Implementation of Science, Technology, Engineering, Art, and Mathematics (STEAM) Learning Model on Wayang Puppet Materials to Improve Student Creativity in the 21st Century

Yopi Malagola[1]✉, Eryneta Nurul Hasanah[2], Siti Nurjannah[3]

[1] Primary Education, Yogyakarta State University, Yogyakarta, Indonesia
[2] Javanese Language Education, Yogyakarta State University, Yogyakarta, Indonesia
[3] Special Education, Yogyakarta State University, Yogyakarta, Indonesia
✉ yopimalagola.2022@student.uny.ac.id

Abstract. This research is motivated by learning that only uses the lecture method, causing students to lack interaction and creativity on wayang puppet material in elementary schools. In addition, the lack of implementation of science, technology, engineering, art, and mathematics (STEAM) learning in elementary schools also impacts the achievement of learning outcomes. Therefore, this study aims to determine the increase in student creativity by applying the STEAM model to wayang puppet learning in elementary schools. The type of research used is classroom action research (CAR), carried out in two cycles. Each cycle has four stages: planning, implementation, observation, and reflection. The subjects of this research are the fourth-grade students of Muhammadiyah Suronatan Elementary School, Yogyakarta, with a total of 20 people. Data collection techniques were carried out through observation, questionnaires, and documentation. The analytical technique used in this research is descriptive qualitative analysis. The results of this study indicate that the application of the STEAM learning model to wayang puppet materials can increase the creativity of fourth-grade students at Muhammadiyah Suronatan Elementary School, Yogyakarta. This is evidenced by the results of cycle 1, where the percentage of student creativity reaches 50%, and the percentage of student creativity increases in cycle 2, reaching 85%.

Keywords: creativity, STEAM model, wayang puppet, 21st Century learning.

INTRODUCTION

The development of world continues to progress from century to century. This has caused many major changes in almost all life sectors, including the education sector. We are currently in the 21st century, which has brought major changes to the order of life, especially in the direction of education on a large scale. Project-based social learning is a type of education in learning that is currently being developed (Johnson, 2015). This project-based social education aims to improve several student abilities, namely Critical Thinking, Collaboration, Creativity, and Communication (4C) (Taar & Palojoki, 2022). Every child needs these four basic abilities to improve their learning abilities. Along with increasing learning abilities, it is hoped that this will increase children's love for culture. Developments that are increasingly advanced at this time make it easier for children to continue learning about their respective cultures, such as the love of learning about wayang culture.

A more enjoyable educational procedure is required to increase students' enthusiasm for learning about culture, especially wayang culture, and to remove any negative perceptions of it (Oryza et al., 2013) such as learning wayang using Web-Comics (Ayuswantana & Rizkiantono, 2014) or we can also using the method of performance training and direct wayang making (Susilo et al., 2020). In choosing a learning method, besides paying attention to a fun learning process, developing 4C abilities must also be considered during the learning process. One learning method that can help students develop 4C abilities in a fun way is STEAM (Science, Technology, Engineering, Arts, and Mathematics).

The STEAM learning method is a method that involves five fields of knowledge in its application (science, technology, engineering, art, and mathematics) comprehensively (Nurwulan, 2020). Furthermore, the STEAM method is also interpreted as a method that can

improve students' thinking depth and develop the creativity and visual-spatial skills needed by students (Wilson, 2018). STEAM learning, which involves a combination of knowledge (Science), utilizing technology, skills in designing work with creativity (Engineering and Art), and arranging it systematically and logically (Mathematic), will build a broad construct of students' learning and understanding of learning material. This can reduce students' lack of understanding of the learning material discussed (Wirawan et al., 2022).

This is supported by research from D.N Ahmad et al. (2021) with the title "Increasing creative thinking of students by learning organizations with STEAM education," where the research results show that the STEAM method has a significant impact on increasing the ability to think creatively in making learning media (Ahmad et al ., 2021). In addition, Fatmawati and Mariana, in 2022, with the research title "Application of STEAM learning through a non-stop fountain activity to increase student creativity in elementary schools," explained that the STEAM learning method can increase student creativity and can make the learning process a fun one (Fatmawati & Mariana, 2022). Furthermore, Irmareta and Choirunnisa (2022) also explained in their research entitled "Project-based glass bottle music learning using the STEAM approach to increase student creativity" that the STEAM learning method can develop learning activities and improve students' creative abilities.

