Research Article

Importance of STEAM Learning Implementation in Elementary School

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Abstract.
As society 5.0 approaches, a learning approach that can help students understand competencies relevant to their era is required. STEAM is extremely important for the development of 21st-century skills. STEAM can improve learning quality by allowing teachers to be more innovative and create interesting and meaningful learning experiences for students. This study uses a qualitative approach, in which it describes the importance of STEAM learning in elementary schools. The study sample was collected from two public elementary schools in Sidoarjo. The goal of this research is to determine the scope of STEAM learning and the challenges associated with implementing STEAM in elementary schools. The Miles and Hubermen technique was used to identify the implementation of STEAM learning in elementary schools. There were three stages: data reduction, data presentation, conclusions, and data verification. The findings of the study were presented in the form of a qualitative description. The study's findings indicate that STEAM learning has occurred but has not been integrated with learning tools. Teachers face challenges such as the readiness of students and facilities, as well as the necessary tools and materials. The STEAM learning approach aims to improve the quality of learning in primary schools.

Keywords: STEAM, primary school, 21st-century skills, qualitative

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1. PRELIMINARY

The importance of education for the development and progress of a nation. Education is an important foundation in the life of the nation and state, so it must be built as well as possible. In accordance with Law no. 20 of 2003 education is defined as a conscious and planned effort aimed at creating a learning atmosphere and learning process that makes students active and can develop the potential possessed by students to have religious spiritual strength, be able to control themselves, develop personality, intelligence, noble character, as well as the skills needed by students in the community, nation and state. Therefore the importance of education for a country. The more advanced a country is, the better the quality of its Human Resources and Education.

The government has made various efforts to improve and advance the quality of education in Indonesia, in order to produce generations who are ready to face the

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Page 76

challenges of the 21st century. One of the efforts made is to make gradual curriculum changes in accordance with changing times, technology and information. which exists. As before, the change in the 2006 Curriculum (KTSP) which was later changed to the 2013 Curriculum was carried out to adapt to changing times and the development of information technology based on 21st century learning (Permendikbud, 2014). Then for now the Independent Curriculum has been implemented, namely a new curriculum, whose learning does not only focus on content but on projects or direct learning.

21st century education itself undergoes a change marked by the development of digital literacy, information literacy and media literacy. This happens because of the rapid development and progress of information technology that affects various aspects of life, including education. Therefore, in addition to making changes to the education system, a change in learning or delivery of classroom learning is also needed. The ideal and appropriate learning for the 21st century does not only focus on teachers but focuses on students, this of course has the goal of developing 21st century skills, known as The 4C Skills: Communication, Collaboration, Critical thinking, and Creativity quoted from (Lidinillah, 2017).

STEAM is one of the 21st century learning innovations. The STEAM learning model can be applied at various levels of education, where this learning can stimulate students to develop aspects of individual abilities and talents as a whole. So that it can create an ideal, quality and optimal learning. STEAM provides students to expand their knowledge, SCIENCE, humanities and at the same time develop skills to answer the challenges of the 21st century. STEAM stands for Science, Technology, Engineering, Art and Mathematics. Accordingly, STEAM learning combines 5 fields of science at once in its implementation. According to Starzinki (2017) STEAM is an integrated approach combining the subjects of Science, Technology, Engineering, Arts and Mathematics as a means of developing students' experiences, communication and critical thinking during learning. According to Guy A. Boy and Yakman, STEAM (Science Technology Engineering Art and Mathematics) is an integrated approach between one another and can encourage students' creativity. Yakman (2012) describes that STEAM learning is contextual learning in which students are invited to understand phenomena what is happening around them, which also invites students to explore all their abilities or talents in collaboration with several fields of science.

The application of STEAM learning itself is to encourage students to be able to find and develop their own abilities.STEAM will also present the results of group work or independently. In addition, cooperation, collaboration and communication will appear during the learning process because this approach is carried out in groups. STEAM

requires individual or interpersonal accountability for the learning that occurs. This process will help students better understand the topic being studied.Quoted from DITSMP KEMDIKBUD STEAM learning asks students to be able to identify a problem, create something to solve the problem, together with classmates solve problems and communicate well in responding to ideas given by other colleagues. In STEAM learning the teacher has the task of being a facilitator and students become the focus or center of learning, which can be done inside or outside the room. The teacher only directs students and helps if students have questions that are not clear.

