



LEARNING BASED ON SCIENCE, TECHNOLOGY, ENGINEERING, AND
MATHEMATICS (STEM) THROUGH WHATSAPP APPLICATION
IN THE TIME OF THE COVID-19 PANDEMIC

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ABSTRACT

The Covid-19 pandemic has caused early childhood education institutions to experience various problems. Learning that has been carried out face-to-face, must eventually be replaced with online learning using digital technology intermediaries. All early childhood education institutions have difficulty dealing with this reality, so that the development of early childhood abilities cannot be developed optimally. One institution that was able to deal with this reality well is RA Nurud Dholam, Mumbulsari Village, Mumbulsari District. This institution was able to deal with it by using the STEM approach through the Whatsapp application media. From this background, this research was focused on describing the implementation of STEM-loaded learning through the Whatsapp application in group B RA Nurud Dholam, Mumbulsari Village, Mumbulsari District, Jember Regency. The research method used was a qualitative approach and the type of qualitative descriptive research. The results of this study indicate that STEM-based learning through the Whatsapp application at RA Nurud Dholam Mumbulsari Village during the covid-19 pandemic went well, because this learning can stimulate children's intelligence, improve children's mathematical and naturalistic logical abilities and make learning more effective and efficient.

Keywords: STEM-Based Learning, Whatsapp Application, Covid-19 Pandemic

INTRODUCTION

In the era of the Covid-19 pandemic, early childhood education institutions face various problems, including changes in early childhood learning patterns. Learning that has been carried out face-to-face, must finally be replaced with online learning using digital technology intermediaries. All early childhood education institutions have difficulty dealing with this reality, so that the development of early childhood abilities cannot be developed optimally. During this pandemic, educational institutions must use online learning. This online learning will improve early childhood learning outcomes if all teachers prepare online learning well. Therefore, online learning is a process that must be carried out by early childhood education institutions during this pandemic.

Online learning is identical to Information Communication Technology (ICT) based learning. Intruction like this must be accustomed to being applied in early childhood education institutions, because at this time educational institutions are entering the 4.0 era. Anam explained that educational institutions including early childhood education institutions must be able to familiarize themselves with innovation or development of ICT-based learning. Thus, in the presence of a pandemic or no pandemic, early childhood education institutions must get used to applying online learning or ICT-based learning to early childhood.

Among educational institutions that have started to implement online learning well is RA Nurud Dholam, Mumbulsari Village, Mumbulsari District. This institution is able to implement online learning using the Whatsapp application media. In this study, educational institutions use the STEM (Science, Technology, Engineering, and Mathematics) approach. STEM-laden learning through the Whatsapp application integrates 4 fields of knowledge including science, technology, engineering and mathematics which are applied by using an intermediary a Whatsapp application. Online learning like this is able to help overcome the difficulties of teachers at RA Nurud Dholam in carrying out the online teaching and learning process during the pandemic. In its application in this educational institution, STEM learning also uses a scientific approach, namely a learning process based on the principle of active student learning to master basic competencies and core competencies at a satisfactory level.

RESEARCH METHODS

The type of research used in this research is descriptive qualitative research, with a qualitative approach. According to Sugiyono, qualitative research is research used to examine the condition of natural objects, and researchers act as key instruments, data collection techniques use triangulation, data analysis is inductive and research results emphasize meaning (Sugiyono, 2018:9). The technique of determining the informants in using purposive sampling and snowball sampling techniques. The informants selected from the purposive sampling technique were the principal (Mrs. Sri Wahyuni, S.Pd) and Group B teachers (Ms. Holila, S.Pd.I and Ms. Khusnul Hotimah, S.Pd). Meanwhile, the informants selected from the snowball sampling technique were the teacher of group A (Mrs. Siti Sholehathul Ismi, S.E) and the guardians of students from different hamlets.

Data collection techniques in this study using interviews, observation and documentation. Data analysis used data collection techniques, data reduction, data display and conclusion drawing/verification. Test the validity of the data using source triangulation.