Based on previous research demonstrating the success of STEAM in increasing elementary school students' creativity and love for wayang culture, this study will employ the STEAM learning method in wayang subjects. This study was chosen for two reasons: the importance of preserving wayang culture and increasing student creativity beginning in elementary school. Undeniably, the development of the times can gradually erode culture if it is not balanced with preservation by the younger generation, because the younger generation is the future artists (Hartono et al., 2022).

Based on observations made at Muhammadiyah Suronatan Elementary School Yogyakarta, it can be seen that teachers still use the lecture method more often in wayang lessons, so wayang learning becomes boring and unpleasant for students. In addition, students cannot develop the four basic abilities needed by students in the current 21st century, one of which is creativity. To overcome this, the lecture learning method was changed to the STEAM method so that students felt happier and could increase their creativity through project-based learning. Based on the problems above, the researcher proposes "Application of STEAM in wayang learning to increase the creativity of elementary school students in the 21st century". The purpose of this research is to increase students' interest and creativity in wayang learning in elementary schools through the application of the STEAM approach. Increasing students' interest and creativity in learning about wayang is expected to foster a sense of love and interest in preserving wayang culture, which is increasingly being eroded by technological developments. Furthermore, this study is expected to serve as a resource for other researchers, allowing for increased STEAM development in underserved elementary schools.

METHOD

This study uses a class action research method (CAR). Classroom action research in this study was carried out in two cycles. Each cycle is carried out in four stages, namely planning, implementation, observation, and reflection (Suryaningsih et al., 2016). Schematic of the stages of implementing this classroom action research can be seen in Figure 1.
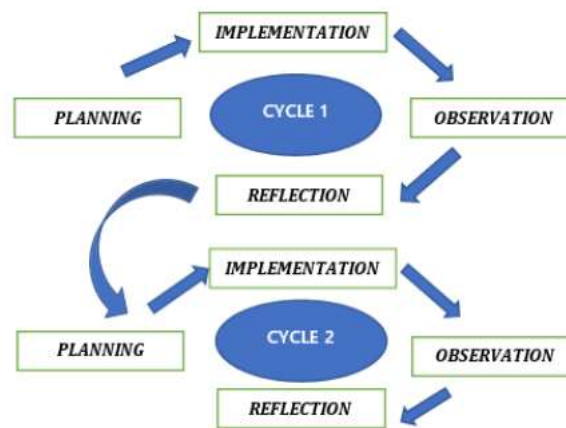
Figure 1. Class Action Research Stages

This research was carried out using STEAM learning on wayang material in elementary schools. The subjects of this study were 20 students of grade 4 students at Muhammadiyah Suronatan Elementary School, Yogyakarta. Data collection techniques on students' creative thinking abilities were obtained through observation using observation sheets which were observed during the implementation of cycle 1 and cycle 2. In addition, data collection was also obtained through questionnaires and documentation. The questionnaire is to find out the increase in student creativity in the learning process (Dharmayanthi et al., 2022). In this study, descriptive and qualitative data analysis methods were used. This data analysis was obtained from the results of observations, documentation, and questionnaires which were arranged systematically and concluded into sentences that were easy to understand (Wicaksana et al., 2022). Technical analysis of data in this study using formulas:

Average Percentage (%) = Total student gradesMax amount x 100

The percentage of students' creativity levels in this study was converted into a five-scale Benchmark Assessment (BA) listed in Table 1.

Table 1. Benchmark Assessment (BA) Conversion Guidelines

Mastery Percentage	Category	Grading
90-100	Very High	Pass
80-89	High	Pass
65-79	Moderate	Pass
55-64	Low	Fail
00-54	Very Low	Fail

RESULTS
Implementation of STEAM Learning on Wayang Material

This study collected data through a questionnaire based on several indicators of students' creative thinking skills in wayang learning in elementary schools, including fluency, flexibility, originality, and decoding. Wayang learning innovations in elementary schools are carried out through the Science, Technology, Engineering, Art, and Mathematics (STEAM) learning approach to increase student creativity. The STEAM (Science, Technology, Engineering, Art, and Mathematics) learning approach is a learning approach that involves students as a whole exploring and understanding the content and meaning of the subjects to be implemented (Degeng et al., 2021). In STEAM learning on wayang material, the teacher acts as a facilitator, and students explore by working together to understand and complete tasks. Students also investigate the process and stages of making wayang.

