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Learning physics at home: The utilization of Indonesian traditional toys for studying

Andinusa Rahmandhika[a]
[a] Universitas Muhammadiyah Malang
Malang, Indonesia

Email of the corresponding author: andinusa@umm.ac.id

Abstract: The concept of physics still brings difficulty to elementary students, especially when they have to learn it individually or with their parents. The materials that need analysis and critical thinking make them unable to solve the problems related to natural science. This community service program was conducted at a study group in Malang and was aimed to improve the student's understanding of the concept of physics with Indonesian traditional toys. The observation was conducted to find out the problems faced by the students and the assistant of learning who assists them in learning physics. The community service program includes the classification of the toys based on the physics concept being learnt, the use of the toys as learning media and learning sources for students, and student's understanding of the physics concept through traditional toys. These activities were conducted to focus students' learning in a fun way and train students to analyze phenomena that occur around them.

Keywords: physics, natural science, Indonesia traditional toys, teaching media

1. Introduction

School is a formal institution established to provide qualified education for students according to their level. It is to support the Compulsory Education Program of the government [1]–[3]. The implementation of learning at schools is carried out with a programmed schedule and supporting facilities. In the teaching and learning process, activities are carried out in the classroom with a blackboard and stationery to present the material. Sometimes, teachers also use gadget technology (laptops and LCDs) and other learning media in their teaching.

Education at schools that is conducted every day also educates students to be disciplined through a predetermined time routine. Activities at schools have also been determined systematically for each subject. In one day of school activities, students are planned to get three to four subjects. The preparation of this program is aimed at achieving core competencies and basic competencies of students in education.

Even though Indonesian education has experienced improvements and will continue to be improved, for now the implementation of formal education has had to be disrupted due to the COVID-19 pandemic. Schools have different methods of teaching and learning processes [4]–[6]. Teachers and students must have distanced teaching and learning processes. Submission of material must be done through communication media. Materials in the form of images, documents or videos are delivered in short messages via messaging applications or social media. Teachers are required to study and understand software applications to create learning materials that students can understand well at home. Evaluation tools to determine student abilities have also moved to computer-based evaluations without using

paper and stationery [7]–[9]. This evaluation is generally carried out through one of the facilities provided by Google, Google Form, or simply in the form of messages written on the messaging platform.

Learning at home requires the assistance of students' parents in understanding the material presented by the teacher [10]–[12]. Parents must be able to become "translators" for their children when they "go to school" or do assignments. This assistance is aimed to make them can still understand even though the material is delivered indirectly. Elementary school education from grade 1 to grade 6 does not automatically become easy guidance for parents. Some parents find it difficult to guide their children to study. Both in terms of a curriculum that presents material based on integrated (thematic) learning or because parents who have not studied what their children are currently learning at school become a factor in the difficulties of parents in providing guidance.

Study groups that are formed in the student's environment while studying at home are part of helping parents' difficulties in accompanying their children to study. These small groups are generally formed because parents ask for help from someone who is considered to have a better understanding of the new curriculum lessons at school.

Like at school, this study group also needs learning media to provide explanations to students, especially for science subjects related to Physics because its concepts for elementary school students require concrete objects to explain them. The selected learning media must be fun and interactive for students. With the nature of students who tend to still want to play, students can be introduced to traditional toys that have physics concepts in their use. With this toy learning media, students can learn through play [13]–[16] to understand the physics concepts.

Indonesia has traditional toys that can teach students the physics concepts. From traditional toys, students can learn about energy and its changes, such as propellers or what is called *kitiran* in Javanese, teaching students how wind energy can be converted into motion energy. Toy boats, or better known as *otok-otok* boats, teach students how to recognize temperature and heat and how heat can move. From these advantageous, it can be understood that Indonesia's cultural heritage in the form of traditional toys does not only introduce games, but also provides an understanding of the sciences around them.

In this study assistance, the natural science subject is still difficult to explain because it is a new science concept for elementary school students and the lack of learning media. Students still tend to "imagine" the concepts from the given explanations. They do not know the concrete examples of the concept, even though they are all around them. In addition, students tend to play when studying because they feel "off" for too long from school activities.

From the situation analysis described, there are problems that arise in the learning situation in the study group. The problems in the study group are:

1. Lack of concentration of students in learning situations. Students do not want to read the text to find explanations or answers to questions. The explanation given by the assistant of learning was not able to provide them with an understanding of the concepts of Physics.
2. Another problem, there is no learning media that can attract students' attention. In this case, students need learning media that can make them play while

learning, learning media that can help students to carry out simple investigations based on the concept of the Natural Science of Physics.

Therefore, the purposes of the community service program are to give an understanding of the concept of physics to elementary students through the apperception of playing and increase their concentration in learning situations. Moreover, it gives enjoyable learning media for students to do simple investigations based on the concept of physics.

