Universitas Muhammadiyah Malang, East Java, Indonesia

JPBI (Jurnal Pendidikan Biologi Indonesia)

p-ISSN 2442-3750, e-ISSN 2537-6204 // Vol. 7 No. 3 November 2021, pp. 288-294

Research Article

Scientific attitudes of young children through literature-based and project-based learning organization

Veena Prachagool [a,1,*], Chanlada Arsaiboon [a, 2]

[a] Faculty of Education, Mahasarakham University, 245 Kham Riang, Kantharawichai District, Mahasarakham 44000, Thailand

[1] veena.p@msu.ac.th*; [2] kruanubanmuk@gmail.com

* Corresponding author

ARTICLE INFO

Article history
Received: 26 May 2021
Revised: 28 July 2021
Accepted: 30 November 2021
Published: 30 November 2021

Keywords
LPBL organization
Scientific attitude
Young children

ABSTRACT

Young children's scientific attitude is basic norms of human kind to cultivated actual learning, which has been an expected to be a curious, motivated, generous and responsible person. The study aimed to investigate scientific attitude of young children through literature-based and project-based learning organization (LPBL). The participants employed were young children, aged five to six years from Mahasarakham University Demonstration School (Elementary), Thailand. The duration of the study was nine weeks. The experiment was conducted in eight weeks, four days a week and 90 minutes per day which were done in 32 times. The research instruments were 32 LPBL learning plans, learning behavior observation forms, scientific attitude inventory, and debriefing focuses group interviews. The descriptive statistics used in the study were average and standard deviation. The results showed that the young children have scientific attitudes at high level by means of LPBL learning organization. The qualitative data supported that they express scientific attitudes in accordance with nature of learning.

How to cite: Prachagool, V., & Arsaiboon, C. (2021). Scientific attitudes of young children through literature-based and project-based learning organization. *JPBI (Jurnal Pendidikan Biologi Indonesia), 7*(3), 288-294. https://doi.org/10.22219/jpbi.v7i3.16646

INTRODUCTION

Scientific attitude is one of scientific learning which is important to be cultivated since early childhood. It is crucial point to be considered to pursuit knowledge in various fields, especially in science. The children with good scientific attitude will grow with great rational thinking method. This, in turn, helps children to have strong mind, ready to learn with others, and take responsible to their society (Halim et al., 2018). Thus, it is important to start their early childhood by cultivating good attitudes. Scientific attitude will be the basis for inviting the desirable good attributes of young children.

Scientific attitude is not only necessary for scientists. It is also important for individuals to be utilized in their self-development (Rutjens et al., 2018). As it is cultivated in their early ages, the curiosity will be gained and they will grow to be responsible adult. Early childhood education focuses on direct experience, with one of the key principles i.e. creating science learning systematically (Kos et al., 2021). The scientific learning process means learning meaningfully, happily, and using science process skills. Hence, children's intellectual skills which demonstrate the ability to practice in various aspects of thinking processes can be shaped and form scientific mind.

Scientific attitude allows children to learn natural surroundings as well as be eager to investigate biological and physical changes. This prepares them to face their future with responsibility, the ability to learn together, and learn how to learn. Children are like little scientists with suspicion, knowledge, questions about the natural world around them and learning their surrounding through experiences all the time. Stimulating and promoting children's learning through scientific processes are therefore a response to the nature of children's learning a person's habitual skills that help to develop cognition about the world.

Development of scientific attitude in early childhood is achieved through the study of knowledge and the use of scientific processes (Dwianto et al., 2017). The quest for scientific knowledge must be a process which is carried out through direct experience with real-world situations, so it can be said that the development of scientific attitudes is important to act in pursuit of knowledge and problem solving (Sharon & Baram-Tsabari, 2020). Children learn well through actions in play and various real experiences. Teachers must let scientific attitudes into teaching and learning (Dilek Eren et al., 2015) activity such as experiment, playing through group interaction, science storytelling (Zulfitria et al., 2020), project assignment (Yli-Panula et al., 2017), and so forth . The lesson must be close to the cognitive development, close to the time, suitable for development, interests and related to prior experiences.

