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## AN EFFORT TO IMPROVE 4C STUDENTS SKILLS THROUGH STEAM LEARNING WORKSHOP FOR JUNIOR HIGH SCHOOL TEACHERS IN KARANGANYAR

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**Abstract:** The application of physical distancing during the pandemic has prompted the government to require schools to implement distance learning. One of the learning approaches that can be applied to carry out school activities today is STEAM learning. For this reason, this service activity aims to train junior high school mathematics teachers in Karanganyar district to be able to design study plans, learning media and assessment instruments. Based on this goal, the community service team carried out a workshop activity at Junior High School 1 Kerjo Karanganyar and POKJA II Karanganyar consisting of 25 teachers. There were two resource persons who assisted in the implementation of the workshop about material on the concept and implementation approach and designing a board game for learning. To find out the understanding of the teachers before and after the training, a questionnaire was used. The results of the questionnaire were analyzed using qualitative method. From community service activities, the following results were obtained, the teachers had (1) understood the concept and implementation of STEAM learning; (2) able to develop learning tools in the form of lesson plans, learning media and assessment instruments; (3) implementing limited STEAM learning.

**Keyword:** *STEAM, 4C, Workshop, Board game*

### INTRODUCTION

The quality of mathematics education has become one indicator of a nation's growth. Related to this, many efforts have been made by the government to improve the quality of education in general, as well as mathematics education in particular through various policies such as improving the quality of teachers and formulating a curriculum that is expected to form superior human resources and can answer the challenges of the current technological era. The 2013 curriculum tries to prepare 21st century human resources who have 4C skills through learning. The concept of 4C skills includes a number of personal and social skills that exist in 21st century learning, which include: critical thinking, creativity, collaboration, and communication. The 4 skills must be mastered by students, and can be trained by teachers as facilitators, one of which is the implementation of STEAM learning.

The current curriculum for primary and secondary school levels is the 2013 curriculum which focuses on student-centred learning, and knowledge that must be actively built by students with teacher facilitation or guidance. The implementation of this paradigm is a challenge for mathematics teachers, especially when there are restrictions on community activities during this pandemic. And it is not an easy thing, in addition to the abstract object of study of mathematics being a big challenge for junior high school mathematics teachers because based on Piaget's theory of the development of children's thinking abilities, junior high school students are in the concrete operational phase towards the formal operational phase (Nurhasanah, 2010), as well as weaknesses in online learning that make student and teacher interaction less than optimal. One of the characteristics of activating learning is that it involves exploration, application and reflection (Gibson, 1987).

STEAM is an acronym for Science, Technology, Engineering, Art and Mathematics, this learning approach uses these 5 elements as an entry point to guide students to discuss, collaborate and think critically and think creatively as mandated in the 2013 curriculum. However, what is its implementation in schools, especially in learning mathematics. what are the tools that can be used in STEAM learning online so that students are enthusiastic about the learning resources provided by the teacher and participate actively in learning. how is the assessment system so that it can accommodate 3 domains, namely the realm of knowledge, attitudes and skills for students. This is a hot topic that can be discussed.

STEAM basically is learning that demands student activity, interactive and fun. Then how is it applied to online learning? This is where in addition to being given how to develop in the implementation of learning, e-module-based learning media will also be developed, which are designed to be interesting and interactive not just in the form of notes in pdf or word. So far, the assessment has been given by teachers to students without any assessment. how assessment instruments can be used is important, because on this assessment the teacher can reflect on his learning. This learning approach integrates natural knowledge, technology, art and mathematics in one student learning experience. Accuracy in choosing and presenting learning materials is currently the key to the success of achieving the expected learning objectives, therefore it is able to answer these challenges.

Mathematics teachers who are members of MGMP POKJA II Karanganyar district basically have the enthusiasm to make changes in the classroom through efforts made to improve teacher skills, especially in implementing student centre learning in the classroom. Unfortunately, limited funds and the ability of MGMP administrators become obstacles in the process of implementing the programme.

