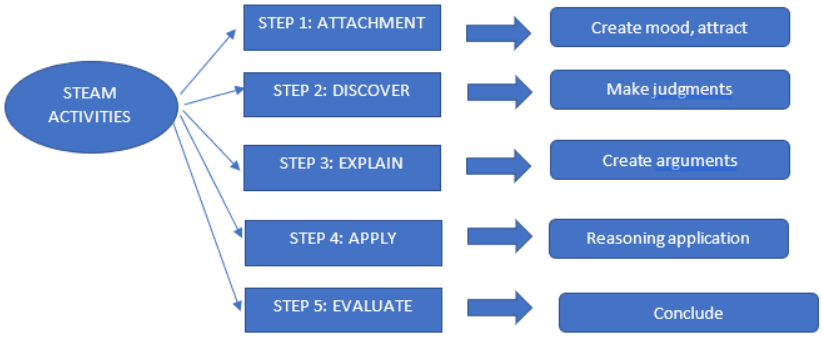
+ Explain and find the cause of things based on visual evidence.

+ Overcoming limitations in children's learning: lack of knowledge to build premises, lack of arguments or arguments that are not logical, cannot draw conclusions or emotional conclusions, are inaccurate.

4.2.3. Model of developing reasoning ability for 5-6 years old children through STEAM activities

Based on the theory of organizing STEAM activities for children of Dejarnette, N.K (2018) [13], characteristics of the reasoning ability of 5-6-year-old children, we propose a model of developing reasoning ability through activities. STEAM action is as follows:

Stage1: Engagement - create mood, attract



Purpose: To help children get excited about the content of the activity, arouse curiosity, and attention, create a need to learn about the topic of the lesson and make children interested or even nervous about the topic.

Help children make connections, making connections from what they know with the problem to be solved.

In this step, the teacher encourages the child to find the answer to the question he posed or the problem he wants to solve. This creates motivation and interest for children to participate in the activity.

Suggested activities:

In this step, the teacher can:

Show children a phenomenon that raises curiosity and creates specific problems, providing meaning, purpose, and focus for the rest of the lesson activities. Direct your child to a topic that needs to be discussed. Example: Introduce children to balance by prompting them to talk

about activities such as a seesaw, a balance, or through physical activity: standing on one leg, etc.

As such, the goal of this phase is to generate questions to be answered or to identify specific problems that need to be addressed. Once this goal has been identified, children will be interested in participating in activities to find answers to the questions posed and to find solutions to problems. It is a fluid and smooth transition to the next stage: the discovery and solution phase.

Stage 2: Discover – Make judgments

The purpose of this step is to collect or generate as much data or information related to the above answer/problem as possible. Exploration activities should be designed, selected, or defined in a way that allows the child's active participation (both hands-on and thinking) rather than passively following the teacher's instructions.

This stage should be designed to encourage children to actively participate in exploration and discovery, making arguments about the scientific knowledge of the problem posed by different forms: using tools to search for network resources (Information Technology) participating in experiments, experiments to thoroughly understand and clarify scientific knowledge, collect information from storybooks, games, or storybook applications on the Internet by computer, iPad, smartphone.

This is a step to provide children with scientific knowledge. It is usually best done through specific activities of scientific exploration of the surroundings. In science discovery activities, children are provided with basic knowledge related to the project they are about to embark on. Therefore, the core point of this step is that she must help the child answer the questions and make judgments from them: Why...? How...? to help children understand the nature of the problems they are investigating.

Suggested activities: Experiment; Observe; Test; Read a book; Take notes with symbols, models, and diagrams.

The judgment generation phase should focus on generating data/information and testing ideas and accuracy rather than providing explanations or answers.

Stage 3: Explain – Create Arguments

Purpose: To help children synthesize new knowledge and create precise arguments to further clarify the concepts and processes they are learning. Teachers create conditions for children to present, describe or analyze the experiences obtained in the discovery and solution step. Teachers provide new concepts and skills to children.

