How do kindergarten teachers grow children science process skill to construct float and sink concept?

To cite this article: Q Qonita et al 2019 J. Phys.: Conf. Ser. 1157 022017

View the article online for updates and enhancements.
How do kindergarten teachers grow children science process skill to construct float and sink concept?

Q Qonita1*, E Syaodih1-3, A Suhandi2-3, B Maftuh3, N Hermita4, A Samsudin2 and H Handayani3

1 Program Studi Magister Pendidikan Anak Usia Dini, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229 Bandung 40154, Indonesia
2 Departemen Pendidikan Fisika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229 Bandung 40154, Indonesia
3 Departemen Pendidikan Dasar, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229 Bandung 40154, Indonesia
4 Prodi Pendidikan Guru Sekolah Dasar, Universitas Riau, Pekanbaru, Indonesia

Abstract. This exploration goal is to describe teacher’s performance on emerging 5-6 years children’s science process skill. Early science learning should optimize science process skill to arouse other children’s development domain. A descriptive-qualitative design with observation and interview has already been implemented to collect data from two kindergarten teachers in Tasikmalaya. The result shows that development of children’s science process skill on early science learning is not optimize yet. It caused, teachers have a lack understanding of early science learning and science concept and limitedness of facilities particularly science tool in the school. This finding can give information to academician and policy makers to make a solution to advance early science education implementation.

1. Introduction
Numerous researchers preserve that science is in a trustworthy point as a discipline in the early years because it concurs naturally with children’s inquisitiveness to discover their world. Children in early years are naturally set and enthused to explore the world around them. If the adults miscarry to sustain children’s essential incentive to explore and discover their world, it may causes children not curious anymore and turns into apathetic towards their world [1-2]. Early science education’s intention have to stimulate children’s sense of wonder by means of practice the content and processes that are developmentally suitable and accord with children’s expertise and also their erstwhile information [3].

One of the leading feature and process of science education at all levels of education is to be aware of the nature of science [4], one of which is physical science allied to matter and the forces that underlie that behaviour like buoyancy. There is at ease with topic in kindergarten that related to buoyancy: water with sub topic sinking and floating.

Floating and sinking is one of the most ordinary matters for science activities in the early year grades of education. Daily observations of big object floating and small object sinking can uphold children’s sense of wonder [5] but also that concept commonly bewilders children even the teachers. Research studies reported that young children’s even their teacher regularly recognizes that object’s floating or
sinking either to its size or to its weight: heavy or big objects will sink while light or small objects will float [6-8].

Floating and sinking is related with buoyancy and density. The object can float or sink it causes of buoyancy. Buoyancy is intensely affected by density. The density of number is acquired from the total mass (weight) of the object divided by its total volume size.

\[
D = \frac{m}{v} = \frac{g}{m^3} = \frac{l}{mL^3}
\]  

(1)

Early childhood teachers not have to teach density’s formula to young children because that formula is the abstract concept; notwithstanding teachers can illustrate the basic concept of density by using or marble or other similar objects to make it more concrete. Like the picture bellow.

![Illustration of high density (left) and low density (right) that can present to children by using by marbles.](image)

To bring together that concept to children, teachers have to understand this basic concept first and then discovery the strategy to carry out that concept to children [9]. The didactic practice about how kindergarten teachers carry out the science features of the curriculum in daily practices has a sturdy control on children’s learning chances in kindergartens [2]. Indonesia’s most recent curriculum has functional a science process which is a scientific method as a learning approach in all levels of education. The learning approach is known as a scientific approach that designed to empower learners do scientific process skill through actively observing, questioning/predicting, gathering information, reasoning, and communicate [10].

Scientific processes skill are children’s key to think of the work they have done, reflect they experienced, think about concepts related to the materials, and talk over their thoughts with teacher and their friends. Scientific process also empower children to think through not only what they did in new ways, as well how they accomplished it and what is important to them [11].

Science learning ought to not merely emphasis on offering information and reasons for scientific phenomena, but ought to be carried out with the goal of offering children with the occasions to magnify their thinking and to construct new understandings from their experiences [12]. The goal of this study is to explore to what extend kindergartens teachers do science learning that support children’s science process skill to construct floating and sinking concept. The problem invention in this study is how teachers develop children science process skill to construct children understanding about floating and sinking concept.