RESEARCH RESULTS AND DISCUSSION

1. Research Results

The implementation of the STEM-charged learning process begins with an opening greeting by the teacher by greeting the child through the Whatsapp application using a voice note. This is as stated by Mrs. Sri Wahyuni, S.Pd, as the principal of the RA Nurud Dholam Mumbulsari school, the following To start the learning activities the teacher will first greet the children using a voice message that is shared via the WA group. At this stage it is the same as the usual opening activity, which begins with saying and answering greetings, reading prayers, asking questions, and discussing learning activities (Sri Wahyuni, Head of RA Nurud Dholam, 2021).

The statement from Mrs. Sri Wahyuni, S.Pd was confirmed by Ms. Khusnul Hotimah as follows:

So in the implementation of learning through the Whatsapp application, there are also 3 activities the same as in face-to-face learning. These 3 activities include initial activities, core activities, and closing activities. The initial activity is usually filled with greetings, asking how things are, and opening soup such as daily prayers. Then the teacher will provide an explanation of the material that the child will learn along with the tools and materials that the child must prepare with the help of parents (Mrs. Khusnul Hotimah, Group B teacher, Interview, Mumbulsari, February 25, 2021).

To find out how it is clearly implemented, the researcher visited the residence of one of the guardians closest to the school, namely Mrs. Salwa and saw firsthand the child's learning process through the WhatsApp application as an intermediary. When visiting the home of a student's guardian, researchers do not forget to use the health protocol as recommended by the government to prevent the transmission of Covid-19. The results of observations made by researchers show that the actual data are in accordance with the explanations of Mrs. Sri Wahyuni and Mrs. Khusnul Hotimah.

The results of the interviews and observations showed that the initial activities carried out by sending voice messages were included in the questioning stage. This stage is very important to do in the process of implementing learning through applications to find out the extent to which children and parents are prepared to take part in teaching and learning activities guided by the teacher. The task of parents in this process is as a facilitator, motivator and mentor for children. Parents act as facilitators are parents will help children provide the tools and materials needed in the learning process. While the motivator means that parents act as supporters and encouragement of children when carrying out learning activities. Acting as a mentor means that parents will represent teachers in providing guidance to children by directing children in learning activities that will be carried out.

Furthermore, in the implementation of the WhatsApp STEM method, the teacher will guide learning by providing video tutorials which will be listened to by children with parental assistance. Mrs. Holila, S.Pd.I as group B teacher RA Nurud Dholam Mumbulsari explained this in detail in an interview on February 25, 2021, as follows:

The teacher guides learning by making video tutorials in the form of learning implementation or material in which there is STEM content and then the video is shared or distributed to WA groups. Parents or guardians of students will accompany the child in watching the video. After the video is understood, then the

parents will accompany the child to play while learning by using objects that are around the child. By utilizing goods or objects that are around the child, it is hoped that it can foster children's ideas and creativity in utilizing used goods (Loose Parts) which is the goal of implementing STEM-charged learning itself (Holila, Teacher Group B, Interview, Mumbulsari, 25 February 2021).

The following are the results of the documentation of giving tutorials by the teacher:



Figure 1
The teacher is giving guidance in the form of tutorials that are shared via the WhatsApp Application

The picture above is an activity when group B teacher RA Nurud Dholam mumbulsari greets and opens the learning process and conveys the theme that will be studied by the children. In this stage the teacher can also provide a tutorial directly about the material in the form of the learning process that will be carried out by the child.

The results of the interviews and documentation above show that the implementation of STEM-laden learning through the WhatsApp application is carried out by educators providing video tutorials as materials or materials that are used as guides in learning and can be observed by children with parental assistance. In this process, we enter the stages of exploring and observing. At this stage the child will collect information through the process of observing video tutorials, and from the observation process the child will collect information which will later be practiced in their learning activities. The next stage is the child's learning process with parental assistance. This was explained by Ms. Khusnul Khotimah, S.Pd, as follows:

After the child observes the video tutorial given by the teacher and the child understands what will be done, the next stage is the child's learning process with parental assistance. In this process the child will do a similar practice with a video tutorial. If in the learning process or practice children use other ways, then that is the goal of STEM where children are free to explore and build their knowledge. Because the practice that the child does does not have to be the same as the tutorial given by the teacher. (Khusnul Hotimah, Group B Assistant Teacher, Interview, Mumbulsari, February 25, 2021).

