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The status of the education of science for children aged 5–6 in some central Vietnamese public preschools

VIET-NHI TRAN*, TUAN-VINH NGUYEN, KIM-NHUNG TA THI and NHUNG LE THI

University of Education, Hue University, Vietnam

RESEARCH ARTICLE

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ABSTRACT

The study aims to determine the status of organizing science activities for preschoolers aged 5–6 and teachers' views on improving science education quality for 5–6-year-olds in Vietnam. The research was undertaken on 150 preschool teachers working with 5–6 years old classes in 24 public preschools in 3 provinces, including Quang Binh, Quang Tri, and Thua Thien Hue. Mixed methods, including surveys, interviews with teachers, and observation of science discovery activities, were used. According to the study results, science education activities were regularly organized in the preschools with specific plans following the school-year curriculum and the national ECE framework of Vietnam. Teachers used various methods and forms for organizing scientific activities, but the classroom environment was dominant. The participation of family and society in science activities at preschools was limited. Teachers also highlight some measures to improve the quality of science education in preschools, including providing necessary facilities, equipment, toys for preschools and increasing modern teaching methods. The findings of this study provide necessary evidence on science education for preschool children in practical terms as the basis for further studies on solutions to improve the efficiency of science education for preschool children in Vietnam.

KEYWORDS

science education, preschool teachers, science discovery, 5–6-year-olds, Vietnam

* Corresponding author. E-mail: tranvietnhi@hueuni.edu.vn

INTRODUCTION

Vietnam has an ancient history of education, and Vietnamese people have high respect for learning. However, early childhood education (ECE) in Vietnam has been the main concern since 1945 (Thao, 2021) after achieving independence and the establishment of the Democratic Republic of Vietnam. ECE is the initial stage in the Education System of Vietnam, implementing for 3-month-olds to 6-yearsolds with the general objective of "Helping children develop physically, emotionally, intellectually and aesthetically, forming the first elements of personality, preparing children for first grade; forming and developing in children psycho-physiological functions, fundamental competencies and qualities, necessary life skills appropriate to their age, arousing and maximum development of latent abilities, placing the foundation for further learning and lifelong learning" (Education law, 2019; Ministry of Training and Education, 2017). To achieve the goal, the current Vietnamese ECE framework curriculum focuses on educational activities towards child-centred, themed-integrated and increasing children's experiences to help them develop comprehensively five areas: physical, cognitive, language, social-emotional and aesthetic.

Science education plays an essential role in cognitive development and the comprehensive personality development of preschool children (Roth, Mafra, Maria, & Plakitsi, 2013; Watters, Diezmann, Grieshaber, & Davis, 2000). Therefore, it has been mainly focused on researching and implementing the ECE curriculum of most countries over the world (Andersson, K. & Gullberg, A., 2014; Conezio & French, 2002; Roth et al., 2013). In Vietnam, science education has been frequently implemented in kindergartens through play, purposeful learning activities, festivals, tasks and daily activities (Nga, 2019; Oanh & Xuan, 2014; Phuong, 2020; Thanh, 2015). The instruction of science discovery for preschool children has been included in the Vietnamese ECE framework for a long time. Its names and approaches had been changed from time to time, such as "Recognize and practice speaking" (since the 1960s), "Learning about the surrounding and practice speaking" (1975–1980), "Getting children acquainted with the surrounding environment" (1980–2009), "Science discovery" (2009 to present) (Oanh & Xuan, 2014). In the current National ECE curriculum of Vietnam, science discovery activities for children 3–6 years old are in the field of cognitive development with aimed at: (1) Curiosity, love to explore and explore surrounding things and phenomena; (2) Having the ability to observe, compare, classify, judge, pay attention, and memorize intentionally; (3) Able to detect and solve simple problems in different ways; (4) Able to express understanding in different ways (by actions, images, words) with spoken language mainly; (5) Having some initial understanding of people, things, and phenomena around (MoET, 2017). Especially for 5–6-year-old children, the knowledge and cognitive skills acquired in science education activities will prepare the necessary psychological functions to confidently enter the period stages where the main activity is learning (Nga, 2019; Phuong, 2020; Thanh, 2015).