2. Method
The study has been intended as a minor scale exploration study with qualitative approaches for collecting and analysing data. In this study, data were collected through observations and interviews from two kindergarten’s teachers in Tasiakmalaya. The source of data was uninterrupted straight observations of science activities in kindergarten classes to see how teachers stimulate science process skill through observing, questioning/predicting, gathering information, reasoning, and communicating. Observer’s role was that of a bystander. The recording of observations was done by video recording and by taking detailed field notes. Observation of learning situations focusing on science is a starting point for interview with two kindergarten’s teachers to gain access to the reasoning behind their practices.
Two teachers were observed and interviewed in two different kindergarten schools in Tasikmalaya. The teachers were all female because the majority of kindergartens teachers in Tasikmalaya are female. The teachers involved in observation science activities were teach children in aged from 5 to 6 years. Teachers were chosen purposively with the criteria that they had teaching experience above five years and they have been certified. The kindergartens were recruited is have accredited and were those who agreed to participate in this study.

2.1. Ethical issue
When engaging the kindergartens, the teachers and the headmasters were informed about the purposes of the study and the methods we were to use. The teachers agreed to join the project without any kind of pressure. The kindergarten’s headmasters was informing about the study to the children’s parents through parents meeting.

3. Result and Discussion
This study has explored teachers’ performance on stimulating children science process skill to construct the concept of floating and sinking. Teachers in both of kindergarten used the same topic but each teacher did the difference activity to construct floating and sinking concept. A kindergarten used raw and cooked egg to be plunged into a container of salt water, actually teacher could explain about density concept but teacher just show the difference between raw egg and cooked egg when plunged into the water. Children are not give chance to try the experiment by themselves. Meanwhile B Kindergarten use various object like coin, toys and plastic spoon to be plunged in the plain water. Teacher gave a chance to some child to plunging the objects into the water by themselves.

Table 1 shows the results data of the implementation scientific approach to develop science process skill in two kindergartens. It show that both of teachers have not optimized children science process skill yet. Nevertheless their approaches to science education were found to be little different in several ways.

|                | A Kindergarten                                                                 | B Kindergarten                                                                 |
|----------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Observing      | Teacher tried to optimize observing by stimulate children’s sense of sight with teacher guiding. Teacher pointed the object and then children answer what teacher was pointed. Teacher also asked children to observe what happened to the raw and cooked egg when plunged in the water | The teacher tried to optimize observing by stimulate children’s sense of sight. Teacher showed the objects that will plunk to the water and ask children to mention what the objects and observe what happened when that objects plunged to the water. |
| Questioning    | The teacher not asked the children if they have any question or not but teacher who asked the children why one egg was float since the other was sink. | The teacher not asked the children if they have any question or not. |
| Predicting     | Before the teacher did the experiment, teacher instead told the children that raw egg will sink since cooked egg will float. | Before children plunged each object into the container of water, teacher asked the children which object that they predict will float or sink. |
| Gathering      | Teacher guided children to gathering information by observed the teacher’s demonstration. | Teacher guided children to gathering information by observed the teacher’s demonstration. |
| Information    | After teacher demonstrate to plunged raw and cooked egg to the water, teachers not asked children to making connection why the raw egg was sink fast since the cooked egg was bounced for a few times and then drift slowly. | After each object plunged to the water, teachers asked children to making connection why some object float since the others sink. Children answer that the objects which sink is heavy since the objects which float is light. |
Both of teachers tried to stimulate the children to observe the object. But teachers did not let children to observe more detailed. They just ask the children to mention what object that teachers point. Teachers also not stimulate children questioning, as mentioned before that if children not stimulate their curiosity, they sense of wonder will lost [1-2].

The predictions allowed explication of pupils’ preliminary ideas [9]. But teachers in A kindergarten not stimulate children prediction, while B kindergarten stimulate children prediction. Children in B kindergarten predict based on weight and size. The result in line with the statement that many research tasks comprising predictions about sinking and floating are a lot used to educate the density concept. Although such tasks show that children’ predictions are initiated to hang on a grouping of weight, size or substance, and not density, even midst the adults [8].

For the communicating, both of teachers engaged children’s consideration to particular points which they considered fundamental for children understands using guiding questions. Teachers did not enterprise for building steady and orderly practice of entire class discussions or during explorations. Whereas discussion during explorations has been found have influenced children’s cognitive modifications and helped them improve more scientifically understandings of floatation, float and sink [9].

