

Steam's Approach to Historical Learning in The 21st-Century

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Abstract: This article aims to find out how steam is used in history learning in the 21st century. The method used in this article is a library study. The use of STEAM is an effort to integrate STEAM into one with historical learning meaning that each subject mentioned in steam contributes to historical material. STEAM connects the fields of science, technology, engineering, art, and mathematic so that students are given a holistic understanding of the interconnectedness of the field of science through the learning experience of the 21st century. Through teaching history, teachers can deliver historical material to students who are very closely related to STEAM, for example, pre-Script Human material. In the material can be said to contain elements steam, for example, Mathematic, learners can calculate the year from the neolithic-megalithic era how many years. So that students can know the number of years that occurred in the pre-Script period. The results of studies that have been done show that the steam approach can be applied in historical learning. Thus, the conclusion of this article, STEAM is one of the important concepts that must be mastered by history teachers to integrate each historical material with other science materials, which can then make learners have a high level of thinking and analysis in the learning process.

Keywords: *Approach, STEAM, History Learning, 21st-Century Learning*

Introduction

As one of the important parameters of national development, education becomes very important. Education is a standard for measuring a country's progress. Indonesian education has not succeeded in creating reliable human resources, let alone improving the quality of the nation. Many countries believe that the multidimensional crisis experienced by the country is the result of the failure of the education system used (Pratiwi & Fasha, 2015). Education plays an important role in preparing students for their future development. In the past, students have mastered the skills necessary to become competent in daily manual or cognitive tasks. Today, however, the economy and industry are very different, and computers and machines are capable of doing most of the work that humans did in the past. In the future, there will be more tasks that require high levels of thinking skills, these are tasks that cannot be completed automatically by computers and machines (Pratiwi & Fasha, 2015).

Therefore, students must be equipped with the ability to survive and thrive in increasingly complex lives and work environments in a globally competitive information age. Students should be allowed to develop adequate life and career skills.

Schools need to prepare students to face work challenges in a technology-driven society that is constantly changing by helping them develop high-level thinking skills and a variety of

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other skills that allow students to adapt when facing challenges and changes due to technological developments, which are currently in the era of the industrial revolution 4.0 (Mu'minah & Suryaningsih, 2020).

In the era of the industrial revolution, 4.0 wants the ability of human resources (HR) that have high quality. The existence of such capabilities is expected to compete in the era of the 21st century and industrialization 4.0 in the era of globalization. In anticipation of this, education is designed to improve high-quality performance through the learning process. It is listed in the curriculum (Rochman & Hartoyo, 2018).

Curriculum changes in Indonesia occurred very quickly from the curriculum in 1998, in 2004, in 2006, in 2013, and now the revised 2013 curriculum. This has an impact on the learning process carried out by teachers in schools. To meet a new curriculum, of course, there needs to be a change in the implementation of learning activities in schools. This change is to face the development of the 21st Century, where there needs to be changed in the field of education, especially curriculum reform. Curriculum 2013 aims to equip Indonesians to have creative, innovative, productive life skills and contribute to the life of society, nation, and state (Utaminingsih, 2020).

The implementation of the 2013 curriculum refers to 21st Century Skills and developing 21st-century skills. the consequence is that teachers are required to master 21st-century learning well. 21st-century learning is learning that prepares the 21st century generation. There are three main subjects in 21st-century learning, namely: (1) Learning skills and innovating. (2) Information, Media, and Technology. (3) Life and career skills, which include the ability to live in the world (Sartono, Suryanda, Leyli, & Ahmad, 2020).

The skills of the 21st century arise from an assumption that today's individuals live and live in a technology-laden environment, where information is abundant, and acceleration of very high technological advances, and new patterns of communication and collaboration. Success in the digital world depends heavily on the skills that are important to have in the digital age. Students who live in the 21st century must master science, have metacognitive skills, be able to think critically and creatively and be able to communicate or collaborate effectively, this situation illustrates the gap between hope and reality. Thus, the skills of the 21st century must be mastered and possessed by every student to face the Industrial Revolution 4.0 (Joenaity, 2019).

One of the 21st-century learning approaches related to the development of soft skills is the steam learning approach (Science, Technology, Engineering, Art, and Mathematics) that relates the fields of science (science), technology, engineering, art, and mathematics so that students are given a holistic understanding of the interconnectedness of the field of science through the learning experience of the 21st century. Learning with the STEAM approach is contextual learning, where students will be invited to understand the phenomena that occur nearby. STEAM's approach encourages learners to learn to explore all their abilities, in their own way. STEAM will also bring up different and unexpected works from each individual or group. Besides, collaboration, cooperation, and communication will appear in the learning process because this approach is done in groups. With this kind of learning, learners will feel curious, want to learn, and understand what is going on the causes, and the impacts they have, and try to overcome them. This happens because students can directly relate, connect, and even find solutions to problems that arise, in this learning model students are invited to think critically (Sartono et al., 2020).