Most researches on science education in ECE asserted that for preschoolers, science is not only knowledge but also a process or path to learn and explore the surrounding world (Adbo & Vidal Carulla, 2020; Nga, 2019; Ngoc-Tram & Nga, 2015; Rochel & Kimberly, 2004; Watters et al., 2000). Scientific discovery is the process of understanding and discovering the world around children based on the living experience that children have accumulated. When engaging in science discovery activities, children must coordinate many senses, use skills of observation, comparison, classification, judgment, inference to participate in the process of practical

experience and interact with the world around them. It is necessary to create an attractive, safe and suitable environment to stimulate children to explore actively, discover and solve problems reasonably in organizing science discovery activities (Adbo & Vidal Carulla, 2020; Nga, 2019; Ngoc-Tram & Nga, 2015; Rochel & Kimberly, 2004; Watters et al., 2000). Therefore, teachers also need to focus on supporting children to develop the following skills: observing, comparing, classifying, measuring, judging, making predictions, solving problems, exchanging, discussing and drawing conclusions about things. Simultaneously with the training and development of these skills, teachers must train children's social skills and educate children in scientific attitude to the world around them (Adbo K. & Vidal Carulla, C., 2020; Nga, 2019; Phuong, 2020). In addition to the cross-cutting point of the Vietnamese ECE curriculum, the effectiveness of organizing science activities for children in preschool is also influenced by many different factors such as approach, teacher's educational capacity, the direction of educational administrators, school facilities, and the involvement and support of parents and social forces (Nga, 2019; Phuong, 2020).

Infact, research on science education for preschool children in Vietnam is not too abundant and mainly revolves around a few authors. Most research focused on measures to organize science discovery activities for 5–6-year-olds in the direction of child-centred (Hong, 2011; Ngoc-Tram, 2013; Oanh & Xuan, 2014; Tuong-Van, 2013), and providing guidelines for organizing scientific discoveries activities at preschools through the construction of simple experiments for children about inanimate nature, soil, water, air, light and the animal and plant world (Ngoc-Tram & Nga, 2015; Phuong, 2015; Thanh-Thuy, 2007). Some researchers considered science education as a means to educate and develop comprehensively for 5–6-year-old children by building a bank of specific scientific discovery activities and guiding preschool teachers in organizing science discovery activities for children in a diverse way and create opportunities for children to participate in practical science discovery activities (Ngoc-Tram, 2013; Oanh & Xuan, 2014; Thanh, 2015). The others researched on training children's cognitive skills (Nga, 2019) and language skills (Ngoc-Chau, 2018) through scientific discovery. The above studies have shown the role of science discovery activities in children's cognitive development as well as comprehensive development and used it as an effective means of education. They tends to focuses mainly on "what to teach" and "how to teach" science in preschool. It has been observed that there is a lack of specific evidence regarding an overall view of the general situation in implementing science education for children aged 5–6 at at preschool institutions, especially in central Vietnam. The article focuses on finding out the current situation of teachers' selecting contents, methods, forms, and the participation of social forces in science education for children 5–6 years old in 24 public preschools in Quang Binh, Quang Tri and Thua Thien Hue provinces of Vietnam. The research results may provide a reference for science education practice in Vietnam's preschool education.

RESEARCH QUESTIONS AND METHODS

Research questions

This study aims to describe the status of science education for children aged 5–6 in some public schools in central Vietnam. In this context, for these questions, answers were sought.

To what extent teachers perceive the importance of science education goals for preschool children?

How do preschool teachers implement the tasks, contents, methods and forms of science education in 5–6-year-olds classes?

What do teachers want to innovate to improve the effectiveness of science education for children in preschool?

Research methods and sample

Mixed methods, including surveys, interviews with teachers and observation of class, were used in this research (Creswell, 2009). The main instrument was a questionnaire with multiple options designed according to the 5-point Likert scale (1 = not at all important/least emphasized/never, 5 = very important/highest emphasized/almost always) (Robinson, 2014). The questionnaire was examined by three experts and piloted with thirty teachers outside of the study. Necessary corrections were made, and a total of ten questions were included in the questionnaire. The final paper version of the questionnaire was used to collect data from preschool teachers. The Cronbach's alpha coefficient for internal consistency of the variables was 0.89, which indicates a relatively high consistency (Warmbrod, 2014). In addition, an interview form and an observation form were prepared to get teachers' opinions and their practice on science education for children 5–6 years old in preschool (Creswell, 2009).