Learning about puppet material with the STEAM approach includes the disciplines of Science, Technology, Engineering, Art, and Mathematics. According to Bahram et al. (2017), in the STEAM approach, science can be defined as knowledge or knowledge obtained through scientific processes such as observation, prediction, conducting experiments, and drawing conclusions. Technology is an innovation made to help humans meet their needs. Engineering is an effort to apply the available science and technology to solve various human problems. Art is anything that humans can create that has beauty and can evoke feelings about themselves and others. Mathematics can be interpreted as the science of quantities, numbers, patterns, and relationships related to engineering, science, and technology.

Wayang learning activities in elementary schools are carried out by integrating STEAM learning components. The integration of STEAM components in wayang material can be seen in Table 2.

Table 2. Integration of STEAM Components in Wayang Material

STEAM Indicator	Material Integration
Science	The concept of knowledge about wayang and wayang stories.
Technology	Wayang is learned and made using simple tools and materials.
Engineering	Wayang is created through a series of processes and stages.
Art	There is creativity in the making of wayang, both in shape and color.
Mathematics	Counting and measuring are involved in the process of making wayang.

Based on the STEAM learning integration design (Science, Technology, Engineering, Art, and Mathematics) in wayang material in table 1, it can be seen that in the implementation of learning, five STEAM components are integrated into wayang material in elementary schools. In carrying out the learning process, the five STEAM components are implemented at the stages of the learning process. The stages of implementing STEAM learning in wayang learning subjects in elementary schools can be seen in Figure 2.
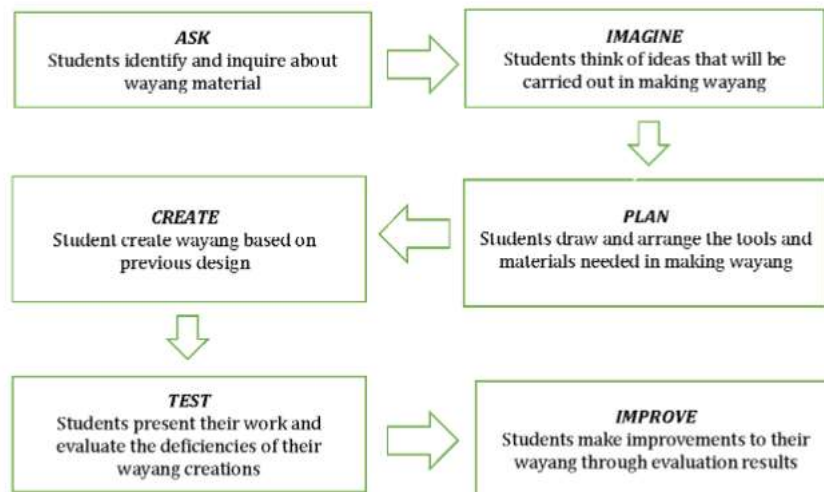
Figure 2. Stages of Implementation of STEAM Learning on Wayang Material

Based on the scheme of STEAM learning stages (Science, Technology, Engineering, Art, and Mathematics) on the wayang material, it can be seen that STEAM learning on the wayang material has six stages. The first stage is the asking stage. At this stage, the teacher conveys apperceptions about the characters, the history of wayang, and the process of making wayang through speech and learning videos. Students identify and ask about the delivery of wayang material delivered by the teacher. Students are expected not only to gain knowledge about wayang but also to be able to make and preserve wayang art. At the imagine stage, students convey ideas about the wayang that will be made. The character, as well as the shape and color, are chosen.Students are expected to be creative and imagine various ideas that will be carried out.

Students draw and arrange the tools and materials needed to make wayang during the planning stage. During the Create stage, students will create wayang based on previous designs using the tools and materials that are available. If there is a deviation from the previous design or concept in the middle of the manufacturing process, the child is expected to be aware of it and become critical. At the test stage, the child evaluates his puppet work with the teacher's help to see which part of it needs to be repaired. The results of this test can be used to help students improve their wayang works. The improvement stage is the final stage of STEAM learning with wayang material. At this stage, students correct deficiencies in their wayang works based on the work test results.

Students' Creative Thinking Skills

The findings of this study revealed an increase in the creativity abilities of fourth grade students at the Muhammadiyah Suronatan Elementary School in Yogyakarta as a result of STEAM learning on wayang material. In the early stages, this research carried out observations regarding the level of creativity of students when participating in the learning process. During the initial observations, it was discovered that the teacher used the lecture and storytelling methods in teaching wayang material, resulting in low student participation and interest. The results of observing the level of children's creativity in the initial observations can be seen in Table 3.