2. Method

In conducting the community service program, the author used Participatory Action Research (PAR) approach [17] because it is aimed to enhance the creativity of society in solving their problem. They were expected to be able to use the potency they have to overcome the difficulty. Therefore, the author proposed to give assistance and guidance in solving the problem. There are steps conducted to find out the potency and problem of the study group.

1. Identification of learning media and learning sources used in the study group.
2. Classification of Indonesian traditional toys based on the physics concepts.
3. Determining the delivery method of materials by implementing the Indonesian traditional toys as learning media in learning situations.
4. Implementing the learning media in learning situations.
5. Evaluating the learning process.

The steps planned were conducted systematically to obtain the appropriate learning media based on each concept and method to deliver it. The evaluation was also conducted to consider the use of Indonesian traditional toys in school teaching and learning activities.

3. Result and Discussion

Learning guidance is still needed by students to recognize the concept of material and assignments given by the teacher as an assessment. The parents of students who serve as "teachers" at home are having a hard time with the assignments. Therefore, the study group around them becomes the helping solution for parents.

In this situation, students need guidance to further improve their understanding as they study at school. Even though there is a handbook for students, there are still many of them who do not understand the instructions, steps, and procedures contained in the book or given by their teacher as school activities or assignments. Even though the concept is the same as school, online learning methods still make the students do not understand. Students tend to immediately look for "instant" answers for every assignment they receive without wanting to understand the material.

This difficulty occurs a lot in the concept of learning the natural science related to physics, especially elementary school learning which is now delivered thematically. Introduction to each material is needed so that students know what is learned. Thus, online school difficulties are actually not only experienced by

students but also by people who act as the assistant of learning and "teachers" at home.

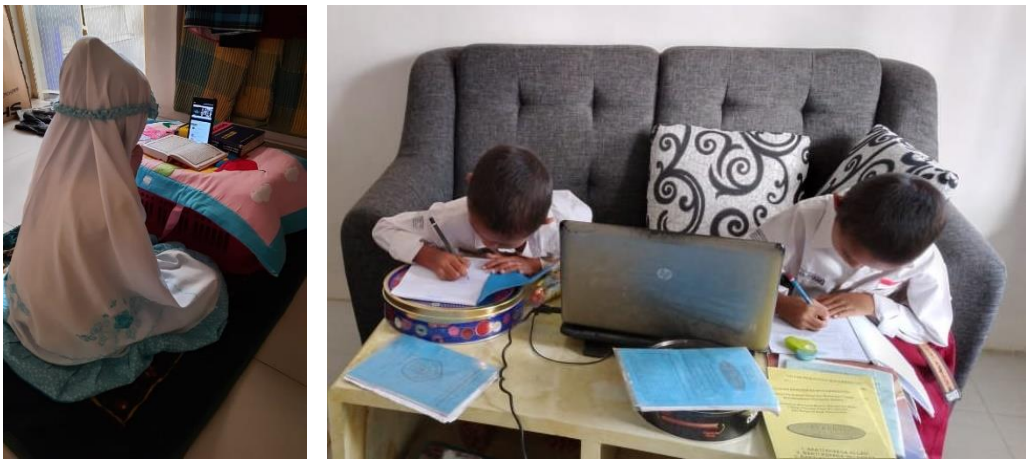

Figure 1. The “school” and learning situations at home during COVID-19 pandemic

Several study groups began to form because of this learning difficulty. One of the study groups that was formed was in Malang. This study group was formed as a student learning assistance during the COVID-19 pandemic. The difficulties of parents at home in guiding their children to "school" and learning make the study groups in the environment a solution to the parents’ problems. This study assistance was guided by a teacher at SD Muhammadiyah 08 Dau Malang. In this assistance, the difficulty faced was the introduction of the concept of science to elementary school students. Science began to be taught in grade 3. At this level, science is still an introductory lesson, and the understanding is in grades 4 to 6.

