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Implementation of Loose Part Play STEM (Science, Technology, Engineering, and Mathematics) Media on STEM Understanding of Pre-service Teachers: A Case Study in Serang City, Indonesia

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Abstract

This study aimed to implement the STEM (Science, Technology, Engineering, and Mathematics)-based Loose Part Play Media on an understanding of cerebral palsy pre-service teachers in the city of Serang. The participants in this study are cerebral palsy pre-service teachers in Serang, Indonesia. The participant was 21 teachers. The method in this activity is a case study. The results showed that increasing of the STEM understanding was 26.2. It can be concluded that the STEM-based loose part play media can increase the STEM understanding of the pre-service teachers to find solutions to the problems faced by cerebral palsy pre-service teachers in Serang. An increase in understanding achievement indicates this through loose part play STEM of 26.2 (seen from the initial and final test), and the pre-service teacher's understanding of STEM-based loose play part media is 82.5.

Kata Kunci: Cerebral palsy, Loose part play media, STEM

INTRODUCTION

STEM is an acronym for Science, Technology, Engineering, and Mathematics. The US National Science Foundation launched the term STEM in the 1990s under the name SMET. Still, several parties did not approve the term, which was later changed to become the theme of the education reform movement in the four disciplines to grow the workforce in STEM. As well as develop citizens who master STEM (STEM literate) knowledge, as well as the increasing global competitiveness of the United States (US) in science and technology innovation (Mulyani, 2019). The approach from the four fields of science is a harmonious collaboration of scientific fields between problems that occur in the real world (Matanluk et al., 2013; Torlakson, 2014).

STEM-based learning can potentially improve 21st Century skills (Farwati et al., 2021). In a time of rapid development of technological innovation and competitive global challenges, the development of science, technology, engineering, and mathematics (STEM) competencies is essential. The existence of STEM can increase citizens' scientific literacy, increase international economic competitiveness, and is an important foundation for responsible citizenship, including ethical guardianship of our planet (Maass et al., 2019). Nugroho et al., (2019) further explained that STEM education could be used in other scientific fields by utilizing the principles of science, technology, engineering, and mathematics as a basis for learning and developing students' potential. The benefits of implementing STEM Education

are improving critical thinking skills and becoming creative, logical, innovative, productive, and directly related to real conditions so that students are ready to be competitive and work according to their preferred fields (Widya et al., 2019). Research conducted by the research institute Hanover Research (2011) shows that the main goal of STEM learning is to demonstrate holistic knowledge between subjects. STEM. The purpose of learning using the STEM approach is suitable for learning in vocational high schools whose subjects require complex knowledge.

STEM education formally integrates science, technology, engineering, and mathematics based on the curriculum. STEM education can also be carried out non-formally through non-academic and non-curriculum activities. STEM education is expected to form human resources with high expertise in their fields to provide new innovations. One part of STEM is Media Loose Parts Play. This media game uses materials that can be moved, brought, combined, redesigned, aligned, separated, and put back together in various ways. This material can be derived from natural or synthetic materials. Examples include stones, sand, gravel, twigs, wood, balls, buckets, boxes, shells, etc. Children can make an activity through their imagination using the available materials. Through the use of loose-part play media, it can help train the fine motor skills of children with cerebral palsy students. The child's hands will make active movements to use the loose part play media that has been provided in the form of a game, form and arrange the media that has been provided. The use of loose-part media Play can also increase children's imagination and creativity, improve hand-eye coordination, train fine motor skills, and train concentration. It can also be used as a medium to express children's emotions.

The application of the curriculum in schools implies that the learning process must enrich students' learning experiences using a scientific-based approach. To make it happen, the teacher needs to understand pedagogic principles, one of which is learning Design. One of the millennial generation's learning resources that have become quite popular is STEM (Science, Technology, Engineering, and Mathematics). However, there are several problems, including 1) teachers do not understand holistically and comprehensively the development of STEM-based Loose Part Play learning media, 2) teachers still experience difficulties in understanding and developing STEM-based loose part play learning designs for cerebral palsy student learning innovations, 3) the teacher has no experience and has never even compiled and developed STEM-based loose part play learning media. This condition became the basis for research to investigate the STEM (Science, Technology, Engineering, and Mathematics)-based loose part play media on cerebral palsy pre-service teachers in Serang, Indonesia.