Table 3. Data on Student Creativity Levels in the Pre-Cycle

No.	Indicator 1	2	3	4	Total	Average	Mastery Percentage	Category	Grading / Completeness
1	4	2	3	2	11	2,75	69%	Moderate	Pass
2	2	1	1	3	7	1,75	44%	Very Low	Fail
3	2	2	2	1	7	1,75	44%	Very Low	Fail
4	2	1	1	1	5	1,25	31%	Very Low	Fail
5	2	1	2	3	8	2	50%	Very Low	Fail
6	4	3	2	2	11	2,75	69%	Moderate	Pass
7	2	2	1	3	8	2	50%	Very Low	Fail
8	2	1	2	1	6	1,5	38%	Very Low	Fail
9	3	3	3	2	11	2,75	69%	Moderate	Pass
10	2	2	2	3	9	2,25	56%	Low	Fail
11	2	1	1	1	5	1,25	31%	Very Low	Fail
12	2	1	2	1	6	1,5	38%	Very Low	Fail
13	2	1	1	3	8	2	50%	Very Low	Fail
14	2	1	1	1	5	1,25	31%	Very Low	Fail
15	4	3	3	2	12	3	75%	Moderate	Pass
16	2	2	1	2	8	2	50%	Very Low	Fail
17	2	3	3	3	11	2,75	69%	Moderate	Pass
18	2	2	2	2	8	2	50%	Very Low	Fail
19	2	2	2	1	7	1,75	44%	Very Low	Fail
20	2	2	3	2	9	2,25	56%	Low	Fail

No.	Indicator 1	2	3	4	Total	Average	Mastery Percentage	Category	Grading / Completeness
1	4	2	3	2	11	2,75	69%	Moderate	Pass
2	2	1	1	3	7	1,75	44%	Very Low	Fail
3	2	2	2	1	7	1,75	44%	Very Low	Fail
4	2	1	1	1	5	1,25	31%	Very Low	Fail
5	2	1	2	3	8	2	50%	Very Low	Fail
6	4	3	2	2	11	2,75	69%	Moderate	Pass
7	2	2	1	3	8	2	50%	Very Low	Fail
8	2	1	2	1	6	1,5	38%	Very Low	Fail
9	3	3	3	2	11	2,75	69%	Moderate	Pass
10	2	2	2	3	9	2,25	56%	Low	Fail
11	2	1	1	1	5	1,25	31%	Very Low	Fail
12	2	1	2	1	6	1,5	38%	Very Low	Fail
13	2	1	1	3	8	2	50%	Very Low	Fail
14	2	1	1	1	5	1,25	31%	Very Low	Fail
15	4	3	3	2	12	3	75%	Moderate	Pass
16	2	2	1	2	8	2	50%	Very Low	Fail
17	2	3	3	3	11	2,75	69%	Moderate	Pass
18	2	2	2	2	8	2	50%	Very Low	Fail
19	2	2	2	1	7	1,75	44%	Very Low	Fail
20	2	2	3	2	9	2,25	56%	Low	Fail

Description of the indicators in the observation sheet of this study are as follows:
1. Indicator 1 is an indicator of Fluency.
2. Indicator 2 is an indicator of Flexibility.
3. Indicator 3 is an indicator of Originality.
4. Indicator 4 is an Elaboration indicator.

Table 3 shows that student creativity in wayang learning is still very low. This is shown by the percentage of completeness that was only achieved by 5 students, with the highest percentage of 75% in the moderate category. The other 15 students are still in the medium

category in terms of achieving the percentage of completeness in the level of student creativity. Therefore, it is necessary to improve the learning approach in an effort to increase the level of student creativity in learning. Efforts to increase the level of student creativity in this study were carried out through STEAM learning. In STEAM learning, students are designed to play an active role in designing and creating wayang that will be carried out by students. In addition, learning is focused on student activities, while the teacher's role is only to accompany and facilitate students. In detail, the results of the level of student creativity in the implementation of STEAM learning on wayang material for class IV students at the Muhammadiyah Suronatan Yogyakarta Elementary School in cycle I can be seen in Table 4.