STEAM learning is an innovation and breakthrough for education in Indonesia that seeks to develop the ability to create an economy based on science and technology, and then can be implemented at all levels of education in Indonesia. So that STEAM itself is also suitable to be implemented in thematic learning in Indonesia. Thematic learning is an integrated learning that combines several subject matter into one theme or topic in learning. Thematic learning emphasizes or invites students to participate in learning so that learning becomes active. Thematic learning is learning that invites students to learn more actively through the application of the concept of learning by doing activities (learning by doing)..

The thematic learning model has been designed by education experts in 1999, where this learning refers to the KBK and KTSP which have been implemented in 2005 (Hilda Karli; 2006). According to Forgaty, there are only 3 thematic learnings introduced in Indonesia, namely: 1) Thematic learning of the spider web model, namely several subjects that are connected in a predetermined theme, if needed, the theme will be further developed into a sub-theme with fixed pay attention to the interre-lationships between subjects. Which will then be developed in various supporting learning activities. 2) Connected thematic learning is an alternative in thematic learning when in implementing the net model the teacher has difficulty integrating subjects on the agreed theme. This connected thematic model connects several concepts, skills and attitudes in certain subjects. 3) Integrated Thematic Learning is an inter-subject approach. Where this model is implemented by combining several subjects (interdisciplinary), setting material priorities on learning, skills, concepts and attitudes that are interconnected in subjects. To develop a theme, the teacher must be able to select several subjects which are then linked in one theme to contain several subjects. This connected thematic model connects several concepts, skills and attitudes in certain subjects. 3) Integrated Thematic Learning is an inter-subject approach. Where this model is implemented by combining several subjects (interdisciplinary), setting material priorities on learning, skills, concepts and attitudes that are interconnected

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Thematic Learning has the principles contained in the Process Standards are regulated in the Regulation of the Minister of Education and Culture Number 22 of 2016 namely Integrated Thematic Learning is carried out based on the principles of integrated learning. The principles of Integrated Thematic Learning are as follows: 1) Students are not asked to find out; 2) The focus of learning is directed at competencies related to student life through discussion of learning themes that are closest to students; 3) Unified a number of basic competencies in one theme related to concepts, skills, and attitudes; 4) Books are not the only source of learning but can be obtained from other learning sources; 5) learning can be done in groups or independently according to the characteristics of the activities carried out; 6) Teachers must be able to plan and implement learning because each student has a level of experience, intelligence, and interests that are not the same or different for each topic; 7) Basic Competencies of subjects that cannot be combined into one can be taught separately; 8) students can gain direct experience from real or concrete learning into abstract ones; 9) Thematic learning is not a series of learning, but it is designed in the syllabus to form a learning in order to achieve Basic Competence where the teacher can make adjustments.

STEAM learning is indeed suitable for all levels of education, especially in accordance with 21st century learning and also in accordance with the education system implemented in Indonesia. But the question is how far has STEAM learning been implemented in school learning? Based on several previous studies such as Yuyun Estriyanto (2020) in his research stated that 64% of participants agreed and 28% stated

strongly agree that training material on STEAM is new knowledge for teachers. Then there is a study from Nasrah, et al (2021) which found unexpected things in learning, namely (1) in teaching learning the teacher was still less creative and active, (2) there was still a lack of understanding of the teacher about the STEAM learning model. This expands the existing questions such as how far do teachers understand and have implemented STEAM learning in schools? Because the importance of this understanding must be understood by the teacher because the teacher is the main key in the learning. Therefore, researchers want to do research on "The Importance of Implementing STEAM Learning in Elementary Schools". This research was conducted in elementary schools because at this level it is an important key in providing knowledge that will be used and utilized for the next level. With the problem statement, How is STEAM learning implemented in elementary schools? Are there any obstacles experienced by teachers when implementing STEAM learning in elementary schools in thematic learning of science subject content? In addition, this study aims to describe the extent to which STEAM learning is applied in elementary schools, to find out and describe the obstacles faced by teachers in implementing and to find out the extent to which STEAM learning in science subject thematic learning in elementary schools.