This is the stage when the teacher plays the role of controlling and directing and correcting knowledge for children. Based on the knowledge and experiences that children have gained from the previous step (Step Making judgments), teachers encourage and prompt children to speak out. On that basis, the teacher corrects the children's wrong or incorrect knowledge. During this stage, teachers should provide specific, precise concepts by presenting them on the board or with pictures to help children remember what they have just learned.

This is the stage where all the data/information that the child has collected from the previous stage is applied to clarify the concepts, meanings, and scientific knowledge of the things and phenomena that the teacher is directing. children come. Teachers introduce children to simple science concepts by providing new vocabulary; formulating definitions, explanations, and answers to questions, or ways to scientifically solve specific problems. Typically, this is a period when teachers can use interactive lectures and discussions to help children understand lesson topics, see their connection to real life, and assess associations and interdependence of Steam disciplines in problem-solving.

For preschoolers, teachers need to present scientific concepts in the form of diagrams. That helps to form children's visual memory for scientific concepts.

In the process, the teacher needs to ask the children to present or share what they have discovered/observed/gathered during Discovery. Ask prompting questions and encourage the child to express his or her thoughts from the information they have just received. At the same time maintain an interactive learning environment in which children actively participate in providing information instead of just passively receiving information. The goal of this stage is to develop the child's understanding of the design themes in the lesson and work toward how to apply them in life. When children have grasped scientific concepts and knowledge, they are ready to put that knowledge into practice. That's the move to step 4: Design.

Stage 4: Apply- Apply to reason

Purpose: Children apply arguments to creating products, and developing new knowledge and skills. At this stage, children may be asked to answer new questions, and solve new problems based on concepts learned. For example, a new research project, the design of a new experiment, the design of a new model, or a defined task to apply learned concepts are posed. In this step, teachers need to help children come up with ideas based on what they have learned.

Children can also turn arguments into products by design. After the child has finished the design, the child needs to actualize the design. Example: The caterpillar will be sent away in a box. Children need to punch holes to make windows so that there is enough air for the caterpillars to breathe... Children need to prepare a sleeping place for the caterpillars in the box,... All are put in the box. That's when the project is complete.

In that process, teachers need to observe and be ready to support children when they have difficulties. Teachers observe and help children by asking questions for children to think to figure out how to do it instead of doing it for the child or showing the child how to do it.

Stage 5: Evaluation – Conclusion

Purpose: Assess the child's knowledge and skills, the process of which the child works by both the teacher and the child himself in the form of a test or as a quick question. Children will summarize whether their arguments can be applied or deployed in practice.

This stage encourages children to self-assess their knowledge and abilities and provides an opportunity for teachers to evaluate their participation in learning activities toward achieving the educational goals of the lesson. The teacher asks the children to display their products and introduce their group's products. This helps develop presentation skills in children.

Teachers should pay attention:

The assessment is not to evaluate the child or evaluate the child's product by comparing the products of this group with another group, this child, or another child, but the child evaluates himself and understands the operation steps and knowledge. that children get after the activity. Children need to close their inferences and arguments, what is their meaning of them? It helps children change how they explore the world around them.

4.3. Evaluate the effectiveness of the model for developing reasoning ability for 5-6 years olds children through STEAM activities

The experimental procedure was carried out in two specific stages as follows:

- Stage 1: Preparing for the experiment

Step 1: Determine the purpose of the experiment

+ Step 2: Determine the content and scope of the experiment

+ Step 3: Determine the standard and scale of experimental results

+ Step 4: Develop a plan to organize the experiment

- Phase 2: Experimental implementation

+ Step 1: Experimental survey

+ Step 2: Carry out the experiment

+ Step 3: Evaluate the results after the experiment

+ Step 4: Analyze the results after the experiment

Experiments were carried out on 60 preschool children at Hoa Hong Experimental Kindergarten, in which there were 30 children in the control group and 30 children in the experimental group. The author used a survey to collect raw data. Collected and analyzed results are integrated with other research methods (observation, interviews, etc.) to make necessary and accurate scientific conclusions).