Table 4. Data on Student Creativity Levels in Cycle I

No.	Indicator 1	2	3	4	Total	Average	Mastery Percentage	Category	Grading / Completeness
1	4	3	3	3	13	3,25	81%	High	Pass
2	2	2	2	3	9	2,25	56%	Low	Fail
3	3	3	3	2	11	2,75	69%	Moderate	Pass
4	2	1	1	1	5	1,25	31%	Very Low	Fail
5	2	3	3	3	11	2,75	69%	Moderate	Pass
6	4	3	3	3	13	3,25	81%	High	Pass
7	2	2	2	3	9	2,25	56%	Low	Fail
8	2	2	2	1	7	1,75	44%	Very Low	Fail
9	3	3	3	2	11	2,75	69%	Moderate	Pass
10	3	3	2	3	11	2,75	69%	Moderate	Pass
11	2	2	3	2	9	2,25	56%	Low	Fail
12	2	1	2	2	7	1,75	44%	Very Low	Fail
13	3	2	2	2	9	2,25	56%	Rendah	Fail
14	2	1	2	2	7	1,75	44%	Very Low	Fail
15	4	3	3	2	11	2,75	69%	Low	Pass
16	2	2	1	2	8	2	50%	Very Low	Fail
17	2	3	3	3	11	2,75	69%	Moderate	Pass
18	3	2	3	3	11	2,75	69%	Moderate	Pass
19	2	2	2	2	8	2	50%	Very Low	Fail
20	3	3	3	2	11	2,75	69%	Moderate	Pass

In table 4, the level of student creativity in cycle I above shows that there was an increase in the creativity of class IV students. This is shown by the increasing number of students' creative completeness and the increasing percentage of completeness, namely as many as 10 students with the highest percentage of 81% being in the high category. In addition, in the cycle, there are still 10 students who have not reached the percentage of completeness in the level of creativity. There are still difficulties experienced by students in showing their creativity. Therefore, in cycle II, the implementation of STEAM learning on wayang material is arranged with better preparation through the evaluation of the implementation of cycle I. Table 5 shows the results of the level of student creativity through STEAM learning on wayang material in cycle II in detail.

Table 5. Data on Student Creativity Levels in Cycle II

No.	1	2	3	4	Total	Average	Mastery Percentage	Category	Grading / Completeness
1	4	4	4	3	15	3,75	94%	Very High	Pass
2	4	3	3	4	14	3,50	88%	High	Pass
3	3	3	4	3	13	3,25	81%	High	Pass
4	3	2	2	2	9	2,25	56%	Low	Fail
5	3	4	4	3	14	3,50	88%	High	Pass
6	3	4	4	4	15	3,75	94%	Very High	Pass
7	3	4	3	3	13	3,25	81%	High	Pass
8	2	3	2	2	9	2,25	56%	Low	Fail
9	3	3	3	3	12	3	75%	Moderate	Pass
10	3	3	3	3	12	3	75%	Moderate	Pass
11	3	3	3	2	11	2,75	69%	Moderate	Pass
12	4	3	3	3	13	3,25	81%	High	Pass
13	3	2	2	2	9	2,25	56%	Low	Fail
14	3	3	3	2	11	2,75	69%	Moderate	Pass
15	3	3	3	3	12	3	75%	Moderate	Pass
16	3	3	3	3	12	3	75%	Moderate	Pass
17	3	3	3	3	12	3	75%	Moderate	Pass
18	3	4	3	3	13	3,25	81%	High	Pass
19	3	3	2	3	11	2,75	69%	Moderate	Pass
20	3	3	3	3	12	3	75%	Moderate	Pass

　　　　Table 5 shows that there was an increase in the level of student creativity compared to the pre-cycle and cycle I stages. This was shown by the increasing number of students' completeness and the increasing percentage of mastery; namely, 15 students with the highest percentage of mastery of 94% were in the very high category. Only three students remained in the final cycle of the STEAM learning process with wayang material who had not been able to demonstrate their creativity and were still in the low category. However, it is believed that if students continue to be stimulated through interesting learning and are encouraged to participate actively in their learning, their creativity will increase.

　　　　Based on the results of observations as described in the pre-cycle, cycle I, and cycle II stages, it shows that there is an increase in the level of student creativity in STEAM learning in wayang material for grade 4 students at Muhammadiyah Suronatan Elementary School, Yogyakarta. This is shown in the change in the level of student creativity in each cycle, which has increased very significantly. A comparison of the percentage increase in the level of student creativity in the pre-cycle, cycle I, and cycle II stages can be seen in Table 6.