2. METHOD

This study applies a qualitative research approach. The research have a purpose to describe the results of the analysis of STEAM learning in elementary schools in thematic learning of science subject content and what are the obstacles experienced by teachers when implementing STEAM learning in elementary schools in thematic learning of science subjects content.

Subjects The research was conducted on fifth grade students in 2 elementary schools in the Sidoarjo area. The data sources for this action research include students, teachers, learning outcomes documents, and the learning process

The data collection technique is done by using interviews. Interviews were conducted with teachers and students. Interviews in this study were This study was conducted to find out the extent to which teachers and students understand about STEAM learning and what obstacles were found

The observation method is the collection of data obtained through direct observation and also through systematic recording of the object to be studied. In this study, researchers will make observations of teachers and students during the learning process.

Documentation Is a document that can be in the form of learning tools used in learning, photos and videos in the implementation of research on STEAM learning analysis in elementary schools in thematic learning of science subject content.

Data Analysis Techniques is a process of compiling data sequences, grouping them into a pattern, category, and a description, so that a research can be produced and formulated. In this study, data analysis was carried out continuously and gradually from beginning to end, both in the field and outside the field based on the techniques proposed by Miles and Huberman:

Data reduction, or the process of reducing the amount of information in field notes gathered via interviews, observations, and document reviews Data reduction is a type of data analysis that streamlines, anticipates significant information, categorizes data, discards irrelevant information, and arranges data such that it is systematic and capable of drawing insightful conclusions.

The ability to make decisions and take action is provided by the presentation of data, which is a collection of structured information. In the process of presenting this data, which is most frequently used to present data in qualitative research, namely in the form of narrative prose, the entire set of data that was acquired is made visible in a way that is simple to read and understand.

Conclusions and verification of data that have been arranged in such a way (first patterned, then focused, and finally systematically arranged data) are then concluded so that the meaning of the data can be found. The hope is that after obtaining the necessary data, a detailed description of the results of the analysis of STEAM learning in elementary schools in thematic learning of science subject content can be applied or not? When is the extent of the application of STEAM learning in elementary schools. Then the results of the research can be used as a reference to carry out further research in STEAM learning in elementary schools in thematic learning of science subject content. So that it can help improve the quality of learning in elementary schools.

3. RESULTS AND DISCUSSION

Based on the results of interviews and observations conducted in 2 elementary schools, it is known that these 2 schools have never carried out learning activities using STEAM. Several things were conveyed by the teacher, that the teacher had heard and received knowledge related to STEAM learning but had never used it in learning. Researchers made STEAM learning efforts by showing some examples of STEAM learning tools. Then the teacher and researchers jointly develop STEAM learning tools. Teachers

and researchers conduct discussions regarding what is possible by looking at the real conditions in schools to implement STEAM learning. After agreeing on the results of the learning tools made, the teacher implements STEAM learning in the classroom.

TABLE 1: Results of Class V Assessment of SDN North Sidoarjo Region.

No absen	Name	Prior Value STEAM Implementation	Value After STEAM Implementation
1	AM	76	85
2	FI	68	76
3	MMZ	68	78
4	JSB	72	85
5	EA	60	76
6	NM	76	86
7	WS	66	84
8	PR	64	78
9	IR	68	76
10	SM	70	76
11	RMT	70	80
12	MS	68	82
13	DRT	62	78
14	LAW	70	80
15	MS	68	78
16	MT	70	84
17	HF	64	76

TABLE 2: Results of Class V Assessment in the West Sidoarjo region.