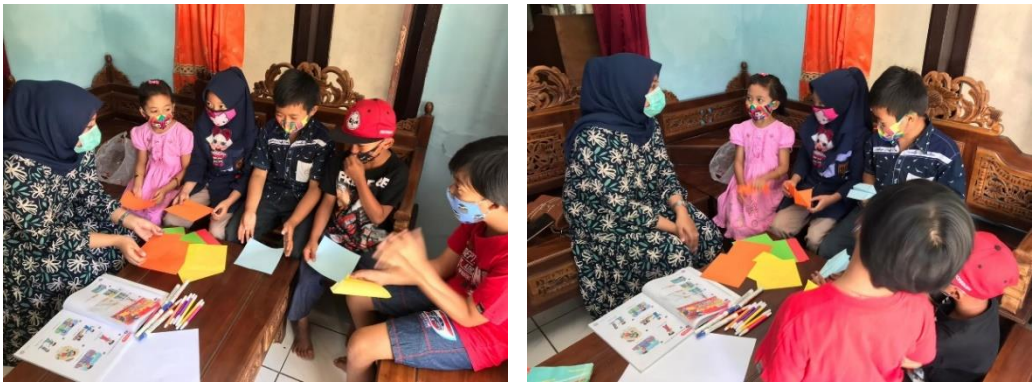

Figure 2. Learning situation in the study group

In this community service program, the author provides mentoring and training to the assistant of learning in the study groups so she can develop her learning methods. This activity begins with observing students' difficulties in understanding science concepts. Student motivation was also observed during the "school" process and learning in the study group. Some of them tend to be bored at "school" and study because they feel they are not going to “school” if they are not at school. Students play more and talk or joke with their friends than study.

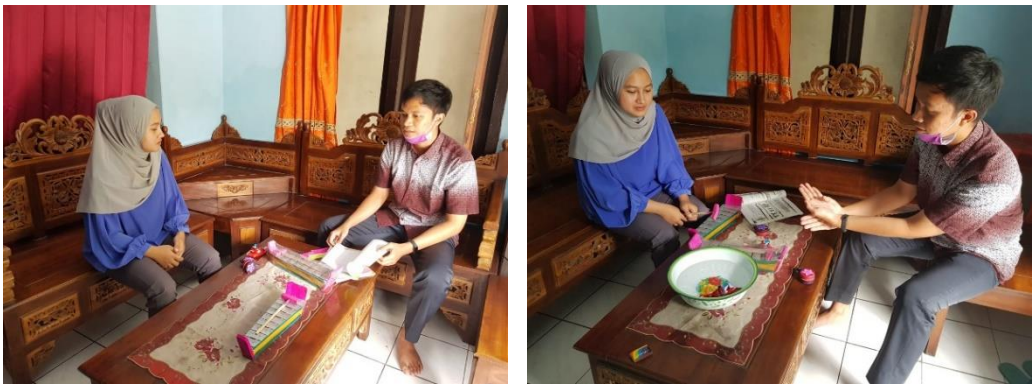

Figure 3. Guidance and training the concept of physics in Indonesian traditional toys

Guidance for the assistant of learning of the study group was conducted in determining learning media to assist her in delivering the material. With the behavior of students who get bored easily and like to play, the author used Indonesian traditional toys as learning media to teach physics concepts to the elementary level of students. In the implementation, the learning assistant is guided to classify the traditional toys according to the chapter or sub-chapter of the physics concept to be taught. In this community service activity, *gambang* (xylophone), *otok-otok* boats, and yo-yos were used to explain the concept of physics. Meanwhile, students were guided to make paper propellers as skill activities to introduce the concept of science to students at the elementary level. In addition to traditional toys, students' understanding of science is also supported by rulers, thermometers and other objects, magnets.

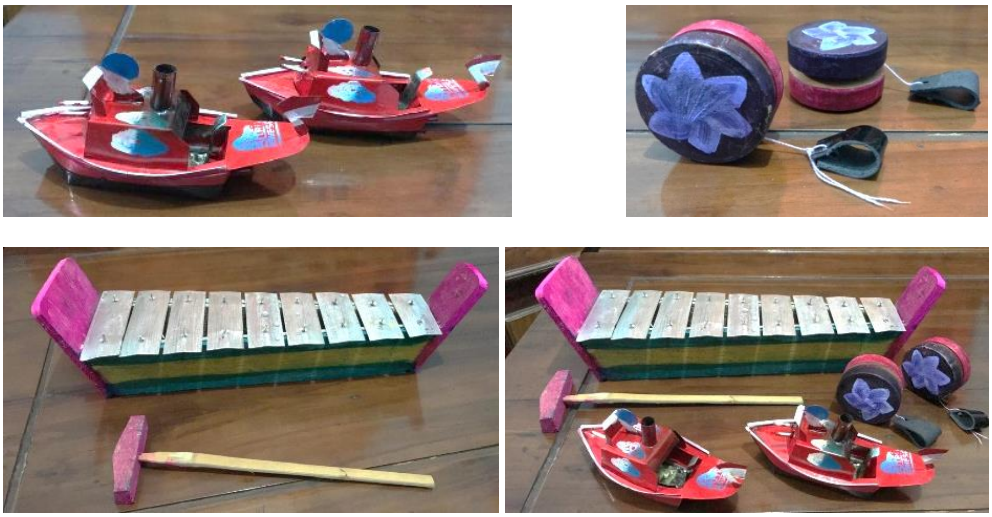

Figure 4. Indonesian traditional toys as the learning media

In explaining the concept of energy and its changes, students can use xylophones, *otok-otok* boats and paper propellers. xylophone teaches students about the energy of motion and how it changes so that it becomes sound energy and how sound can occur. Moreover, students will know that sound occurs due to vibrations

that occur in the xylophone bar. They learned about the concept of energy conversion from *otok-otok* boat. It is when heat energy transforms into motion. Heat energy is used by the *otok-otok* boat as power so that the boat can move. From the phenomena that happened on the *otok-otok* boat, students can learn about the conversion of heat energy into motion energy, while with propellers, students can learn about how wind energy changes into motion energy.