In addition, teachers are also aware that technological changes require new skills that need to be developed in mathematics learning related to the changes occurring in the 21st century, as well as the current restrictions on community and student activities. The ability of teachers in the use of technology, the ability of teachers to create and facilitate mathematics learning where mathematical concepts are

abstract online that are interesting to students. The lack of student interest in interacting with teachers during online learning (problem solving: mathematics and science), while on the other hand, the demands of students must have 4 skills (4C) absolutely must be trained by teachers in their learning, the low interest of students to carry out tests as part of learning is also a problem experienced by partners.

In general, the problems faced can be formulated at the following points: (1) How to improve teacher competence in implementing mathematics learning that can improve students' 4Cs? (2) How to develop learning tools in the form of lesson plans and student worksheets that are in accordance with the STEAM approach? (3) How to facilitate students in the implementation of STEAM learning?

## **METHOD**

The training in this service activity uses a workshop model. The workshop for this service activity has the theme "Improving the 4C Skills of Junior High School Students in Karanganyar Through STEAM Learning" which was carried out offline on 21 August 2021 at SMPN 1 Kerjo Karanganyar, with participants being junior high school teachers from POKJA II Karanganyar. In this activity, the community service team has prepared workshop materials and resource persons. There are two resource persons who assist in the implementation of the workshop. The 2 resource persons are Mr Rizky, M.Kom from the Information Technology Study Program, AMIKOM University Yogyakarta and Mrs Nur Baiti Nasution, S.Pd., M.Sc. from the Mathematics Education Study Program, FKIP Pekalongan University. Mrs Nur Baiti Nasution, will deliver theoretical material about STEAM, while Mr Rizky, M Kom will deliver STEAM activities by designing board games for learning. The service activity was carried out on Saturday, 21 August 2021 starting at 07.00 to 15.00 WIB which was divided into 2 sessions (meetings):

At the 1<sup>st</sup> meeting delivered the training material online using the zoom media platform. The material to be delivered in the training will consist of five units at the 1<sup>st</sup> meeting, such as:

Unit 1: Learning in the 21st Century

Unit 2: STEAM learning: meaning, purpose and benefits

Unit 3: Development of lesson plans with STEAM learning approach

Unit 4: Learning Media Development

Unit 5: Assessment Instrument Development

At meeting 2<sup>nd</sup> the speaker delivered offline. The materials presented are:

Unit 1: Practice of making lesson plans with a STEAM approach

Unit 2: Practice STEAM activities by designing board games for learning.

## RESULT AND DISCUSSION

### 1. Workshop material preparation

The materials used for the workshop consist of STEAM learning theory and STEAM learning activities by designing board games for learning.

### 2. Workshop

The offline workshop was held at SMPN 1 Kerjo Karanganyar. The number of participants was limited to a maximum of 25, each group consisting of 5 people. Participants of this program written in Table 1.

Table 1. Participant of the workshop

No.	School Participant
1	Junior High School 1 Kerjo
2	Junior High School 3 Stap Kejo
3	Junior High School N 1 Jenawi
4	Junior High School 3 Satap Jenawi
5	Junior High School 1 Mojogedang
6	Junior High School 2 Mojogedang
7	Junior High School Penda Mojogedang
8	Junior High School Muhammadiyah 4 Mojogedang
9	Junior High School IT Abu Ja'far Mojogedang
10	Islamic Junior High School Darussalam Mojogedang

### 3. Workshop result

To find out the participants' understanding, before the workshop the participants were asked to fill out a questionnaire about their understanding of learning and its implementation in learning activities. The results of the questionnaire for workshop participants in session 1 was shown in Figure 1.