Looking at table 3.3 shows that the general average of the reasoning ability of 5-6-year-old children of the experimental group after the experiment is 2.125 points, which is much higher than that of the control group, which is 1,325 points.

The results of the levels showing the children's reasoning ability are shown as follows:

	EXPRESSION	**GROUP**	**LEVEL**							
			Good		**Rather**		**Medium**		**Feebleness**	
			Quantity	%	Quantity	%	Quantity	%	Quantity	%
1	Children recognize inferred objects	Experiment	10/30	33.33	15/30	50.00	5/30	16.67	0	0.0
		Contrast	3/30	10.00	12/30	40.00	13/30	43.33	2	6.67
2	Children discover logical problems	Experiment	9/30	30.00	17/30	56.67	4/30	13.33	0	0.0
		Contrast	2/30	6.67	15/30	50.00	11/30	36.67	2	6.67
3	Children show reasoning ability	Experiment	9/30	30.00	17/30	56.67	4/30	13.33	0	0.0
		Contrast	2/30	6.67	14/30	46.67	12/30	40.00	2	6.67
4	Expression of reasoning ability by spoken language or gestures, gestures	Experiment	10/30	33.33	15/30	50.00	5/30	16.67	0	0.0
		Contrast	3/30	10.00	12/30	40.00	13/30	43.33	2	6.67

*Experiment (E); Contrast (C)

Looking at table 3.4, there is a clear change in the children of the experimental group after the experiment compared with the control group. Children in the experimental group with children were assessed mainly at the good level and the good level, there were no children at the weak level. However, children in the Control group were mostly average and weak.

After the application of STEAM, my reasoning ability increased markedly. Children recognize inferred objects, discover logical problems, and demonstrate the ability to deduce from features and

details leading to the results of the object. Especially the expression of reasoning ability by spoken language or gestures, gestures.

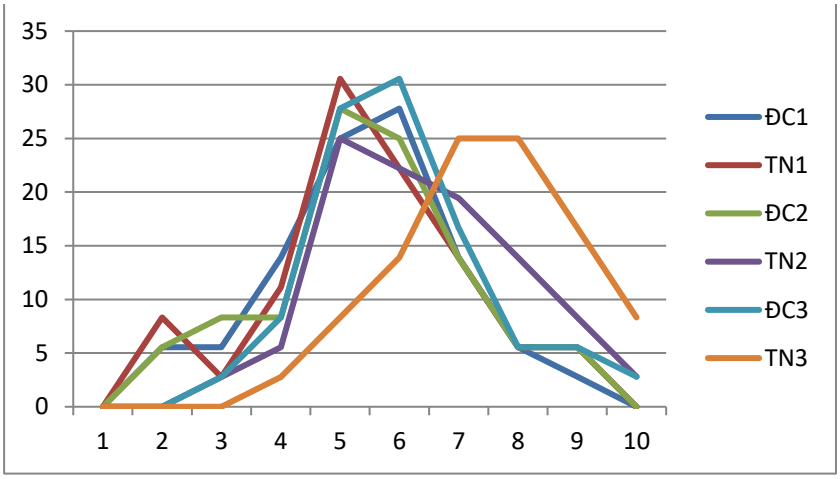
In the Control group, the majority of children reached the average level, the percentage of children who reached the weak level before the experiment had not improved, and many indicators reached a low level, still at the average score from 1.63 to 2.00 points. Thus, compared with before the experiment, the expression of children's reasoning ability did not change significantly, the average score in general increased, but the increase was very small and uneven in most of the indicators.

In the experimental group, the measured results after the experiment showed that the children's reasoning ability had achieved very significant development steps. Which, all children participating in the experiment had an average score of 2.70 to 3.57 points. In particular, there were no children showing signs of weak reasoning ability. Most of the expressions of reasoning ability have a good average score. If before the experiment, none of the children showed good reasoning ability, then after the experiment, many children achieved good levels in making intuitive inferences about the external characteristics of the object, making inferences. logical, showing cause and effect, classifying and arranging objects according to rules, and explaining their classification and arrangement.