No Roll call	Name	Prior Value STEAM Implementation	Value After STEAM Implementation
1	AM	60	76
2	BRB	64	78
3	DRI	70	80
4	IH	68	76
5	DH	70	82
6	MA	68	78
7	NK	60	76
8	MFK	74	84
9	ZAR	62	76
10	NO	68	80
11	A A	70	86
12	M N	64	80
13	WSA	68	78

We can understand from the table above that in Sidoarjo elementary schools in the northern region, from 68.3%, it increased to 79.8%. Meanwhile, the increase in elementary schools in the western region from 66.6% increased to 79.2%. The student response was very positive from 30 students there were 28 students who stated that STEAM learning was very fun and made a new experience for students. This means that as many as 93.3% of students agree that STEAM learning is implemented in elementary schools. The obstacles experienced by the 2 schools are that students still do not understand the flow of STEAM learning activities, learning takes longer than learning on normal days this is because STEAM learning is the first experience for students in these two elementary schools. Previously, students had not gotten a complete picture of STEAM learning. As for the teachers, they have received information related to how to learn STEAM, but the teachers have never tried it at all in doing the learning. According to Colker and Simon (DeJarnette, 2018: 1) STEAM is very important because it helps teachers combine several of the same subjects and then can provide learning experiences that make children more questioning, exploring, discovering, researching and developing and building creative and innovative skills. Positive responses were also given by a number of students that by learning STEAM they had the opportunity to carry out activities such as practice, in line with the opinion of Guy A. Boy and Yakman, STEAM which suggests that STEAM is an integrated approach with one another and can encourage students' creativity. Yakman (2012) describes that STEAM learning is contextual learning in which students are invited to understand the phenomena that occur around them, which also invites students to explore all their abilities or talents in collaboration with several fields of science.

4. CONCLUSION

The need for STEAM learning to be implemented in elementary schools, STEAM learning invites students to explore and develop the full potential of students through their own way. STEAM will also present the results of individual or group work. The complexities of the 21st century today require skills in many areas, and STEAM-based learning can be both preparation and practice for everyone. So STEAM is very suitable to convey learning to face the era of society 5.0. Lack of socialization in the application of learning models so that there are still many teachers who have not implemented or know about STEAM learning in the thematic science subjects. Thus, it is hoped that further research can develop and implement STEAM learning in several elementary schools.

5. THANK-YOU NOTE

References

[1] Amira N. Development of written test instruments to measure basic skills of STEAM (Science, Technology, Engineering, Arts, and Mathematics) junior high school students on science concept. 6th UPI International Conference on TVET 2020 (TVET 2020), 520(Tvet 2020); 2021. p. 64–69

[2] Haifaturrahmah, H., Hidayatullah, R., Maryani, S., Nurmiwati, N., & Azizah, A. (2020). Pengembangan Lembar Kerja Siswa Berbasis STEAM untuk Siswa Sekolah Dasar. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *6*(2), 310. https://doi.org/10.33394/jk.v6i2.2604

[3] Idam ragil wa, hadi mulyono roy ardiansyah, dwi yuniasih saputri F. P. A. (2020). Implementasi Pembelajaran Berbasis Science, Technology, Engenering, Art And Mathematich (STEAM) untuk Meningkatkan Kompetensi Paedagogik dan Professional Guru SD Melalui Metode Lesson Study. *Jurnal Pendidikan Dasar*, *8*(2), 119–123.

[4] Mu'minah, Iim Halimatul and Yeni Suryaningsih. "Implementation of steam (science, technology, engineering, arts and mathematics) in 21st century learning". J Bio Educ. 2020 April;5(1):65-73.

[5] Ana N, Zelela MS. "Application of STEAM innovative learning in elementary schools". IF PGSD: Sci J Educ. 2021;5(2).

[6] Rifa Hanifa Mardhiyah et al. "The importance of learning skills in the 21st century as demands in human resource development". Lectura: J Educ. 2021 Feb;12(1).

[7] Yerry S. "Webquest as 21st century learning". Edcomtech. 2018;3(2).

[8] Press conference. Ministry of Education, Culture, Research, and Technology. Number: 413/sipers/A6/VII/2022.

[9] Hadinugrahaningsih T. 21st century skills and STEAM (science, technology, engineering, art and mathematics) project in chemistry learning. Jakarta; 2017.

[10] Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System.