Research on STEAM (Science, Technology, Engineering, Art, and Mathematics) has begun to be done. One of them is from Yanti Julia entitled "Application of Steam-Based Goolital-Ject To Improve Critical Thinking of Students in Plant Structure And Function Materials Class VIII-A Smp Negeri Unggul Sigli in 2020. Based on his research in each cycle, there is an increase in critical thinking skills of students delivered cycle, the indicators include

focus from 63.0% increased to 70.4%, reason from 48.1% increased to 55.6%, inference from 40.7% increased to 51.9%, situation from 59.3% increased to 66.7%, clarity from 59.3% increased to 63.0%, and overview 55.6% increased to 59.3%. students' understanding also improved.

This research is different from previous studies. The difference between this research and previous research lies in the utilization of STEAM (Science, Technology, Engineering, Art, and Mathematics) conducted in historical subjects. STEAM aims to improve critical, creative, and innovative thinking in learners. Then in this study using the concept of educational integration, namely uniting formal objects and material objects. Therefore, this research was conducted to find out how steam is used especially in historical subjects, and also to know the difficulty of teachers in applying STEAM in historical subjects. STEAM is widely used in science learning, such as chemistry, physics, etc. Here researchers conduct STEAM research on history learning which is the latest breakthrough in history learning, with the aim that students can associate history with other sciences. So that students do not just focus on the science of history alone.

Research Methods

This article was written using the literature study method. Literature study is a series of activities relating to methods of collecting library data, reading and taking notes and processing research materials (Zed, 2014). The data used as a writing source is in the form of online articles and books related to the theme of this paper.



Table 1. Lictérature Review

No	Title	Author	Institution	ISSN/Vol	Link	Research Method	Research Result
1.	Implementation of Steam (Science, Technology, Engineering, Arts And Mathematics) in 21st Century Learning	Iim Halimatul Mu'minah and Yeni Suryaningsih.	University of Majalengka	Journal of Bio Educatio, Volume 5, Number 1, April 2020 pp. 65-73. ISSN: 2541-2280	https://www.jurnal.unma.ac.id/index.php/BE/article/viewFile/2105/1793	study method book. The method of literature study is a critical study of the discussion of a topic that has been written by researchers or scientists in various sources.	Steam implementation in 21st century learning can train students' skills and talents to deal with 21st century problems. In addition, learning in schools based on STEAM-based themes is expected to produce final outputs in the form of products and designs made by students related to design.
2.	STEAM Implementation in Biology Learning: Efforts to Empower Biology Teachers madrasah Aliyah DKI Jakarta	Nurmasari Sartono, Ade Suryanda, Tania Leyli Shofia Ahmad, and Zubaidah	University of Serambi Mecca Banda Aceh	BAKTIMAS Journal of Community Service Vol. 2, No. 1, March 2020 e-ISSN 2585-113x	http://www.ojs.serambimekkah.ac.id/BAKTIMAS/article/view/2099	Experiential learning method with participant-centered approach through case study techniques, and simulation, followed by the process of creating simple learning media.	The implementation of the activity is carried out in the form of a workshop. The workshop activities have been well underway and provide significant benefits for the participants' teachers. Activity results show there is an increase in steam related teacher skills. The high participation rate of participants is seen from the full involvement of participants in the activity. Activities to improve the knowledge and skills of teachers should be carried out continuously. If there are changes to the curriculum, then teachers must get enough education and training in order to implement well in learning.
19.	Implementation Of Higher Order Thinking Skills In Teaching Of Science : A	Sulaiman, T., Muniyan, V., Madhvan, D., Hasan, R.,	University Malaya	IRJES 1(1), 1–3. e-ISSN: 2550-2158	https://www.masree.info/wp-content/uploads/2019/11/Implementation-of-Higher-	Studi kasus Kualitatif yang melibatkan tiga guru IPA di sekolah negeri, swasta, dan pusat pendidikan swasta.	Hasilnya menunjukkan bahwa guru sudah sadar dan menerapkan HOTS dalam pembelajaran. Namun, mereka yakin terhalang oleh beberapa kendala. Oleh