The data were collected from 2016–2017. Two of the present study's authors have been part of the research team during the process of data collection. Obtained data were collected and analyzed using IBM SPSS software version 26.0 in order to calculate the percentage, mean, standard deviation and analysis of variance (ANOVA). As difference and relation's meaningfulness level, $P < 0.05$ has been regarded sufficient.

The participants were 150 teachers teaching 5–6 years old classes at 24 public preschools in 3 provinces of Quang Binh (8 schools, 51 teachers), Quang Tri (10 schools, 49 teachers) and Thua Thien Hue (6 schools, 50 teachers). They were selected according to the maximum variation from among the purposeful sampling methods (Palinkas et al., 2015). This sampling method is often used when researcher want to document unique or diverse variations that have emerged in adapting to different conditions (Patton, 2002). The number of 5–6 years old classes were different from preschools so the number of teacher surveyed in schools was not the same. Among 24 preschools, 7 preschools were in the urban area and 17 schools were in the rural area. The mean age of teachers was 33.5 (ranged from 21 to 53 years). Of which 12 teachers had worked for more than 20 years, the rest were from 6 to 20 years. More than half of them (83 people) had an experience of 5 years or less in charge of 5–6 year-olds, only one person is over 20 years, the rest is from 6 to 20 years. Regarding qualifications, one person had a master degree, 128 people had an undergraduate degree (4 years of training), seven people qualified intermediate degree, the rest got a college degree (3 years of training). The participants were informed on the purpose of the research project, their voluntary participation, and their right to withdraw from the research at any time. It was also explicitly highlighted participants' right to privacy by ensuring anonymity and confidentiality for data protection.

RESULTS AND DISCUSSION

This section presents findings from teachers' perspectives on the importance of science education goals, selecting and applying contents, methods, forms, their opinion on participation of

social forces in science education for 5–6-year-olds at preschool, and measures to improve the quality of science education in preschools. The results obtained from the surveys were presented in tables, and some results from interviews and observation of science activities were shown in the discussion process.

Goals and tasks of science education for 5–6-year-olds

Objectives are the first element, directing the entire process of organizing scientific education activities. Teachers' opinions on the importance of science education goals being specified in the National ECE curriculum of Vietnam is shown in the table below:

Table 1 shows that the mean scores for the importance of the goals were all above "important". Teachers paid great attention to determining appropriate goals for the process of organizing science discovery activities for preschool children 5–6 years old. These goals intend to form children's corresponding knowledge, skills, and attitudes, which are necessary to raise awareness and contribute to the comprehensive development of children (Phuong, 2020; Tuan-Vinh et al., 2017). The goal "Able to observe, compare, classify, judge, pay attention, and remember intentionally" was rated the most important among the above goals. It was consistent with the characteristics of the science activity as a specific activity in the field of cognitive development in the national ECE curriculum of Vietnam. In particular, the current Vietnamese ECE curriculum emphasises that should not only focus on the amount of knowledge children gain but must pay special attention to the way children discover the surrounding things and phenomena, training childrens' scientific processes skills, enhancing children's experiences and focusing on child-centred educational orientation (Nga, 2019; Ngoc-Tram & Nga, 2015; Tuong-Van, 2013). The goal also has been set as an expected outcome in the curriculum (MoET, 2017; Nga, 2019; Tuan-Vinh et al., 2017).

Moreover, the survey results also show that the remaining objectives were equally important. In particular, the goal "Having some initial understanding of people, things and surrounding

Table 1. Teachers' opinions on the importance of science education goals for 5–6-year-olds

Objects	Mean	SD
Curiosity, love to inquiry, explore things and phenomena around	4.58	0.58
Able to observe, compare, classify, judge, pay attention, and remember intentionally	4.65	0.49
Able to detect and solve simple problems in different ways	4.28	0.49
Able to express understanding in different ways (actions, images, words, etc.) with oral language mainly	4.44	0.49
Having some initial understanding about people, things, and surrounding phenomena	4.51	0.49

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

phenomena" results from implementing the rest goals. From the knowledge acquired from science activities, children could express their understanding in different ways such as actions, images or oral language.