The results of the Independent Samples Test show that: The standard deviation (standard deviation) of the mean scores of the control and experimental groups is quite similar. For example: In the Control group it was .431 compared to the experimental group was .563. That means there is a difference in the results of the Control group compared with the experimental group. The results of the standard error (Std. Error Mean) between the two groups of control and experiment are different: .056 compared with .073; .050 versus .063… This result shows that there is a difference in the expression level of reasoning ability between the control group and the experimental group after the experiment. This can confirm that after the experiment, the expression of reasoning ability of the children in the experimental group has markedly improved and is relatively uniform. In summary: There is a difference between the experimental and control groups in terms of inference ability due to many different factors, in which experiment is the influencing factor with a large weight.

To evaluate and verify the pedagogical experimental results, the author analyzes the frequency of the results obtained through 3 tests during the experimental period (4 months). The results are shown in the following chart:

Chart 3.1. Frequency distribution of inference ability over 3 tests



The chart analysis shows:

Control group: After 3 times of testing, the results of the number of tests with scores from 4.5 to 6.5 (always staying above 20%) accounted for a fairly high percentage and a score of 8 to 10 scores are very low. On the other hand, the frequency curve of the control group across the tests is not large and quite uniform.

Experimental group: The test results showed that the scores were higher than the control class in all 3 tests and the results tended to increase, especially in the 3rd trial. This result shows that the positive effect is positive. extremes of the measures proposed by the author.

The frequency curve of the experimental group is roughly symmetrically distributed around the mode value = 6.5 points (The frequency line of the experimental group is below the frequency line of the control group at the interval < 6.5 and above the frequency line of the control group). rate of the control group at the range > 6.5). This proves that the experimental group has accumulated knowledge and reasoning skills through the tests. Thus, the model experiment has had a positive impact on the effectiveness of the formation and development of the reasoning ability of children participating in the experiment.

Judging by observation:

The results of pedagogical experiments have shown a clear improvement in the reasoning ability of 5-6 years old MG children through the results of comparison of measurements before and after the experiment as mentioned above and through specific manifestations of Children in the experimental group and the control group such as:

+ In the control group, the observed results showed that the children's expressions of reasoning ability were unstable and uneven, and there was no obvious improvement compared to the time before the SP experiment. Most children are still shy, still afraid of being wrong, and passive in giving their personal opinions. The limitations in the children's inferences have not been overcome such as Limited quantity and quality of premises, lack of logic, the reasoning is still subjective, emotional...

+ In the experimental group, all children are very active, children like to give their own opinions and comments, and have their arguments about things and phenomena without worrying or worrying about their own opinions. whether it is right or wrong. Children have had real experiences during STEAM activities. Children have been encouraged to experience and speak for themselves about the results of the experience, the activity is not results-oriented, but has paid more attention to the process of children's experience. Therefore, children are very excited to conclude things and phenomena. Children can both play and speak their reasoning in a deductive or inductive way.

During the experiment, children in the experimental group were interested in creating inference premises through increased observation, increased participation in STEAM activities, through closed STEAM projects with other forms. such as: going on a tour of your family so that your child can gain more knowledge and experience about your household appliances, learn about materials for making utensils, etc. In STEAM activities, children were bold and proactive. more in asking questions to answer and making inferences about surrounding things and phenomena in both deductive and inductive ways. Accordingly, the children who were shy before the pedagogical experiment and depended heavily on the guidance and support of teachers gradually became bolder and more confident. Children no longer hesitate to ask questions and provide answers during STEAM activities. Children can experience more diverse forms of STEAM, and can implement STEAM projects, simple designs, and manufactures not only in the classroom but also in the corridors, playgrounds, and parks...During the process. In STEAM activities, children are allowed to express their thoughts, although that thinking is not always correct, thereby promoting children's reasoning ability.