The results of these interviews indicate that the child's learning process does not have to be the same as the material given. Children are free to explore and build their knowledge. This is in accordance with the Developing Skills and Process stages, namely building, designing, using numbers, taking measurements, identifying, comparing,

Authors: Nur Halimah, Nurul Anam, Naili Inayatul Maghfirah & Zainal Arifin

sorting and so on. In this stage the child will reason with his sensory abilities in processing information which will later be communicated. This is as expressed by one of the guardians of students, namely Siha, as follows:

After the child carries out learning activities or practices, the child will be stimulated to be able to tell the learning process by means of the accompanying mother asking simple questions. The child will answer or tell in detail what has been done. In this case, it is my duty as a mother to record children's stories and then the recordings are sent to the teacher as assessment material. (Siha, Student Guardian Group B, Interview, Mumbulsari, February 25, 2021).

Mrs. Siha's statement was confirmed by Mrs. Holila, S.Pd.I as follows:

In the practice or learning process of children, parents will take pictures or record children's activities. In addition, parents must stimulate children to be able to tell the steps or the learning process in a coherent manner. When the child tells the story, the parent will record the child's conversation and send a recording in the form of a video or image along with the recording of the child's voice. From pictures or videos and recordings of the child's voice can be used as material for assessment by the teacher. (Holila, Teacher Group B, Interview, Mumbulsari, February 25, 2021).

From the results of the interview, it shows that the final process of implementing STEM-laden learning through the WhatsApp application is Communicating or communication. At this stage requires patience and strategies from parents in order to make children willing to tell enthusiastically what they have done while learning. The expertise of parents in making children comfortable when telling stories will help teachers get information about children's attitudes when sharing stories.

By using a scientific approach, the implementation of STEM-loaded learning through the WhatsApp application can develop children's logical mathematical and naturalist intelligence. This is in accordance with the following statement by Sri Wahyuni, S.Pd:

The components in STEM, if applied properly, can develop some children's intelligence. For example, these components of mathematics and techniques can improve children's mathematical logical intelligence. Meanwhile, simple science and technology can foster naturalist intelligence in children because they relate to nature and the environment the child lives in. (Sri Wahyuni, Head of RA Nurud Dholam, Interview, Mumbulsari, February 25, 2021).

Sri Wahyuni's statement is justified by Khusnul Hotimah's statement as follows:

This complete STEM content is able to help teachers to stimulate various basic intelligences that children have. One example is the ease with which children understand how to count through the practices carried out in the learning process. (Khusnul Hotimah, Group B Assistant Teacher, Interview, Mumbulsari, February 25, 2021).

To obtain data in accordance with the results of the interviews, researchers collected documentation in the form of photographs of children's learning outcomes. The

following are the results of the documentation of the implementation of STEM-loaded learning through the WhatsApp application:



Figure 2
The results of the water absorption experiment with using vegetables and 5 food coloring

The picture above is a child's learning outcomes in which there is STEM content. From the experimental process of water absorption, it introduces the components of science and mathematics to children. So with this activity the child will get information and try to reason about the process of change. The use of several food colorings indirectly introduces children to mathematical concepts, namely the classification of objects and the technique of mixing several colors. Of course, the results of this learning process will stimulate children's logical mathematical and naturalist intelligence.



Figure 3
The result of combining technology and engineering

From the results of the documentation above, it shows that the learning process by combining technology and techniques makes children have ideas so that they are able to be creative and make works according to their imagination.



Figure 4
Process Science, Technology, Engineering and Mathematics (STEM)

From the results of the documentation above, it shows that STEM-charged learning helps children's learning process which is carried out in a coherent manner able to make children creative, innovative, and think critically. The impact of implementing STEM-loaded learning through the WhatsApp application is being able to stimulate several multiple intelligences (Multiple Intelligences) of children including mathematical logical intelligence and naturalist intelligence.