In the end of learning, both of teachers not expound the concept behind floating and sinking. Research point out that in some early childhood settings, children around five are do not need to introduce the concept because inadequate cognitive difficulties are being made of them. Whereas Vygotsky’s explain that learning is crucial to cognitive advance and the best time for learning something new is in early years where children is most receptive [9,13]. But actually teachers also have difficulty and have limited ability to extend the concept to the children. It this has an impact on the weak understanding of the concept of floating and sinking matter [14].

Table 2 show that both of teachers have not understand yet about early science learning. They emphasized that one of the main goal for science education was that the children should have fun with science activity. Based on the answer of interview, there is indicated that teachers still have a shortage science pedagogical content knowledge. Research point out that one key idea for supporting science teaching and learning is pedagogical content knowledge. Pedagogical content knowledge incorporates teachers’ knowledge of the content to be taught, their knowledge of what children can learn and how they learn it, and their knowledge of strategies that will uphold children’s content learning, also how and when to apply that knowledege [15].

Table 2. Kindergarten teacher’s interview about teaching science.

| Question | A Kindergarten | B Kindergarten |
|----------|----------------|----------------|
| What are you thinking about science in early childhood education? | “Science is a fun activity, like doing experiment or cooking”. | “Science is a natural phenomenon around he children”. |
| Do you always stimulate children science process skill? How do you do that? | “I usually do an experiment. You can see the procedure in the lesson plan”. | “I always ask the children to observing, making a classification, making predicting, and communicating”. |
| What are the difficulties of teaching science to young children? | “I’m lack of science concept and how teaching science to the children because I don’t have much experience and I didn’t get any training about science teaching. Beside that we don’t have proper science tool to support the activity”. | “It’s not difficult because science for young children is simple. We can tell the phenomena around the children and do simple sciences experiment to make children have fun”. |
4. Conclusion

Floating and sinking presented with two different activities but teachers in both kindergartens have not boosted children science process skill yet. Science process activity in two kindergartens not managed children to learning by themselves. Teachers do combination of both instruction and hands-on manipulation to show that float and sink is affected by mass and size only. It caused, kindergarten’s teachers pondered that to construct scientific concept such as density through science process is difficult to teach and to learn. They believe that children need full guidance and instruction to do science process activity. As well as that some complex concepts can only be taught at more advanced levels of schooling. Moreover, teacher’s scientific knowledge and science pedagogical understanding have been narrow. However, collective figures of authors argue that kindergarten teacher must be shifting their standpoint about early science education and must to advance their knowledge and experience in science teaching. Certainly, in the past few years’ research, science education has exposed the necessity to expand teacher’s quality of learning and teaching process mostly in the early years, in instruction to more sufficient interconnection between theory, observation and experimentation in classroom practice.

References

[1] H Eshach 2006 Science Literacy in Primary School and Pre-School, K. C. Cohen, Ed. Netherlands: Springer pp 29–54.
[2] A S E Hammer and M He 2016 Eur. Early Child. Educ. Res. J., 24 450
[3] M Ampartzaki and M Kalogiannakis 2016 Early Childhood Educ J, 44 169
[4] N Mansour 2015 Int. J. Sci. Educ., 37 1767
[5] J R McDonald 2012 Sci. Act. Classr. Proj. Curric. Ideas, 49 77
[6] R D Castillo, T Waltzer, and H Kloos 2017 Cognitive Research: Principle and Implication, 28 J
[7] A Forum, S Learning and B Co 2005 Asia-Pacific Forum on Science Teaching and Learning, 6 1
[8] M Z Hashweh 2016 Res. Sci. Technol. Educ., 34 1
[9] M. Kallery 2015 Int. J. Early Years Educ., 23 31
[10] U Duruk, A Akgün, C Doğan, and F Gülsuyu 2017 Int. J. Environ. Sci. Educ., 12 117
[11] L K Berland, C V Schwarz, C Krist, L Kenyon, A S Lo and B J. Reiser 2016 J. Res. Sci. Teach.,53 1082
[12] C V Schwarz et al 2009 J. Res. Sci. Teach., 46 632
[13] M Kallery, D Psillos, and V Tsifles 2009 Int. J. Sci. Educ., 31 1187
[14] Viyanti et al 2017 J. Phys.: Conf. Ser. 909 012057
[15] J Gropen et al 2017 Early Educ. Dev., 28 607

Acknowledgments

We thank to KEMENRISTEK DIKTI for a part of financial support through the hibah PUPT. We also thank to kindergarten teachers who have been willing to participate in this study.