The tasks of science education for children 5–6 years old is determined based on the set goals. The survey results on teachers implementing science education tasks levels are shown in Table 2 below:

The survey results show that the tasks set out were not similar to determining the importance of the goals identified above. Teachers attached importance to language development and physical development, social-emotional and aesthetic development tasks rather than cognitive developing of children. This also shows that teachers' perceptions were not really consistent, the ability to define educational tasks based on goals was not systematic, and the integration was not appropriate. It should be affirmed that it should not be taken lightly to develop language, physical, socio-emotional and aesthetic tasks, but these are just areas of development integrated into cognitive development activities, which is the most important in science education (Ngoc-Tram & Nga, 2015; Phuong, 2020).

For preschool children's science activities, cognitive development tasks must be put on top, next to other integrated tasks. Table 2 also shows that the majority of teachers put this task at a critical level. The most noticeable result of cognitive development in children is the formation, consolidation and expansion of symbols of nearby objects and phenomena. Symbols could be in a specific form (such as a rooster, a hen) or a general form (such as cattle, poultry). To help children acquire pre-scientific knowledge, it is needed to develop children's cognitive skills from simple to complex, such as observation, comparison, grouping, measurement, communication,

Table 2. The teacher's level of performing science education tasks for 5–6 years old children

Tasks	Mean	SD
Consolidating knowledge, expanding children's understanding of the surrounding environment	4.36	0.59
Developing children's sensory and perceptual abilities	4.24	0.61
Training and developing the ability to pay attention, remember purposefully for children	4.32	0.61
Training and developing cognitive skills (observation, comparison, classification, measurement, inference. . .) for children	4.32	0.63
Stimulating interest and developing curiosity about the surrounding environment for children	4.47	0.55
Training and developing language skills for children	4.66	0.54
Developing of physical, social-emotional and aesthetic of children	4.50	0.63

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

inference, and judgment. In addition, it is necessary to form a positive attitude towards the acquisition of knowledge such as curiosity, scepticism, optimism and self-confidence for children (Ngoc-Tram & Nga, 2015; Oanh, H. T. & Xuan, N. T, 2014; Phuong, H. T, 2020; Roth et al., 2013; Watters et al., 2000). Determining the right task is one of the prerequisites for choosing content for children to explore science.

The selection and implementation of science discovery contents

The general trend in choosing educational contents in Vietnamese preschools is through themes close to children daily life (Tuan-Vinh, N. et al., 2017). The construction of themes is based on the orientation of the National ECE framework curriculum, children's characteristics, and the learning conditions of the school, class, and locality. There is no general rule on the number of topics nor the specific topic name. Usually, a theme is done in about 3–5 weeks, at least 1–2 weeks. Topics are arranged throughout 35 weeks of a school year. The contents of science education are clarified by the "content network" of the themes. Significantly, the contents need to show the children's interest in and the teacher has a "source" to deploy (Oanh, H. T. & Xuan, N. T, 2014; Phuong, H. T, 2020; Tuan-Vinh, N. et al., 2017). During a school year in Vietnamese preschools, 5–6-year-olds often explore ten topics related to their real-life: kindergarten, self, family, occupation, animals, plants, transportation, water and natural phenomena, homeland – country – Uncle Ho[1], primary school (MoET, 2017; Tuan-Vinh, N. et al., 2017).

Findings related to the implementation of themes into science education contents for children 5–6 years old are summarized in Table 3 below:

As shown in Table 3, all themes were developed into the science education contents for 5–6 years old children. The average score in each theme ranged from 4 (very often) to 5 (almost always), and the standard deviation was also similar to each other.

One-Way Anova test only shows the statistically significant difference in the two topics Occupation and Primary School, between Quang Tri and Quang Binh provinces ($P < 0.05$). For

Table 3. The levels of implementing themes in science education for 5–6-year-olds

Themes	Mean	SD	*p*
Kindergarten	4.27	0.62	0.674
Self	4.35	0.56	0.078
Family	4.44	0.61	0.376
Occupation	4.25	0.68	0.001
Animals	4.49	0.58	0.740
Plants	4.50	0.58	0.320
Transportation	4.28	0.65	0.752
Water and natural phenomena	4.32	0.62	0.384
Homeland – Country – Uncle Ho	4.21	0.76	0.202
Primary School	4.09	0.76	0.040

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

[1]Ho Chi Minh (1890–1969) is a great leader of Vietnam who wholeheartedly devoted himself to the country and the people's happiness.

other topics, schools had similar levels of implementation. The comparison results also prove that the preschools in the survey area have closely followed the orientation of the educational content in the ECE framework curriculum.