Table 6. Results of Comparison of Percentage of Student Creativity Level in Pre-Cycle, Cycle I, and Cycle II

No.	Category	Total Students at Pre-Cycle	%	Total Students at Cycle 1	%	Total Students at Cycle 2	%
1	Very High	0	0 %	0	0 %	2	10 %
2	High	0	0 %	2	10 %	6	30 %
3	Moderate	5	25 %	8	40 %	9	45 %
4	Low	2	10 %	4	20 %	3	15 %
5	Very Low	13	65 %	6	30 %	0	0 %
	High Category	5	25 %	10	**50 %**	17	**85 %**
	Low Category	15	75%	10	50 %	3	15 %

Table 6 shows a comparison of the level of creativity of grade 4 students at Muhammadiyah Suronatan Elementary School, Yogyakarta. Each cycle has increased in the very high category, at the pre-cycle stage, students' creative abilities were still 0%, and there was no increase in cycle I. Then in cycle II, there was an increase of 2 students (10%). At the high category level, it shows an increase in the number of students and the percentage of mastery of creativity in each cycle. In the pre-observation, it had not shown students who had a high level of creativity, but in the application of STEAM learning in cycle I, there were two students (10%). In cycle II, the

percentage of students in the high category increased to six (30%). Furthermore, the medium category also experienced a significant increase in student creativity in each cycle. This is shown in the pre-cycle stage, where there are five (25%) in the medium category. It increased to 8 students (40%) in cycle I and 9 students (45%) in cycle II. In the very low category, there was a decrease in the number of students in that category. In the pre-cycle stage, there were 13 students (65%) who were in the very low category. Furthermore, the number of students in the very low category decreased in cycle I from 7 to 6 (30%), and in cycle II there were no more students in this very low category.The preceding explanation shows how incorporating STEAM learning into wayang material can boost student creativity during the learning process. This increase was evidenced by the level of student creativity in the pre-cycle stage, which was 25%, increasing to 50% after the implementation of cycle I, and there was a significant increase in cycle II, which was 85%. The results of this study are also in accordance with research conducted by Amelia and Marini (2022), which shows that STEAM learning makes students more creative in the learning process and shapes students to better understand phenomena that occur in everyday life. In addition, Cahyani's research (2021) also showed that there were differences in the creative abilities of students before and after the application of STEAM learning (Cahyani & Sulastri, 2021). This was continued by other researcher Anjarwati (2022) which stated that there was an increasing score in students creativity in thematic learning using the STEAM method, where there was a significant difference in percentage of the result in cycle I (48.43%) and results in cycle II (81.05%) (Anjarwati et al., 2022).

DISCUSSION

STEAM learning (Science, Technology, Engineering, Art, and Mathematics) is an interdisciplinary approach to studying real-world concepts by applying the principles of science, technology, engineering, art, and mathematics in the learning process (Aditya & Budiana, 2021). In the STEAM learning process, which actively involves students in exploring and understanding the meaning of the learning material being carried out, one of the mistakes that often occurs is that art focuses on products rather than the process of student learning through thinking, designing, and creating work. STEAM learning makes students appreciate the knowledge of science, technology, engineering, art, and mathematics in forming critical thinking skills, creativity, and imagination in trying to understand real-life problems. STEAM learning is needed

to improve and foster student creativity in every learning process so that they can produce innovative works (Ahmad et al., 2021).

Creativity is a very important ability for students to have in order to solve problems through various interesting innovations. Students' creative abilities will utilize intelligence based on experience and abilities learned and trained in a learning process (Novellia, 2018). Therefore, creativity becomes a skill that must be improved so that students can face the challenges of the 21st century, which demands that students think critically and creatively, communicate, collaborate, and master technology and information. Likewise, with the challenges of education, we must be able to prepare generations that are able to face the challenges of education in the 21st century. One of the challenges of 21st-century learning is that using technology in the learning process will help students understand the knowledge conveyed. Therefore, STEAM learning is very suitable for learning that uses technology to facilitate students' learning process (Wirawan et al., 2022).

The implementation of the STEAM model is very suitable to be applied in the learning process to improve students' creative thinking skills, as seen in the research results previously described. A very significant increase can be seen in the final results of the application of the STEAM method in cycle II during the learning process, where students are able to carry out the learning steps of making puppets starting from the ask stage to the improve stage by involving their creative thinking skills. The final result of the learning process is that students are able to make puppets with good creativity as a means of learning media for students to get to know the characters and history of wayang.