The experience must be in accordance with needs and interests of children. The scientific attitude development mentioned above are in line with the process of organizing project-based learning experiences and literature or literature-based and project-based learnings (LPBL). This learning organization aims at enhancing good attitudes towards the pursuit of knowledge. It gives children experiences of places, people and things around them. Moreover, literature can engage children's interests in science and let them to do as their imagination through learning in terms of project to gain knowledge (Hansson et al., 2020). Children expansion out of their borders of knowledge and their power of imagination help them to gain their thinking skills. This helps them to understand the world, gain new experiences, and find reliable information use it for further learning.

Acknowledging the crucial role of scientific attitude, there are many researchers focused their research on this topic (Boeve-de Pauw et al., 2011; Dilek Eren et al., 2015; Ergul et al., 2011). Some of them observed about the factors influence the attitudes such as parental attitudes and ethnic (Alrehaly, 2011), type of school and environment (Boeve-de Pauw et al., 2011), gender (Yamtinah et al., 2017), grade, and academic achievement (Akpınar et al., 2009), and so forth. However, the study focused on the implementation of LPBL is still limited.

Yet, LPBL allows children to gain real experiences while studying, develops necessary learning skills, starts with students' interest, loves to learn about science, and searches ways to lead them gain the answer. Based on the above concepts and reasons, early childhood's scientific attitude plays an important role in learning science, solving scientific problems, and emphasizing future science interests of children early. This research aims to investigate scientific attitude of young children through LPBL organization.

METHOD

The participants employed in this study were 25 young children, male and female, between five and six years who were enrolled in kindergarten year 3, Mahasarakham University Demonstration School (Elementary), semester 2, academic year 2019.

The instruments used in this research were four items. First, LPBL plan, including the context, learning, and key questions of innovation, projects and literature as the base. There were 32 different experience schemes. The duration of the study was nine weeks in which the experiment was done in eight weeks, four days a week and 90 minutes per day, and was done in 32 times. Second, learning behavior observation in scenarios which was created by researchers. Third, scientific attitude interviewing, children can take responsibility to the interviewing episode, even with obstacles to work, and accept the consequences of their actions, whether they are right or wrong. Fourth, debriefing sheet which focuses on group interviews after the scenario taken ten minutes to interview. A measure of scientific attitudes consistent with desirable conditions from student identification book.

The data obtained were collected through the experiment which was conducted by organizing LPBL learning experiment of eight weeks in terms of four days a week. It takes 90 minutes a day to measure children's scientific attitude after a week experiment. The data were analyzed descriptively in terms of mean and standard deviation.

RESULTS AND DISCUSSION

The study results revealed that scientific attitudes can be promoted by LPBL. This fact is proven as children were allowed to ask about the things they wanted to know, expressed their interests in the end of the experiment. The children were eager to seek answers, offered opinions on the issues learnt, and acted as planned. In other words, LPBL allows children to develop their scientific skills.

Teachers observed children's interests by participating in conversations about things gained from tale or story listening activities which interested the children. The conversation occurred depicted that each child had something special which attracted them. Teachers used this opportunity to draw out child's hallmarks to motivate them to learn the interesting topic chosen. The condition is that the topic they learn must be based on the needs of most children in the classroom. The data of young children's scientific attitude are reported in Table 1.

Table 1. Children's scientific attitude through LPBL organization

No.	Observer			$\bar{x}$	Level of scientific attitude
	1	2	3		
1	11	10	11	10.67	Low
2	14	15	15	14.67	Highest
3	15	15	15	15	Highest
4	15	14	15	14.67	Highest
5	12	14	14	13.33	High
6	14	13	14	13.67	High
7	11	11	12	11.33	Low
8	15	15	14	14.67	Highest
9	10	10	10	10	Low
10	14	15	14	14.33	Highest
11	16	16	16	16	Highest
12	14	14	14	14	High
13	13	14	14	13.67	High
14	13	12	12	12.33	High
15	14	14	14	14	High
16	15	15	15	15	Highest
17	12	13	12	12.33	High
18	11	10	11	10.67	Low
19	16	16	16	16	Highest
20	13	13	12	12.67	High
21	11	12	12	11.67	Low
22	14	14	13	13.67	High
23	14	14	14	14	High
24	13	13	12	12.67	High
25	14	15	14	14.33	Highest
$\bar{X}$	13.36	13.48	13.4	13.41	High
S.D.	1.65	1.78	1.61	1.63	

