Applying home based STEM activities to promote students learning motivation during Covid-19 pandemic

H Yunita
SMPN 1 Lhokseumawe, Kp. Jawa Lama, Banda Sakti, Kota Lhokseumawe, Aceh, Indonesia
E-mail: henyulitarachman@gmail.com

Abstract. Education today faces new challenges in implementing learning during the Covid-19 pandemic. A compulsion to keep a distance causes learning to be carried out remotely using online methods. During the distance learning process students undergo more independent learning at home and cannot interact directly with teachers and friends. This condition is one of the causes of the lack of student motivation. Family members are major learning companion during a pandemic who could deal directly with students. So that we need a learning innovation that can empower homes and family members as a primary place for learning during home learning activities. This study aims to promote student motivation during the Covid-19 pandemic by applied a home-based STEM model. This model applied when students make learning media on subject of the earth structure and water layers. This study used a Classroom Action Research approach. Class actions are implemented through two cycles of action. Data collection techniques are obtained through observation, interviews, documentation study, and literature study. The research was carried out on class VII-A within 22 students. The results showed that there was an increase in student motivation after the implementation of home-based STEM learning. This is because students feel challenged and have the freedom to develop ideas in making learning media by making use of existing materials. Student interactions with family members during the learning process also play a role in making learning more enjoyable and promote student learning motivation.

1. Introduction
The Covid-19 pandemic made many changes to human life. One of them is education. The education system must adapt and ensure every student gets a proper education without causing the spread of Covid-19 through the distance learning by utilizing information technology. However, the implementation of this distance learning has encountered several problems, such as human resources, infrastructure, and procedures for its implementation [1]. Distance learning also causes students to do more independent learning and unable to interact directly with teachers or other students. Home and family members play an important role in facilitating learning during this pandemic. Based on the results of a literature study, stated that the implementation of online learning in elementary schools during the pandemic can be carried out quite well if there is collaboration between teachers, students and parents [2].

Student motivation has an important role in creating meaningful learning for students to achieve the learning goals. Student learning motivation is not only created by students, but teachers also play a role in creating a conducive learning environment so that students’ learning motivation can develop by itself
Good learning motivation will create a learning enthusiasm that helps students find their own knowledge. This discovery process will certainly provide a meaningful learning experience for students.

Online learning during the pandemic is a new experience for teachers, students, and parents. Many problems were found in its implementation. In addition to mastering information technology, choosing learning methods is very important to keep students motivated to do learning activities from home. The results of the initial survey showed that students felt bored working on the questions given by the teacher but were not accompanied by direct discussion or giving feedback.

Based on the facts above, the researchers felt that learning innovation is needed to keep student motivated during they studied at home. The learning innovation could empower homes and family members as learning resources for students. Rather than give a student the question task, learning activities must be challenging student to solve the problem.

Learning science is not only about cognitive domain, but also how student mastering the science skills. These scientific skills can be obtained by applying the science concepts in everyday life. Home-based learning is the best way to train students' science skills by empowering homes and family members as learning resources [4].

Fun and challenging learning activities for students are one solution that can be done to maintain student motivation in learning [5]. STEM (Science, Technology, Engineering and Mathematics) is a learning method that integrates the concepts of science, technology, engineering and mathematics in learning to solve the problems. Rather than giving assignments, the STEM method is more to challenge students to explore as much as possible to solve any given problem [6].

Through this research, the researcher wanted to implement home-based STEM activities to promote student motivation during the Covid-19 pandemic.

2. Methods
This study conducted with classroom action research (CAR) by applying home-based STEM activities. The research was conducted on class VII-A students within 22 students at Public Junior High School number 1 in Lhokseumawe for the 2019-2020 school year. This study was held in two learning cycles. The application of this home-based STEM activity is carried out on the earth's structure material and the water layer on the earth's surface. Learning and data collection and research documentation are carried out in a network. Data collection was carried out through interviews, student motivation questionnaires and parent assistance questionnaires.

3. Result and Discussion
3.1. Result
Based on the results of the interview at initial condition, it was found that students felt science learning that was carried out online was boring, students were less motivated about doing the assignments. The assignments were about reading and answering the question task. The result of leaning motivation questionnaire in initial condition are showed at figure 1.
One of the most important parts in the STEM learning stage is design (engineering), because at this stage we can find out how students' cognitive abilities are applied in designing a model or product, [7]. In the application of home-based STEM activities, the challenge given to students is to design and model the earth's layer using household materials. Apart from keeping students able to study at home, this opportunity can also be used to carry out learning activities with other family members. The scheme of implementing STEM in this learning can be described as follows.

After the first cycle was completed, the students filled out the motivation questionnaire again, and it was found that there was a decrease in the number of students who had low motivation to 14% or a decrease of 9% from the initial condition. Meanwhile, the number of highly motivated students increased 5% to 9% after implementing home-based STEM activities. The following is an illustration of the results of filling out the learning motivation questionnaire in first cycle is describe on figure 3.
Based on the diagram above, there is no significant increase in the number of motivated students at high levels, but the number of students who have low motivation has begun to decline. This is because students not fully understood and able to do the STEM method in learning. The most difficult part that students feel is at the design stage. The application of STEM invites students to develop higher-order thinking skills at the analysis, evaluation, design, and creation stages \[8\]. The ability of students to design is a documentation of their higher thinking skills.

Revealing the problems faced by students in first cycle, the researcher gave a sharper stimulus that made student easier to choose materials and design a water layer model in second cycle learning. Providing a stimulus in the form of a problem can make students more challenged in solving the problems given \[9\].

In the early stages of second cycle, the researcher showed a transparent plastic container, then challenged students how to make the plastic container a model of the water layer on the earth's surface. Students are very challenged by the stimulus given and begin to design a model of the water layer. One example of the design and water layer model produced by students can be seen in figure 4.

![Figure 3. Learning motivation questionnaire results on the first cycle](image)

![Figure 4. (a) Stimulation (b) Model design (c) Water Layers Model](images)

Based on the results of filling out the learning motivation questionnaire in second cycle, there was a significant increase in student learning motivation. The percentage of students who have high learning motivation increased by 18% from the first cycle to 27%. Meanwhile, the number of students who have low learning motivation still has the same percentage as in the first cycle of 14%. The results of filling out the complete second cycle motivation questionnaire can be seen in figure 5.
The parental assistance also plays a major role in increasing student motivation. Based on the parent assistance questionnaire that was given and filled out online by the parents, it was seen that 68% of the parents helped the students in preparing the tools and materials needed to complete the science assignment. In addition, 78% of student guardians feel happy when accompanying their children to complete each given task. Parental assistance will have a positive influence in increasing student motivation [10].

3.2. Discussion
The condition of the Covid-19 pandemic requires students to carry out learning activities from home. This condition creates limited interaction between students and teachers and their friends. In addition, using the right method in distance learning will maintain the student learning motivation during pandemic covid-19. When student must learn from home, homes and family should be empowered as a conducive learning environment for students. Selection of learning methods should provide fresh challenges to students to keep student motivated in learning. Home based STEM activities can empower the home environment and family members in helping students apply science, technology, engineering, and mathematical concepts in solving the challenges that given. This learning method can increase student learning motivation during home learning activities during the Covid-19 pandemic.

4. Conclusion
The application of home-based STEM activities can increase student motivation during the Covid 19 pandemic. The application of based STEM allows the home to be an excellent learning resource and increases interaction between family members which has a positive influence on student learning motivation.

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