In addition to the final results of the research that the authors conducted, the STEAM method to improve students' creative thinking skills is also supported by other studies from various regions, that needed to provide innovation during the process of solving a problem in learning. The same thing is shown by Aguilera & Ortiz-Revilla (2021), who say that STEAM learning is very suitable to be applied in the learning process because it can increase student activity in learning. Furthermore, Santi (2022) through her research said that the STEAM method was able to improve students' creativity abilities in the learning process of simple electrical circuit experiments in series and parallel. Furthermore, according to Budiyono, et al. (2020) after using the STEAM approach, students' concept understanding ability increased significantly. This high understanding of student concepts has an impact on students' creative thinking skills which have also increased significantly.

Several studies that have been conducted by previous researchers in different subjects and fields have shown positive results, namely there is an increase in students' creative thinking skills during learning by using the STEAM model learning. It is hoped that the research conducted at Muhammadiyah Suronatan Elementary School Yogyakarta on wayang subject matter can be a source of reference that the STEAM model learning can be one of the solution to learning methods to improve students' creative thinking skills.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the application of STEAM (Science, Technology, Engineering, Art, and Mathematics) learning to wayang material can increase the creativity of grade 4 students at Muhammadiyah Suronatan Elementary School, Yogyakarta. This can be seen from the results of the pre-cycle, cycle I, and cycle II, which show an increase in the percentage level of mastery in each cycle. The increase in student creativity has increased from the pre-cycle stage with a percentage of 25%, then in cycle I to 50%, and finally in cycle II to 85%. Therefore, STEAM learning is very well implemented in the learning process in order to increase the active role and creativity of students in the learning process. In addition, the application of STEAM (Science, Technology, Engineering, Art, and Mathematics) learning can help students prepare their abilities to face the challenges of the 21st century.

REFERENCES

Aditya, I., & Budiana, D. (2021). 30946-67943-1-Pb. Jurnal Ilmu Keolahragaan, 20(2), 143–151.

Aguilera, D., & Ortiz-Revilla, J. (2021). Stem vs. Steam education and student creativity: A systematic literature review. Education Sciences, 11(7). https://doi.org/10.3390/educsci11070331

Ahmad, D. N., Astriani, M. M., Alfahnum, M., & Setyowati, L. (2021). Increasing creative thinking of students by learning organization with steam education. Jurnal Pendidikan IPA Indonesia, 10(1), 103–110. https://doi.org/10.15294/jpii.v10i1.27146

Amelia, W., & Marini, A. (2022). Urgensi Model Pembelajaran Science, Technology, Engineering, Arts, and Math (STEAM) untuk Siswa Sekolah Dasar. Jurnal Cakrawala Pendas, Vol. 8 No.(1), 291–298.

Ayuswantana, A. C., & Rizkiantono, R. E. (2014). Perancangan Web-komik Wanorosingo sebagai Media Alternatif Pengenalan Wayang Cek-dong untuk Generasi Muda. Jurnal Sains Dan Seni ITS, 3(1), 1–6. http://www.ejurnal.its.ac.id/index.php/sains_seni/article/view/6021%0Ahttp://ejurnal.it s.ac.id

Bahrum, S., Wahid, N., & Ibrahim, N. (2017). Integration of STEM Education in Malaysia and Why to STEAM. International Journal of Academic Research in Business and Social Sciences, 7(6), 645–654. https://doi.org/10.6007/ijarbss/v7-i6/3027

Degeng, I. N. S., Sutadji, E., Rinanityas, Y. E. P., Prihatin, R., Priawasana, E., Mais, A., & Usman. (2021). The Effect of PBL-based STEAM Approach on The Cognitive and Affective Learning Outcomesof Primary School. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(6), 2390–2399. https://doi.org/10.17762/turcomat.v12i6.5521

Dharmayanthi, N. P. D., Astuti, N. M. E. O., & Sentosa, I. P. P. (2022). The Application of Project - Based Learning Model for the Creativity and Student Learning Outcomes in the Subject of Continental Food Processing and Serving Penerapan Model Pembelajaran Project Based Learning terhadap Kreativitas. Jurnal Ekonomika, Bisnis, Dan Humaniora, 1(1), 1–8.