The LPBL organization has been proven to achieve the high level of children's scientific attitude. This is also consistent with child-centered learning, focusing on children's self-knowledge through media variety and learning methods. As the teachers' intervention in learning is important (Durmaz & Mutlu, 2017), teachers need to provide learning experiences for children to discover their own learning and create good learning (Ghousseini & Sleep, 2011; Maftuh, 2016). In this research, an interesting topic for children is the needed. Thus, the topic to learn decided was about stars and space. The decision was made through a vote and the questions posed by children. The questions made by children were "Why does the day not have stars", "Why do we see a full moon, but some days we see a single moon", "Where does a meteor go?". There were also several ways offered for children to find answers, such as "go to an expert to ask about stars".

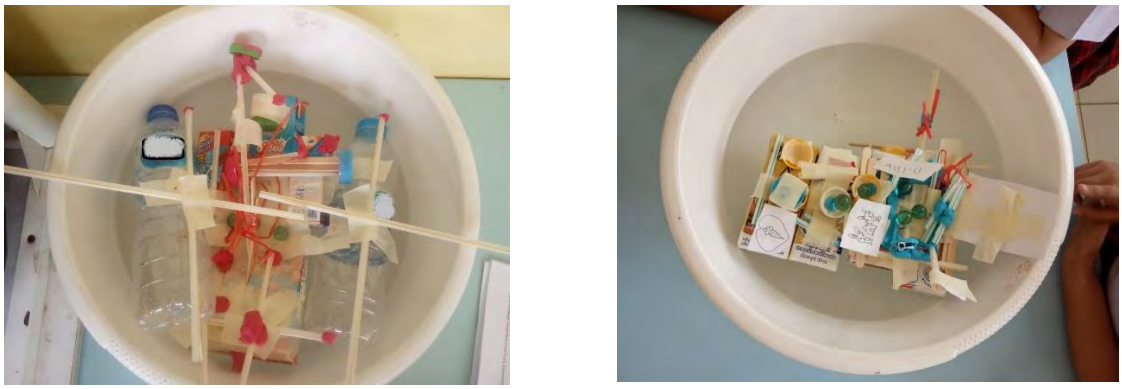
The children owned curiosity about natural phenomena happened surround them through LPBL organization. During the study, simulations and interview were done to keep the empirical data. Bridgers et al. (2020) stated that simulations and interview are enable observers to point out children to express their eager

to understand science behavior. The observation results showed that some groups raised questions such as “What can I do?” “You're going to have it done in time, right?”. This in line with the previous research that inquiry based activity can enhance elementary students’ science attitude (Ergul et al., 2011).

In term of planning activity, researchers interviewed all the children after the class activity. The question was whether they had planned before they did it or not. The answer of this question was "I don't know if I'm going to do it". All five groups of children responded similarly which means that they did not have any plan before they did the activities. However, according to the observation session by researchers, the children in groups had the discussions before they did the activities. They asked their group members simple questions such as “What kind of group are we going to make?”, “Use a milk carton to make a bridge”, “How about making a boat?”. Thus, the statements which conveyed about planning within the group were, literally, discussed. As the responses, the comments on the idea and problem-solving methods proposed were given by other group members. Although all groups’ members stated that their group did not have any plan before doing their activity, but most of them can answer that the first step in crafting things.

Teachers also gave other case entitled “to help rabbits”. The aim of the case given is to recount the process which means cultivating scientific attitude. There are various instructions can be chosen to construct children’s understanding about process. For example, “Use the bottle cap to make a mattress for the rabbit”, “Put the long milk cartons together first and then bring the short milk cartons again”. The aspirations of children were also expressed through their enthusiasm during the activities of inventing equipment to help rabbits (Figure 1). This way, teachers play a crucial role in cultivating children’s science attitude (Dilek Eren et al., 2015).