In general, the children's reasoning ability in the experimental group showed signs of positive development through such expressions as Children are self-conscious, actively making inferences about STEAM objects, and inferences are not based only on STEAM objects. on objects that are directly observed in the activity, but also related to the internal characteristics, the nature that is not directly observable of things and phenomena. Children know based on known knowledge to

make new conclusions about things and phenomena. Children can make their reasoning very funny.

Thus, the experimental process is strictly carried out and brings positive results. The experimentation of BPs who develop reasoning ability for 5-6-year-old MG children through STEAM activities has shown that the reasoning ability of 5-6-year-old MG children can be fully developed through the organization of appropriate STEAM activities. fit. This poses new requirements in the research and application of BPs to develop reasoning ability for 5-6-year-old MG children through systematic and large-scale STEAM activities to improve the quality of care and education. Educating MG 5-6-year-olds.

5. Discussion

Reasoning ability is a form of thinking expression of 5-6 years old children. Learning skills are very important and necessary to help children adapt to social life and develop comprehensively. At MN, STEAM is an activity with many advantages in helping children develop literacy skills. Developing self-study skills for 5-6-year-old children through STEAM activities is the process of educating children in STEAM activities so that children can actively think and apply accumulated knowledge and experiences to strengthen and correct the activities. premises, arguments, and conclusions about the world around them form the basis for effective learning. Accordingly, to develop literacy skills, children need to experience the diversity of the world around them through their senses, classify and learn about cause-effect relationships, bridging relationships in the world. things and express self-efficacy with appropriate words or gestures. Teachers can organize many STEAM activities with many topics/projects to attract children's participation and help children develop reasoning abilities in daily life. Below is an example of applying the model of developing the reasoning ability of 5-6-year-old children through STEAM activities in Figure 1.1. Teachers can be flexible in activities or change activities to ensure the effectiveness of the model.

Project: Protecting Wildlife – Are Kaola Koalas in Danger?

Activity 1: Suggestion - Create a mood, attract

In this activity, the teacher uses visual methods such as pictures, photos, and videos about Kaola koalas. In this work, the teacher combines dialogue, leading, and engaging children in the purpose of the project, which is to find out what dangers Kaola koalas are facing.

The content of conversational questions in this section focuses on leading children to identify problems and activities. From there,

children will determine the purpose of the activity on their own. In this part, teachers need to pay attention to using open-ended questions, questions with multiple answers so that children can freely express their thoughts and gradually identify the problem to be solved.

Activity 2: Make judgments

When the children identify the problem to be solved, in this step, the teacher conducts the children to learn and discover about the Kaola koala through the use of media such as pictures, photos, videos, and stories,… In the process of children's exploration and discovery, teachers can use conversational methods combined with visual diagrams to represent children's judgments related to risk factors that are dangerous to koalas. Kaola. Teachers can use the question: Why are there so few Kaola koalas? How do you know this information?, Wat do you think could be dangerous for the Kaola koalas? As the child responds, the teacher summarizes the child's answer using a visual mind map for the child to record the judgments the child makes. Eg:

Figure 2: Diagram of conversations with children about the dangers that Kaola koalas are facing

In addition to the images the teacher has planned and prepared, the teacher can prepare additional markers and white paper to quickly sketch other judgments of the child. Those judgments may be right or wrong, the teacher should accept all of the children's judgments and

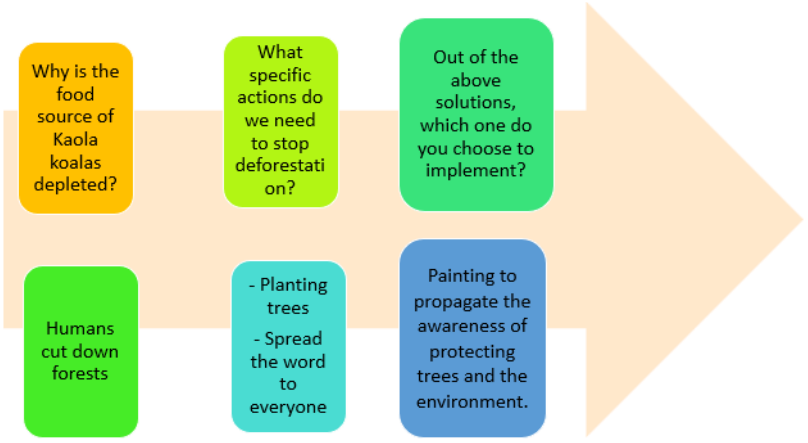
organize for the children to learn and prove that the judgments they make are correct.