METHOD

The study used a case study. The participants was 21 teachers. Implementation of activities in the context is face-to-face (offline). These offline activities are in the form of Exposures or "Lectures" and Workshops. "Lectures" or concept presentation activities are carried out classically and or in groups with lecture methods (expository), discussions, questions and answers, and workshops with the following agenda:

1. Expository presentation of the concepts of "multiple learning resources" for STEM-based Loose Part Play Media learning;
2. Discussions and questions and answers as responses and results of a conceptual-comprehensive presentation for learning loose part play media based on cognitive conflict;
3. Workshop and assistance in the preparation and development of STEM-based loose part play media learning (during face-to-face meetings, stage 1 and stage 2)

Assessment instruments and questionnaires (questionnaires) include:

1. Instrument for assessment of mastery/understanding of concepts: STEM-based loose part play media learning, with content covering

a. Definition and characteristics or characteristics
b. Objectives and benefits
c. Systematics and format

2. Questionnaire or questionnaire about:

a. Participants' responses and perceptions of program and activities, and
b. Self-reflection on the process and results of activities in this partnership program and the plans of each participant in the framework of Improvement-learning innovation of loose part play media in their class.

RESULTS AND DISCUSSION

Based on the initial test (pre-test), the average understanding of STEM was 56.3; after the activity, it was 82.5, or it increased to 26.2. The abstract and conclusion should be the same as this. This shows that this activity has an impact on improving pre-service teachers' ability or competence in mastering STEM understanding. The pre-service teachers' understanding of STEM can impact a better and more effective learning process for cerebral palsy students. STEM is a way of thinking about how educators at all levels, including parents, should help students integrate knowledge across disciplines, encouraging them to think in a more connected and holistic way (Sneideman, 2013). Indonesia needs to develop STEM-based education. Entering STEM education must be carefully prepared, especially for teachers, so that the learning process and curriculum implementation can run well. The pre-

service teacher's ability to apply STEM-based loose part play media in the learning of cerebral palsy students is expected to impact students' habituation in critical thinking, innovation, and ability to solve problems. STEM learning for students is expected to be able to innovate, collaborate, and survive everyday problems (Soylu, 2016).

The teachers' responses to the activities were inputted using a questionnaire instrument. The results of the questionnaire are described as follows.

1. Is this helpful activity for your assignments and (the development) of your career as a teacher?
2. Did you gain new knowledge from this activity, especially about learning resources, teaching materials, and modules? (100%)
3. Have you gained additional or deepened concepts in the field of study and module development? (Yes = 93%, Undecided = 7%)
4. Is the strategy or model used in this activity in line with or following the demands/expectations in b? (Yes = 96%, Undecided = 4%)
5. Generally, I can comprehensively accept the material presented in this activity. (Yes = 89%, No = 5%, Doubt = 6%)
6. Through this activity, I fully understand STEM. (Yes = 75%, Fair/Doubt = 20%, and No = 5%)
7. I can structure the learning of cerebral palsy students in STEM schools. (Yes = 65%, Doubt = 30%, and No = 5%)
8. Does this kind of activity need to be done periodically? (Yes = 93%, No answer = 7%)

The results and findings of these educational and training activities are recommended to be periodic and on-going until professional teachers are obtained or produced. The periodic activities are expected to create the character of continuous professional development of the pre-service teachers, especially pre-service teachers of cerebral palsy in secondary schools.

CONCLUSION

The STEM (Science, Technology, Engineering, and Mathematics)-based loose part play media can and increase the understanding of cerebral palsy pre-service teachers in Serang City about STEM by 26.2.

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