Children expressed their interest in the results of their experiment and participated in the discussions about the product they constructed to help rabbits. As the researchers asked further question how did they know if this device would help the rabbit. A child replied “I can't answer that right now. I have to try it out before it sinks or floats” along with showing his group product (see Figure 1). After the device was tried, some children were doubt. They posed several questions like “Why are there so many boats floating around?” “Why do some plexiglass lay on the bridge and roll into the water while some do not fall into the water?”. These are the prove of children interest on science (Amini, 2015; Murphy et al., 2013)



a. b.

Figure 1. The boats made which have invented by children to help rabbits: (a) bottle bridge, (b) imaginative bridge

Considering about the responsibility, based on the researchers' observations throughout the event, scenarios, and interviews with the 5 groups. Four groups who were able to complete the work in time required by each group would be constantly asking about time to the researchers. They constantly asked “How many minutes remaining?”. Contrarily, one group who were unable to complete the task within the allotted time. Researchers noticed an accelerated enthusiasm for inventing more devices. However, as the researchers told them to complete the task within 30 minutes, the children have not yet put their hands on the device and still discussed in the group. Thus, when the time was up, they did not finish their work yet. The group have just completed their work in their extra 34 minutes. Their explanation about their late work was elaborated in two sentences i.e. “Because there's so much equipment, it makes it long”, “It must be designed to make the boat strong”.

The researchers interviewed the children again during their activity whether anyone did not help their friends. It was found that the most children told a list of friends who did not help others within the group. However, the children did not show any anger to their friends who did not contribute in the group work. As for early childhood, a friend who says he doesn't help, he tells his friend why he didn't help. “He's helped a lot, so

he's let his friends do it". There were two groups who told the researchers that they had helped to do everyone within the group. Most of the children in all groups have helped each other invented the equipment to help rabbits even though they used different ways to help. Some groups discussed and expressed their opinions together, but when they worked, they did it separately, make different devices and put them together. Some groups have a child who was separated to invent only one rabbit aid. But when a member of the group put the device together, it follows what the group members said.

The researchers concluded that in this joint activity, all groups were helped. However, there were several times they came to help their friends and the other times they isolated themselves to do activities that were more interesting for them. As part of the recounting of the results, each group of children came together to invent a device to help the rabbits. After the experiment, the researchers asked for more information about the outcome and cause of the float. Most of children can answer why the boat floated or sunk. For example, "Because the milk carton does not have milk in the carton and it can be light and floating". The last question asked by the researchers was the feelings of the children after making device to safe rabbits. Most of them said that it was a fun activity. Some of them said "I wanted to help the rabbits by inventing something else". Yet, it was found that there were two children who said that it was not fun because it was hot and too sleepy.

Children answered the empirical of their scientific attitudes through interview, and experiment with real things. This allows children to learn from direct experiences suitable for their development which is also consistent with the concept of learning by doing. Moreover, learning by action helps children practice things on their own according to their interests, aptitude, and potential. They learn from practices, enhance necessary skills to self-learning (Ergul et al., 2011), as they believe that it will inspire confidence. Children had fun continuing to search for knowledge as their critical thinking skills are constructed (Elisanti et al., 2018). It also corresponds to the activities for children aged three to six years old.

By doing hands-on activities, a character of success will be constructed in children's mind. LPBL is a base for children to act on their own thinking and doing as scientists who interact with their workplace. Children can learn how to be scientist or enhance skills of learning to be success in the future by achieving higher-order thinking skills (Madhuri et al., 2012), they will also learn to self-development (Elkin et al., 2018). Based on the natural setting, children have the nature of learning with curiosity and eager to learn natural world. Children, with the lens of LPBL, are supported to be interested in knowing, curious, and expressing themselves with behaviors. The scientific attitudes are including enthusiasm for activities and stories like experimenting, discussing, questioning, having patience, and behaving science expressions in both positive and negative.