Interviews with teachers and observation of science activities show that preschool teachers had flexibly added local contents to educate children when implementing sub-themes. For example, the theme "Kindergarten" could be developed under two sub-themes, "lovely pre-school" and "lovely class". Alternatively, the theme "Plants" was implemented to the sub-themes of "local fruit specialties", "my favourite vegetables" and "green tree around us"; The theme "Homeland – Country – Uncle Ho" could develop to sub-themes that suitable for children hometown context. Local themes created the unique features of each preschool, each region and create opportunities for children to experience, accessible to interested children, bring high efficiency for activities.

The Table 4 shows that children rarely participated in topic selection. Although teachers knew that letting children participate in choosing topics would create children's interest and promote children's creativity, 38.6% of them "never" or "rarely" let children participate in topic selection. Some teachers state that it is required for teachers to be professionally qualified and sensitive to children's needs because they did not clearly express their needs and interests. Furthermore, teachers' workload was too large, so they found it hard to pay attention to the children's expression of interest. Besides children, parents tended to less participate in choosing science discovery topics for children. 50% of teachers confirmed that parents were "never" or "rarely" involved in this work. In recent years, socialization in ECE has been carried out but only focuses on financial support, utensils, and toys. Schools and teachers rarely paid attention to and coordinate with parents to orient children's interests. Besides, there was a part of parents who entrust their children's education to the school. Thus, topics for children to explore science were chosen by teachers and preschool's expert teams regularly. The Board of Directors also had a significant role in this work. However, to achieve high efficiency for science discovery activities of 5–6-year-old children, teachers need to coordinate and take advantage of many factors in choosing science education topics for children. In which the child must be should be placed at the center of the educational process. Once a topic has been identified, teachers should organize a participatory experience for children to assess the child's interest and prior knowledge and discovery needs. Then, teachers decide whether to organize a topic discovery or not.

One-Way Anova analysis points out a significant difference in teachers' perception in the three localities of Quang Binh, Quang Tri and Thua Thien Hue about the level of participation of the above four subjects including children, teachers, parents and administrator ($P < 0.05$). In Thua Thien Hue, teachers focused more on children's interests and parents' opinions than on

Table 4. Level of participation in topic selection of the subjects

Subjects	Mean	SD	*P*
Children	2.96	1.31	0.000
Teachers	4.55	0.61	0.041
Parents	2.43	1.06	0.000
Professional groups	4.09	0.74	0.125
Administrators	3.66	0.98	0.000

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

the other two localities. Meanwhile, teachers in Quang Tri province emphasized the role of teachers more. School administrators in Thua Thien Hue and Quang Binh had more influence on children's selection than schools in Quang Tri.

According to the results presented above, teachers had the most considerable role in choosing topics and activities for children. Table 5 below shows the grounds for this selection in teachers.

The survey results show that the orientation of the ECE program was high, from identifying goals, themes, topics and determining children's science discovery contents in the preschool. The implementation of the National ECE framework curriculum orientation also explained why the direction of superiors, living conditions around children, children's needs and interests, children's cognitive development level and teachers' knowledge was also paying attention to when building science education contents for children. In the process of science education for children, colleagues' involvement was occasionally, and the involvement of parents was rare. This also explains that the educational coordination between family – school – society has not yet been closely linked.

The use of methods and forms in organizing science discovery activities for prechoolers. Table 6 below presents the survey results on teachers' teaching methods in organizing scientific discovery activities for preschool children aged 5–6 years old.