1. Discussion

STEM content learning is a learning approach that integrates 4 disciplines. In Group B, RA Nurud Dholam, STEM learning is carried out through an application, namely WhatsApp. STEM-loaded learning through the WhatsApp application is a learning activity in which it combines four fields of science, namely science, technology, engineering and mathematics through the intermediary of a WhatsApp application. From the results of the study, it was stated that during the Covid-19 pandemic, STEM could also be applied to Early Childhood Education institutions by using application intermediaries. The findings of this study are in accordance with Chesloff's theory which states that "STEM education must begin in early childhood because the heart concepts of STEM are curiosity, creativity, collaboration, and critical thinking which are in great demand". (Resa Pujiawati, 2020:110). This kind of education is part of the education and learning process that is student oriented/centered. (Tribakti: Journal of Islamic Thought, 31.1: 2020).

The implementation of STEM-loaded learning through the WhatsApp application at RA Nurud Dholam uses a scientific approach which means it is student-centered and stimulates students to be active in the process of learning activities. The scientific approach in implementing STEM-charged learning has 5 stages, including; questioning (Questioning), observing and gathering information (observing), trying (experimenting), reasoning (associating) and communicating (communicating). The stages in this scientific approach are in accordance with the theory of Suci Utami Putri which states the aspects that teachers must pay attention to in the application of STEM include; Questioning, exploring and observing, developing skills and process and communicating (Suci Utami Putri, 2018: 65).

The stages of questioning (questioning) in the implementation of STEM-charged learning at RA Nurud Dholam are in the form of initial activities which include greetings, exchanging news via voice messages, conducting habituation activities in the form of daily prayers. At the observing stage, it includes the activity of providing video tutorials which will later be observed by children with parental assistance. At this stage the child will collect information through his senses. The next stage is the process of trying (experimenting), in this process the child will practice learning according to the video tutorial given by the teacher. At this stage the child will be given the freedom to explore his knowledge through the learning process carried out. This process in Suci Utami Putri's theory is known as the developing skills and process, which is a process where children try to build their potential from the activities carried out. The last stage is communicating, which is the stage where the child will be stimulated to tell the learning process in a coherent manner.

STEM-loaded learning through the WhatsApp application using a scientific approach is able to stimulate children's logical mathematical and naturalist intelligence. Mathematical logical intelligence is the ability to use numbers and use logical thinking, for example; Children are able to number objects, match objects with number symbols, come up with ideas and others. While naturalist intelligence is intelligence in understanding nature and utilizing nature, for example; Children can recognize causal relationships, the results of an experiment and know how to take advantage of nature.

CONCLUSION

STEM-laden learning through the WhatsApp application is a strategy for teaching and learning activities carried out online during the Covid-19 pandemic, the implementation process of which combines 4 components of science, including science, technology, engineering and mathematics. The implementation of STEM-charged learning at RA Nurud Dholam is devoted to Group B who are in the 5-6 year age range due to more mature age considerations. The process of implementing learning through the WhatsApp application involves parents to help teachers accompany children in learning activities.

The implementation of STEM-loaded learning through the WhatsApp application uses a scientific approach with 5 stages, including; questioning, observing and gathering information, conducting experiments, reasoning and communicating. The initial activity is the stage of asking (Questioning) along with the stages of observing and gathering information (Observing). The core activities include the stages of conducting experiments (experimenting) and reasoning (associating). The final activity includes communicating activities.

The implementation of STEM-laden learning through the WhatsApp application is able to become a learning model that can be applied online during a pandemic in developing 6 aspects of development. Of course, this fact can overcome learning problems during the Covid-19 emergency, especially in Early Childhood Education institutions. In addition to being able to answer these problematic challenges, the implementation of STEM-loaded learning through the WhatsApp application can also stimulate one of the multiple intelligences of children, namely mathematical logical intelligence and naturalist intelligence.

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