<p>1. Sebelum mengikuti kegiatan workshop ini, bagaimana pemahaman Bapak/ Ibu tentang pembelajaran STEAM selama ini?</p> <p>Belum ada gambaran tentang STEAM.</p>	<p>1. Sebelum mengikuti kegiatan workshop ini, bagaimana pemahaman Bapak/ Ibu tentang pembelajaran STEAM selama ini?</p> <p>Belum paham</p>
<p>2. Jika sudah memahami, apakah sudah pernah mengimplementasikan dalam kegiatan pembelajaran Bapak/ Ibu?</p> <p>Belum pernah</p>	<p>2. Jika sudah memahami, apakah sudah pernah mengimplementasikan dalam kegiatan pembelajaran Bapak/ Ibu?</p> <p>Belum bisa mengimplementasikan</p>
<p>3. Terkait dengan jawaban pertanyaan no.2, apakah terdapat permasalahan yang ditemui di saat mengimplementasikan pembelajaran STEAM tersebut?</p> <p>Terkendala dengan waktu. (memakan waktu)</p>	<p>3. Terkait dengan jawaban pertanyaan no.2, apakah terdapat permasalahan yang ditemui di saat mengimplementasikan pembelajaran STEAM tersebut?</p> <p>Karena belum mengimplementasikan, jadi belum tahu apakah ada permasalahan atau tidak</p>
<p>4. Jika belum, apakah Bapak/ Ibu pernah berusaha untuk mempelajari pembelajaran STEAM tersebut?</p> <p>Berusaha.</p>	<p>4. Jika belum, apakah Bapak/ Ibu pernah berusaha untuk mempelajari pembelajaran STEAM tersebut?</p> <p>Ta berusaha mempelajari</p>

Figure 1. Teacher perception about learning activities

Based on Figure 1, it appears that participant does not yet have an understanding of STEAM learning. They never implemented STEAM learning in learning activities. The main obstacle faced was the lack of time available. A teacher's job is not limited to preparing lesson plans. More than that, top down administrative tasks are equally important. STEM implementation is more complex at the beginning, but it is possible to implement it in the long run. There is a strong curiosity and willingness to apply in the next lesson. Teachers tend to be confident with direct learning, this is seen to be flexible. Meanwhile, STEAM learning is still unfamiliar. Participants do not understand STEAM learning, thus they have never applied it to learning activities in the classroom.

1. Sebelum mengikuti kegiatan workshop ini, bagaimana pemahaman Bapak/ Ibu tentang pembelajaran STEAM selama ini?

menurut saya s. science, Technology, Engineering, art. matematika  
itu adalah singkatan atau akronim yang selama ini saya tahu.
2. Jika sudah memahami, apakah sudah pernah mengimplementasikan dalam kegiatan pembelajaran Bapak/ Ibu?

saya sudah pernah mencoba menerapkan di dalam kegiatan pembelajaran di kelas saya. Namun belum bisa sepenuhnya terimplementasi
3. Terkait dengan jawaban pertanyaan no.2, apakah terdapat permasalahan yang ditemui di saat mengimplementasikan pembelajaran STEAM tersebut?

\* Persiapan pembelajaran di kelas saya yg kurang optimal.  
\* Kurang investasi dalam pengembangan profesional guru  
\* Persiapan dan inspirasi siswa yang buruk.  
\* Kurangnya koneksi dengan metode pembelajaran lain-  
salam berbagai macam cara untuk meningkatkan pembelajaran
4. Jika belum, apakah Bapak/ Ibu pernah berusaha untuk mempelajari pembelajaran STEAM tersebut?

Selama pandemi ini saya belum pernah belajar secara diklat. Namun saya pernah mempelajarinya melalui internet.

Figure 2. Teacher perception about learning activities that know the theory before

Some teachers have learnt the basics of STEAM learning, however never use it before. It means that in general, many teachers in Karanganyar still do not understand the concept of STEAM learning. Thus, efforts to understand STEAM learning in Karanganyar are interesting to do. Given that STEAM learning can be used as a means to improve 21st century skills (critical thinking, creative thinking, collaborative, communication) in junior high school students, this case needs to be applied in Karanganyar.