Paper propellers made by students in the study groups can introduce them to the concept of energy conversion from wind energy into motion energy. From playing with the paper propellers, they learn the proper shape of the propeller so that it can move and how the propeller can move in a balanced way. Observation tables for an understanding of propellers are also made so that they can observe and analyze the rotating propeller.

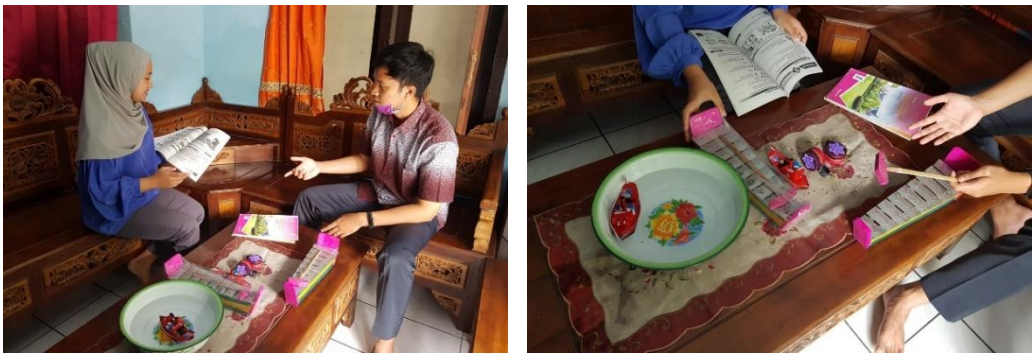

Figure 5. Guidance for the assistant of the study group to classify the traditional toys based on the physics concepts being taught

Learning using traditional toys was begun by providing basic theory from student books. Students are introduced to energy conversion and how sound can occur. Another material provided is how heat energy can be converted into motion energy and how balance can occur in an object. Students are invited to observe what happens to the toy if it is operated. The results of their observations were written down in their notebooks and analyzed so that they can find out every phenomenon that occurred in the traditional toys they are played.

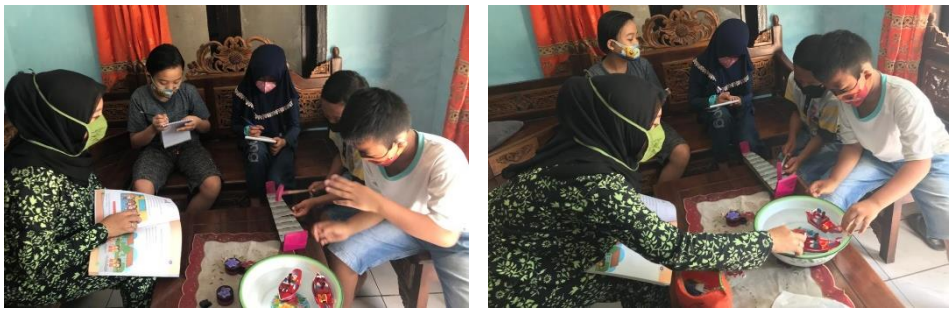

Figure 6. Learning situation using traditional toys

The use of traditional toys as learning media in the study group can increase students' motivation and understanding in learning physics concepts at the elementary school level. Students can better communicate the results of their experiments based on the Theme book (school handbook). Students can directly

observe the phenomena that occur in physics. Students can also write down the data obtained from the observations they made.

The use of Indonesian traditional toys in science, apart from being an introduction to culture to children from an early age also introduces them that science can be learned anywhere, from anywhere, and at any time in a fun way. Through traditional toys, children can carry out simple science investigations by observing, analyzing, and recording what happens when the toys are played. The phenomena they observe from playing can introduce them to the concept of science for students at the elementary school level.

4. Conclusion

The community service program conducted by the team in the study group in Malang can provide better learning motivation for students at the elementary school level. A better understanding through traditional toys is triggered because they want to better understand the concept of physics that occurs in every toy they were played. The simple operation of the toy also trains their motoric skills in learning.

In avoiding the boredom of learning among students, teachers or the assistant of learning can use the resources around school or house. This includes the use of traditional toys which also introduce the characteristics or history of the nation. Thus, Indonesian traditional toys can be used as learning media for students in the class.

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