Fatmawati, R. D., & Mariana, N. (2022). Penerapan Pembelajaran STEAM melalui Aktivitas Make A Non Stop Fountain untuk Meningkatkan Kreativitas Siswa di Sekolah Dasar. Jpgsd, 10(6), 1248–1260. https://ejournal.unesa.ac.id/index.php/jurnal-penelitian-pgsd/article/view/47109

Hartono, Nuryani, W., & Kusumastuti, E. (2022). Javanese art conservation in Indonesia inheriting potentials of local wisdom through Wayang Wong Bocah . Research in Dance Education, 00(00), 1–16. https://doi.org/10.1080/14647893.2022.2062317

Irmareta, I. L., & Choirunnisa, N. L. (2022). Pembelajaran Seni Musik Botol Kaca Berbasis Proyek Dengan Pendekatan Steam Untuk Meningkatkan Kreativitas Siswa I.

Pendahuluan Kegiatan pembelajaran merupakan inti dari kegiatan pendidikan secara keseluruhan. Guru merupakan faktor penentu yang sangat do. Enggang: Jurnal Pendidikan, Bahasa, Sastra, Seni, Dan Budaya, 2(1), 155–167.

Johnson, K. (2015). Behavioral Education in the 21st Century. Journal of Organizational Behavior Management, 35(1–2), 135–150. https://doi.org/10.1080/01608061.2015.1036152

Novellia, M. (2018). Penerapan Model Pembelajaran Problem Based Learning (Pbl) Untuk Peningkatan Kemampuan Berpikir Kreatif Dan Hasil Belajar Siswa Dalam Pembelajaran Tematik. Journal for Lesson and Learning Studies, 1(2), 149–156. https://doi.org/10.23887/jlls.v1i2.14760

Nurwulan, N. R. (2020). Pengenalan Metode Pembelajaran STEAM Kepada Para Siswa Tingkat Sekolah Dasar Kelas 1 Sampai 3. Jurnal Madaniya, 1(3), 140–146.

Oryza, A., Aziz, A., & Purnama, B. E. (2013). Perancangan dan Implementasi Sistem Pembelajaran Aksara Jawa untuk SD Berbasis Multimedia Di SDN Bumirejo 02. Speed.Web.Id, 5(4), 1–7.

Safilda, F. N., Anggoro, B. S., Putra, R. W. Y., Ahmad Sodiq, & Nurhasanah Leni. (2021). Analisis Pemahaman Konsep Berdasarkan Model Scramble Berbasis STEAM dan Gaya Belajar. Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika, 4(2), 98–107. https://doi.org/10.30605/proximal.v4i2.1364

Suryaningsih, N. M. A., Cahaya, I. M. E., & Poerwati, C. E. (2006). Pengembangan Kreativitas Anak Usia Dini. Jurnal Pendidikan Indonesia, 5(2), 1–2.

Susilo, J., Mandarani, V., & Junaedi, M. (2020). Wayang Silat Jawisogo sebagai Pendidikan Karakter Cinta Tanah Air Berbasis Kearifan Lokal Generasi Muda Sidoarjo. J-ABDIPAMAS (Jurnal Pengabdian Kepada Masyarakat), 4(1), 143. https://doi.org/10.30734/j-abdipamas.v4i1.962

Taar, J., & Palojoki, P. (2022). Applying interthinking for learning 21st-century skills in home economics education. Learning, Culture and Social Interaction, 33(April 2021). https://doi.org/10.1016/j.lcsi.2022.100615

Wicaksana, T. I., Ambiyar, A., Maksum, H., & Irfan, D. (2022). Penerapan model (PJBL) untuk meningkatkan kreativitas dan hasil belajar dalam mata pelajaran pemrograman berorientasi objek. JRTI (Jurnal Riset Tindakan Indonesia), 7(3), 370. https://doi.org/10.29210/30032058000

Wilson, H. E. (2018). Integrating the Arts and STEM for Gifted Learners. Roeper Review, 40(2), 108–120. https://doi.org/10.1080/02783193.2018.1434712

Wirawan, I. M. P., Wulandari, I. G. A. A., & Sastra Agustika, G. N. (2022). Bahan Ajar Interaktif Berbasis Pendekatan STEAM pada Muatan IPS Siswa Kelas V SD. Jurnal Penelitian Dan Pengembangan Pendidikan, 6(1), 152–161. https://doi.org/10.23887/jppp.v6i1.45370