Activity 3: Create arguments

After the judgments are established, the teacher organizes for the children to explore and discover to prove the judgments they make. In this step, the teacher focuses on the process of leading the children to prove the above statements. Teachers can use several questions to guide children to argue for the judgment that the pandas do not have food because of human deforestation such as: Why is the food source of Kaola koalas depleted? How to help Kaola koalas improve their food sources? To stop deforestation, what specific actions do we need?, ... or questions for judgment The number of bears is decreasing due to human hunting activities: How to reduce bear hunting in forests? How do you guys help keep bears from being hunted by humans? How do you plan to implement that idea?...

For example, to come up with an idea to make a poster, the teacher leads the children to reason as follows:

Figure 3: Suggesting the sequence of questions to lead children to reason



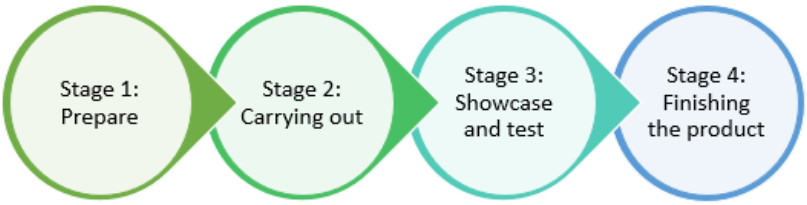
With guiding questions, leading children into the above reasoning process, we will elicit children's ideas about how to solve problems. From there, the children will point out one or several specific solutions to the problem to be solved such as: Planting trees to cover the forest, making banners, and slogans to propagate people not to destroy forests or designing a cheering dance. protect the habitat for Kaola koalas, ...

Activity 4: Using reasoning

On the basis that children can give their arguments and propose certain solutions to contribute to the protection of Kaola koalas, the teacher proceeds to let the children work together to realize that idea. When children perform, teachers always observe, suggest, and support children when needed. Teachers are always cheerleaders, encourage children, and are open to accepting all failures when children realize their ideas. At the same time, teachers see it as an opportunity for children to learn. In this reasoning activity, children realize their solutions in several forms such as pictures, dances, models, tables, diagrams, plays, etc.

To implement the solution, the group of children needs to plan whether they will also use inference to organize the process of creating the product such as:

Figure 4: Inferential organizational plan for problem-solving



Activity 5: Conclusion

With this activity number 5, the teacher organizes for children to display, perform and give presentations about the products they have realized in step 4. This is a very important activity because it is an activity to help children self-assess consolidate and deepen his knowledge of some of the actions to protect Kaola koalas.

In this part, the teacher organizes groups of children to give suggestions and comments on the product of their friends. From there, the teacher summarizes and guides the children to complete the product. More importantly, after the process of exchange and discussion, children know how to self-assess the right - wrong, reasonable - unreasonable, ... of the arguments they make. From there, children repair, change and supplement their products by themselves.

6. Conclusion

To develop abilities for 5-6-year-old children through STEAM activities, preschool teachers need to constantly be fully aware of the purpose,

role, and importance of developing literacy skills for 5-6-year-old children. through the STEAM Council. Firmly grasp the model and apply it effectively. In addition, preschool teachers need to be fostered and strengthen the capacity to organize STEAM activities effectively and flexibly in coordination with other educational activities to develop life skills for 5-6-year-olds. At the same time, preschool teachers must also exploit and creatively use appropriate materials, tools, and toys to build an open STEAM activity environment, creating conditions for children to learn effectively. Especially, preschool teachers need to have close cooperate with parents in developing literacy skills for preschool children 5-6 years old through activities at school as well as in the family.

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