As the teachers interacted with children frequently in various ways, being interested in what they say or do, gave them the opportunity to explore and experience, encouraged them to do things on their own to succeed, would give them all aspects of proper development (Vogt et al., 2018). Teachers should use open-ended questions to organize learning experiences, such as "How can children find answers?". Moreover, teachers also need to encourage them to express their opinions or different ways of thinking. Teachers play a role in provoking questions from children. The pursuit of knowledge involves questions that are meaningful for children, yet, children must be able to find the answers by going into observations themselves and gaining knowledge from various sources. The use of questions or creating situations encourages students to create good scientific attitudes. A relaxing learning environment helps children to be ready to learn, develop scientific ideas, imagination, and be able to express their thoughts freely (Prachagool & Nuangchalerm, 2019)

CONCLUSION

The instructional practice in term of LPBL can promote young children's scientific attitudes through suitable learning experiences. LPBL allows young children to have imagination, do learning by doing, work with others, and understand how to be responsible in their assignment. Thus, the young children gained scientific attitudes with high level by means of LPBL organization. However, the further study about how to create learning environment or learning ecology which promote scientific attitudes is needed.

REFERENCES

Akpınar, E., Yıldız, E., Tatar, N., & Ergin, Ö. (2009). Students' attitudes toward science and technology: An investigation of gender, grade level, and academic achievement. *Procedia Social and Behavioral Sciences*, *1*, 2804–2808. https://doi.org/10.1016/j.sbspro.2009.01.498

Alrehaly, E. D. (2011). *Parental attitudes and the effects of ethnicity: How they influence children's attitudes toward science education*. https://files.eric.ed.gov/fulltext/ED515978.pdf

Amini, R. (2015). Outdoor based environmental education learning and its effect in caring attitude toward environment. *Jurnal Pendidikan IPA Indonesia*. https://doi.org/10.15294/jpii.v4i1.3500

Boeve-de Pauw, J., Donche, V., & Van Petegem, P. (2011). Adolescents' environmental worldview and personality: An explorative study. *Journal of Environmental Psychology*, *31*(2), 109–117. https://doi.org/10.1016/j.jenvp.2010.05.003

Bridgers, S., Jara-Ettinger, J., & Gweon, H. (2020). Young children consider the expected utility of others' learning to decide what to teach. *Nature Human Behaviour*, *4*(2), 144–152. https://doi.org/10.1038/s41562-019-0748-6

Dilek Eren, C., Karadeniz Bayrak, B., & Benzer, E. (2015). The examination of primary school students' attitudes toward science course and experiments in terms of some variables. *Procedia-Social and Behavioral Sciences*, *174*, 1006–1014. https://doi.org/10.1016/j.sbspro.2015.01.1245

Durmaz, H., & Mutlu, S. (2017). The effect of an instructional intervention on elementary students' science process skills. *Journal of Educational Research*, *110*(4), 433–445. https://doi.org/10.1080/00220671.2015.1118003

Dwianto, A., Wilujeng, I., Prasetyo, Z. K., & Suryadarma, I. G. P. (2017). The development of science domain based learning tool which is integrated with local wisdom to improve science process skill and scientific attitude. *Jurnal Pendidikan IPA Indonesia*. https://doi.org/10.15294/jpii.v6i1.7205

Elisanti, E., Sajidan, & Prayitno, B. A. (2018). The effectiveness of inquiry lesson-based immunity system module to empower the students' critical thinking skill. *EDUSAINS*, *10*(1), 97–112. https://doi.org/10.15408/es.v10i1.7259

Elkin, M., Sullivan, A., & Bers, M. U. (2018). *Books, butterflies, and 'bots: Integrating engineering and robotics into early childhood curricula*. 225–248. https://doi.org/10.1007/978-981-10-8621-2_11

Ergul, R., Simsekli, Y., Calis, S., Ozdilek, Z., Gocmencelebi, S., & Sanli, M. (2011). The effects of inquiry-based science teaching on elementary school students' science process skills and science attitudes. *Bulgarian Journal of Science and Education Policy (BJSEP), 5*(1), 49–68. http://bjsep.org/getfile.php?id=88