Table 5. The basis for construction of science education contents

Base	Mean	SD
National ECE curriculum	4.14	0.04
Direction of superiors (Department of Education, Board of Education)	4.09	0.81
Natural and social conditions close to children	4.15	0.72
Children's needs and interests	4.31	0.65
Children's cognitive level	4.27	0.67
Suggestions from colleagues	3.38	0.72
Suggestions from parents	2.79	1.02
Teacher's own knowledge	3.94	0.94

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

Table 6. Methods of organizing science discovery activities for 5–6-year-olds

Methods	Mean	SD
Observation	4.64	0.53
Lecture-cum-Discussion	4.50	0.64
Play-based learning	4.34	0.70
Experiment	3.77	0.88
Modelling, diagramming	3.30	0.89
Problem-based teaching	3.57	0.99
Small group cooperative teaching	4.25	0.81

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

According to Table 6, there was a similarity in the level of teaching methods used in organizing science discovery activities for 5–6 year-olds. Teachers used a combination of methods to direct and conduct the activity on a "regular" level. In which observation, lecture-cum-discussion, small group cooperative teaching were used most. This result proves that teachers had relied on children's cognitive characteristics to choose appropriate teaching methods. It is because childrens' cognitive process takes place based on unifying sensory and rational perception, and sensory perception is a source of all knowledge about the surrounding world (Phuong, 2020). Therefore, observation was the basis for children's intuitive cognitive activities. Teachers also considered Play-based as an essential method because play is 5–6-year-olds' leading activity, which has many advantages in consolidating knowledge for children. Experimental methods, diagramming, modelling, problem-based teaching were also often used to support the main methods and increase children's activeness when participating in activities. In addition, some teachers claimed that they also used some other combined methods such as visual materials, tasks, story-telling, reading stories to create diversity for activities, increase the attractiveness for activities. Thus, there are many methods to organize scientific discovery activities for 5–6-year-old children. It is necessary to rely on the child's cognitive characteristics, the source of knowledge about the surrounding world and the child's age to use these methods effectively.

Science education for preschoolers could be implemented in many different forms. For preschool children aged 5–6, activity-based education is the most popular. This form clearly shows the nature of guiding children to explore science as children acquire knowledge through their activities; it clearly demonstrates the goal of equipping children with knowledge and forming the right attitude to the surrounding world (Phuong, 2020). The level of use of organizational forms is described in Table 7.

Teacher orientation learning activities were used the most among these forms. Teachers explained that "this activities' form is organized very closely, planned in a particular sequence based on age characteristics and surrounding conditions, to form children's knowledge quickly and suitable to the development requirements".

Outdoor activity was also concerned because "when playing outdoors, children have many opportunities to get acquainted with natural things and phenomena, experience the acquired knowledge in practical activities; participate in games that reinforce knowledge about the world around them, and experience with natural materials such as soil, sand, water, air, light to detect their characteristics" said by teachers. Outdoor activities would also create joy and satisfaction

Table 7. Forms of organizing science discovery activities for 5–6-year-olds

Forms of activity	Mean	SD
Teacher orientation educational activities	4.69	0.49
Conner activity	4.01	0.84
Outdoor activity	4.32	0.74
Sightseeing, picnics	3.37	0.87
Working tasks	3.42	0.84
Festivals	3.29	0.90

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

for children when communicating with each other in the natural environment. Therefore, this activity could help well to implement the guiding concept of "child-centred", some teachers stated.

Besides learning and outdoor activities, corner activity was considered as a significant form of educating science to kids. In corner activities, children would feel free to play in the classroom corners, so the activity incredibly means guiding children to explore science. Usually, preschools determine the content of science education integrated into corner activities based on each area's educational theme and characteristics. So, teachers found it easy to determine the amount of knowledge, skills and attitudes that can be formed and trained for children. Working tasks form was also critical to develop children's awareness because children were interested in adults' work to satisfy their needs to learn, discover and experience emotions and understanding through different types of age-appropriate tasks. Other forms such as sightseeing, picnics, festivals, were organized depending on the time and conditions of the preschool.

From observing the form of scientific discovery activities of children in preschool, we realized that each form has certain advantages for accomplished educational goals. Forms are closely related and could be nested together. The limitation of the teachers is that organizing these educational forms follow the available motifs, so the flexibility was not high, and little stimulation of creativity and self-creation of knowledge for children.