<p>5. Setelah mengikuti kegiatan workshop ini, bagaimana menurut Bapak/ Ibu, pemahaman tentang pembelajaran STEAM, apakah sudah memahami atau masih ada yang belum dipahami?</p> <p><i>dari segi pemahaman 60% sudah saya pahami, sebagai seorang fasilitator saya belum bisa ada bayangan membayangkan apa yang akan saya ajarkan ke anak, mengingat banyak murid ada yang berbeda minat.</i></p>	<p>5. Setelah mengikuti kegiatan workshop ini, bagaimana menurut Bapak/ Ibu, pemahaman tentang pembelajaran STEAM, apakah sudah memahami atau masih ada yang belum dipahami?</p> <p><i>Sudah ada gambaran</i></p>
<p>6. Jika ada yang belum dipahami, pada bagian mana yang belum dipahami, apakah pada teori pembelajaran pembelajaran STEAM atau pada implementasinya atau keduanya?</p> <p><i>pada implementasi steam di sekolah</i></p>	<p>6. Jika ada yang belum dipahami, pada bagian mana yang belum dipahami, apakah pada teori pembelajaran pembelajaran STEAM atau pada implementasinya atau keduanya?</p> <p><i>Implementasinya</i></p>
<p>7. Menurut Bapak/ Ibu, apakah pembelajaran STEAM dapat diterapkan pada kegiatan pembelajaran pada mata pelajaran yang Bapak/ Ibu ampu? Jelaskan pula alasan dari jawaban Bapak/ Ibu tersebut</p> <p><i>bisa karena pembelajaran ini amat sangat menarik dan membuat anak tidak jenuh.</i></p>	<p>7. Menurut Bapak/ Ibu, apakah pembelajaran STEAM dapat diterapkan pada kegiatan pembelajaran pada mata pelajaran yang Bapak/ Ibu ampu? Jelaskan pula alasan dari jawaban Bapak/ Ibu tersebut</p> <p><i>Dapat diterapkan</i></p>
<p>8. Setelah mengikuti kegiatan workshop, apakah Bapak/ Ibu dapat mengimplementasikan pembelajaran STEAM, dalam meningkatkan skill 4C (<i>critical thinking, creativity, collaboration, dan communication</i>) siswa SMP? Jelaskan jawaban Bapak/ Ibu.</p> <p><i>Setelah mengikuti kegiatan ini saya yakin akan bisa mengimplementasikannya di dalam kelas saya nanti, dan saya sangat bersemangat untuk meningkatkan skill 4c di SMP tempat saya mengajar</i></p>	<p>8. Setelah mengikuti kegiatan workshop, apakah Bapak/ Ibu dapat mengimplementasikan pembelajaran STEAM, dalam meningkatkan skill 4C (<i>critical thinking, creativity, collaboration, dan communication</i>) siswa SMP? Jelaskan jawaban Bapak/ Ibu.</p> <p><i>Dapat karena dng Pembelajaran STEAM lebih menarik</i></p>

Figure 3. Teacher perception after learning activities

From the results of the two participants in Figure 3, it shows that although at first they did not understand the concept of STEAM learning and its implementation, but with this workshop they have begun to understand and try to implement it in classroom learning. This shows that participants already have an understanding of the concept of STEAM learners. Participants also understand that STEAM learning is interesting learning in improving 21st century skills for junior high school students. After the workshop, participants have an understanding of the concept and implementation of STEAM learning. From the understanding that has been owned, participants are interested in implementing in classroom learning activities on the basis that STEAM learning is an interesting learning to improve students' 4C skills.



## CONCLUSION

From the workshop results, it can be concluded that many teachers are still familiar with STEAM learning. Currently, they still use the direct learning method because it is more flexible. However, the data shows that teachers are interested in implementing STEAM learning in the next lesson. However, the interview results explained that sufficient time is still needed so that learning practices can be carried out in the classroom. In order for the application of STEAM learning to be more optimal, it is necessary to prepare various teaching materials, learning media and assessment instruments that are varied. Synergy from various parties is also needed, so that the implementation runs smoothly. However, the concept of 4C skills includes a number of personal and social skills in 21<sup>st</sup> century learning (critical thinking, creativity, collaboration, and communication) that are suitable for implementation in junior high schools in Karanganyar.

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