Ghousseini, H., & Sleep, L. (2011). Making practice studyable. *ZDM - International Journal on Mathematics Education*, *43*(1), 147–160. https://doi.org/10.1007/s11858-010-0280-7

Halim, L., Abd Rahman, N., Zamri, R., & Mohtar, L. (2018). The roles of parents in cultivating children's interest towards science learning and careers. *Kasetsart Journal of Social Sciences*, *39*(2), 190–196. https://doi.org/10.1016/j.kjss.2017.05.001

Hansson, L., Leden, L., & Thulin, S. (2020). Book talks as an approach to nature of science teaching in early childhood education. *International Journal of Science Education*, *42*(12), 2095–2111. https://doi.org/10.1080/09500693.2020.1812011

Kos, M., Jerman, J., & Torkar, G. (2021). Preschool children's attitude toward some unpopular animals and formation of a positive attitude toward them through hands-on activities. *Journal of Biological Education*, *00*(00), 1–18. https://doi.org/10.1080/00219266.2021.1877779

Madhuri, G. V., Kantamreddi, V. S. S. . S. N., Prakash Goteti, L. N. S., & Goteti, L. N. S. P. (2012). Promoting Higher Order Thinking Skills using Inquiry-Based Learning. *European Journal of Engineering Education*, *37*(2), 117–123. https://doi.org/10.1080/03043797.2012.661701

Maftuh, B. (2016). Innovative teaching and learning in elementary school. In Muhammad Husni, Yuyun Febrina, Bq. Shofa Ilhami, Yul Alfian Hadi, & Nurul Mu'minin MZ (Eds.), *Proceeding ICETE 2016 International Conference* (pp. 1–11). Universitas Hamzanwadi. http://hamzanwadi.ac.id/CONTENTS

Murphy, C., Bianchi, L., McCullagh, J., & Kerr, K. (2013). Scaling up higher order thinking skills and personal capabilities in primary science: theory-into-policy-practice. *Thinking Skills and Creativity*. https://doi.org/10.1016/j.tsc.2013.06.005

Prachagool, V., & Nuangchalerm, P. (2019). Investigating the nature of science: An empirical report on the teacher development program in Thailand. *Jurnal Pendidikan IPA Indonesia*, *8*(1), 32–38. https://doi.org/10.15294/jpii.v8i1.17275

Rutjens, B. T., Heine, S. J., Sutton, R. M., & van Harreveld, F. (2018). Attitudes towards science. In *Advances in Experimental Social Psychology* (1st ed., Vol. 57). Elsevier Inc. https://doi.org/10.1016/bs.aesp.2017.08.001

Sharon, A. J., & Baram-Tsabari, A. (2020). Can science literacy help individuals identify misinformation in everyday life? *Science Education*, *104*(5), 873–894. https://doi.org/10.1002/sce.21581

Vogt, F., Hauser, B., Stebler, R., Rechsteiner, K., & Urech, C. (2018). Learning through play–pedagogy and learning outcomes in early childhood mathematics. *European Early Childhood Education Research Journal*, *26*(4), 589–603. https://doi.org/10.1080/1350293X.2018.1487160

Yamtinah, S., Masykuri, M., & Syahidul Shidiq, A. (2017). Gender differences in student's attitudes toward science: An analysis of students' science process skill testlet instrument. *AIP Conference Proceedings*, *4*, 030003-1-030003–030006. https://doi.org/10.1063/1.4995086

Yli-Panula, E., Jeronen, E., Seiko-Ahlström, H., & Ruotsalainen, E. (2017). Important biological issues for elementary pupils-A study of elementary pre-service teachers' conceptions. *Nordic Studies in Science Education*, *13*(2), 180. https://doi.org/10.5617/nordina.2579

Zulfitria, Z., Arif, Z., Dewi, H. I., & Susanto, A. (2020). The use of visual art as an alternative learning to develop storytelling ability of elementary school students. *1st Bukittinggi International Conference on Education*, 1–17. https://doi.org/10.1088/1742-6596/1471/1/012032