Two indispensable subjects in organizing any form of activity are teachers and children. The survey results combined with in-depth interviews with teachers said that other stakeholders also participate in these forms, such as parents, the Board of Directors, authorities, local unions, experts. Results of the survey on the level of participation of the components are as follows:

The participation of educational sectors in science education for 5–6-year-olds in preschool

There was not much family and social involvement in science education for children. The role of parents in the form of children's education, if any, was only to support materials, funds, and means of transportation. A relatively high percentage of teachers admitted that "never" had the participation of experts (28.9%) or authorities and organizations (24%). These results show the dim role of other educational forces from determining goals, choosing topics, and building content to organize scientific discovery activities for children (Table 8).

Table 8. Other stakeholders involved in the process of science education for 5–6-year-olds

Stakeholders	Mean	SD
Parents	2.91	0.95
Experts in the fields of children's discovery (for example: expert in botany, zoology, sociologist, police, engineer. . .)	2.10	0.91
Local authorities (for example: leaders of wards and communes; women's society, Youth Union, etc.)	2.34	1.04

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

Science education environment for children aged 5–6 in preschools. The educational environment plays an essential role in children's cognitive development as well as personality development. The results of the survey on children's science activities environment are shown in Table 9 below.

According to Table 9, the classroom environment was used the most in organizing activities. Observing results, it was noticed that each classroom was divided into activity areas/corners for children. In particular, the science corner/area was a place children satisfy their needs for scientific discovery to the fullest. Here, children could be exposed to plants, animals, seeds, etc. Shelves displayed all kinds of scales, toy magnets, geometric figures, breeding animals, bingo animals, vegetables with different colours, shapes and sizes. A place to play with sand, water with appropriate toys was also arranged on the campus. All liked a miniature world for children to observe, track objects in natural and social environments, practice, reinforce and experience existing knowledge. Depending on the topic and conditions of the class, teachers arranged the classroom environment and helped children to use them effectively.

Besides, teachers also "very often" took advantage to let children explore the world around them. Most surveyed preschools had yards and gardens, with many areas more attractive than the classroom environment. There were shaded tree areas, natural corners, and lawns where children could talk, create positive emotions, relax, and feel comfortable. Some schools also arranged bird cages, pets (such as chickens, ducks, rabbits), bonsai pots, pots with soil for children to contact, directly observe, plant, water and take care of them. There was a play area with sand and water, doing simple experiments such as sinking objects, mixing water colours, blowing soap bubbles.

The environment outside the school area was still occasionally used, and some teachers "never" used this environment. Every year, each school only organizes for children to go outside places the school such as Primary School, Army Barracks, Museums, historical sites, and local scenic spots about 2–3 times. For many reasons, this environment was less used, but the main reason is the limit of schools' operating budget.

The need to innovate activities of science education for children aged 5–6. According to the (Table 10) above, all the items mentioned in the table were rated as "very necessary". Adding facilities, equipment, utensils, toys, and increasing active teaching methods are the two needs that teachers felt most necessary. Some teachers state that "the more the operating environment is invested, the more opportunities children have to experience, the higher the child's cognitive positivity". Moreover, strengthening active teaching methods was a teachers' need in organizing science activities for children. This finding is entirely consistent with previous studies suggesting that should increase the use of teaching strategies, active teaching methods in organizing science

Table 9. Science discovery activities' environment

Environment	Mean	SD
Classroom	4.39	0.70
In campus of kindergartens	4.20	0.76
Outside of class (fields, farms, factories. . .)	2.85	0.82

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

Table 10. Factors that teachers would like to change

Factors	Mean	SD
It is necessary to unify in the direction and management	4.38	0.78
Regularly open training courses, professional development for managers and teachers	4.49	0.63
Calling parents and other social forces to participate in the process of organizing activities for children	4.28	0.69
Management staff need to encourage teachers to be more creative and empower teachers	4.23	0.76
Time to organize activities needs to be more flexible	4.01	0.99
Increase the use of active teaching methods	4.52	0.58
Increase activities outside the classroom such as sightseeing, picnics	4.40	0.54
Reduce the number of children in each class	4.22	1.05
Additional necessary facilities, equipment, toys	4.64	0.56
Create conditions for children to learn by creating products	4.24	0.58
It is necessary to pay more attention to the evaluation stage to make timely adjustments in the process of organizing activities	4.25	0.65

Note: $1 \leq \text{Mean} \leq 5$; $n = 150$.

discovery activities following child-centered direction, and enhance children's experiences through diverse forms of discovery and approach (Nga, 2019; Ngoc-Tram & Nga, 2015; Tuong-Van, 2013; Tuan-Vinh, 2017). Teachers also wanted leaders to be more unified in direction and management, strengthen professional training sessions, empower teachers, and reduce the number of children in each class.

CONCLUSION AND SUGGESTION

Science education has a significant role in the Vietnamese ECE curriculum and the development of preschool children. It stimulates children's intellectual development and supports children applying and performing well in all development areas and different school day activities as play, study, visit, work, and festival. Especially for 5–6 years old children, the knowledge and cognitive skills acquired in science activity will prepare the necessary psychological functions to enter the elementary school where the main activity is studied confidently.

Science discovery activities were organized in the preschools regularly, with a specific plan right from the beginning of the school year (in the school year plan, thematic plan, the week plan, the plan of activities). Teachers had paid great attention to determining appropriate goals for the process of organizing scientific discovery activities for preschool 5–6 years old children. These activities aimed to form corresponding knowledge, skills and attitudes, which are necessary to raise awareness and contribute to the overall development of children.

The surveyed preschools teachers had closely followed the science education contents orientation in the Vietnamese ECE framework curriculum. Based on ten themes, specific sub-themes, topics and contents were freely and flexibly selected based on practice with the participation of many different subjects. Research results also show that children and parents rarely participated in topic selection, the teachers decided most of the science education topics and contents under the direct direction of the expert team and the Board of Directors. The basis for determining the topic was also mainly based on the Vietnamese ECE framework curriculum.

Teachers used a combination of methods to carry out science discovery, including observation, conversation, explanation, instruction, assignment, games, and small group cooperative teaching are used most. Intentional learning activities were the main form used, and other forms were organized to support the activity. The classroom environment was most used when organizing science discovery activities, and areas outside the school were only used occasionally. The involvement of family, experts and local authorities in science discovery activities of children at kindergarten was limited.

Adding necessary facilities, equipment, utensils and toys and increasing the use of active teaching methods were the most necessary needs of teachers in the current period. The direction of administrators was also a factor that teachers want to change.

Based on the results of this study and similar studies in the literature, the following suggestions can be made:

Suggestions for preschool administrators:

–It would be useful to organize training, attending classes, exchanging experiences on positive methods and models in organizing science education activities in preschool regularly through professional activities and regular training for teachers.
–Preschool administrators would create favourable conditions and opportunities for teachers to apply positive educational methods and models in science education for 5–6 years old children.

Suggestions for preschool teachers:

–Teachers could increase their knowledge and skills by regularly participating in various courses and seminars to follow the innovations and changes related to science education. Moreover, they should pay special attention to children's needs, interests, and experiences to let children play a central role in activities.

–Teacher should firmly grasp the principles and process of organizing scientific education activities for children to make flexible and appropriate adjustments. Hold the proper role as an organizer in guiding and directing of scientific discovery activities for children.
–Teachers need to bravely apply different methods and techniques in organizing science discovery activities for children, using available physical and human resources to support children's senses of discovering and curiosity.
–Teachers should mobilize, call, and create opportunities for other educational forces as parents, experts and local authorities taking part in organizing science education activities for children at preschool.

ABOUT THE AUTHORS

Nhi Tran Viet works as a University lecturer at the Faculty of Preschool education, University of Education, Hue University, Vietnam. His research interests include science and social education, STEAM education, play-based learning in ECE and preschool teachers' professional development.

Tuan-Vinh Nguyen is a University lecturer and Dean of the Faculty of Preschool education, University of Education, Hue University, Vietnam. As an expert in psychology and education, he has been cooperating with many projects in ECE and preschool teachers' professional development in Vietnam. He has also run researches on social-emotional learning, learner well-being and happy school in the preschool education environment.

Kim-Nhung Ta Thi works as a lecturer at the Faculty of Preschool education, University of Education, Hue University, Vietnam. Her research interests and publications cover the fields of Child Physiology and Nutrition, Environmental education for preschool children.

Nhung Le Thi is a lecturer at the Faculty of Preschool education, University of Education, Hue University, Vietnam. Her research topics are about preschoolers' physical development and education, science and social education for preschool children and the Integrated approach in ECE.

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