	Case Study In Malaysia.	Syrene, S., & Rahim, A.			Order-Thinking-Skills-in-Teaching-of-Science.pdf		karena itu, penelitian ini menyimpulkan bahwa pengetahuan dan kompetensi sangat penting untuk menjamin kualitas penerapan HOTS.
3.	The Implementation Of Innovative Learning Models And Based Hots Scientific Approach On Lesson Plan Of Indonesian Language At Schools.	Suharto, T. V., Waraulia, M. A., & Hermayani, T.	University of PGRI Madiun	IOP Conf. Series: Journal of Physics: Conf. Series 1464 (2020) 012023	https://doi.org/10.1088/1742-6596/1464/1/012023	Qualitative with descriptive methods	teachers have not fully understood about HOTS. Therefore, it is very important that there is a follow-up program to the city education office to improve teachers' understanding of HOTS. it can be done through the workshop. The workshop is suitable for teachers because it still needs more knowledge about the new paradigm of learning, namely the demands of learning must be HOTS-based (Critical thinking, creative, collaborative, and communicative) in this era of industrial revolution 4.0.
4.	Implementing STEAM In The Early Childhood Classroom.	Dejarnette, N. K.	University of Bridgeport	Lectito European Journal of STEM EDUCATION 3(3), 1-9. 2018 ISSN: 2468-4368	https://eric.ed.gov/?id=EJ1190735	Phenomenological approach that focuses on the participants' life experience in developing the given professional and its after.	There has been an increase in positive disposition and self-efficacy of preschool teachers. However, the level of application of STEAM lessons by teachers was initially limited. The acceptance of STEAM lessons by preschoolers with high needs is phenomenal with a high level of engagement and cooperation. More research needs to be done in the field of applying STEAM in pk-12 classrooms to include engineering education.
5.	Implementation Of STEAM Method	Tabi'in, A.	Muhammadiyah	ECJR, 2(1) June 2019. e-ISSN: 2655-9315	http://journals.um.s.ac.id/index.php/	Qualitative Descriptive	The application of STEAM method is very beneficial for the development of the child, not

	(Science , Technology , Engineering , Arts And Mathematics) For Early Childhood Developing In Kindergarten Mutiara Paradise Pekalongan.		University of Surakarta		ecrj/article/view/9903		only the child is able to think critically in solving problems, but also the child experiences excellent social development.
6.	STEAM-Based Learning Analysis to Improve Students' Problem Solving Abilities in Science Subject: a Licterature Review	Nurul Heni Astuti, Ani Rusilowati, and Bambang Subali	State University of Semarang	JISE 10(1) 2020: 79-86 ISSN: 2502-4523		Meta-analysis in which researchers analyze multiple articles as needed.	Based on the results of the review of the article found, it was found several factors that STEM learning is a learning solution especially in improving problem solving skills. With integrated STEM is expected to be able to overcome the problems that exist today. STEM learning can encourage students to build early knowledge and become good problem solvers. In addition, STEM learning can make students have higher motivation and a systematic way of thinking. Also they become more critical and creative in the learning process. Therefore, STEM learning becomes a learning model that is in accordance with the current era of globalization because it can answer multidisciplinary problems.

Finding and Discussion

STEAM (Science, Technology, Engineering, Art, and Mathematics) which relates the fields of science (science), technology, engineering, art, and mathematics, so that learners are given a holistic understanding of the interconnectedness of the field of science through the learning experience of the 21st century. Learning with the STEAM approach is contextual learning, where students will be invited to understand the phenomena that occur nearby. STEAM's approach encourages learners to learn to explore all their abilities, in their own way. STEAM will also bring up different and unexpected works from each individual or group. Besides, collaboration, cooperation, and communication will appear in the learning process because this approach is done in groups. With this kind of learning, learners will feel curious, want to learn, and understand what is going on the causes, and the impacts they have, and try to overcome them. This happens because students can directly relate, connect, and even find solutions to problems that arise, in this learning model students are invited to think critically (Sartono, et.al, 2020). There are foundations in the steam approach, namely:

1. Constructivism Theory

As a pedagogical learning theory, constructivism was developed on the foundation of cognitive psychology, which discusses how learning and cognition take place (Li, 2017; Marentič Požarnik, 2008). Cognitive and constructivist theories and directives appear to each other, so we cannot make a difference between these two groups of theories. Besides, several authors, such as Piaget, Vygotsky, Bruner, and Glaser, have influenced and established major conceptual determinants in both theoretical groups, and are considered the originators of both. Concerning determining knowledge as an individual or social process, we distinguish between the theory of learning based on cognitive and social constructivism (Tomljenovic & Vorkapic, 2020). Cognitive constructivism, that is, psychological theory, cognitive learning, is based on Piaget's theory (1951), which, in the context of learning, emphasizes the active interaction of individuals. Piaget believes that the development of cognitive processes is not a congenital category or a direct result of experience, but the result of the student's active cognitive construction process. Cognitive psychologists emphasize the role of psychological learning in concept learning, which is realized through the creation of conditions that cause cognitive dissonance. Simply put, this theory is a theory that states that learners must build their own knowledge.

2. Multiple Intelligence (KM)

Howard Gardner, whose name is synonymous with this KM theory, hints, that there may be more intelligence than the seven bits of intelligence it has defined, particularly in other cultures. Thus, the KM list can be rearranged and added. The real purpose of creating and compiling a list is also "to elevate the diversity of intelligence" (Gardner, 1993). No matter, whether there are more types of intelligence or not, the seven bits of intelligence that Gardner has offered us are a giant step toward a point where individuals are valued and diversity cultivated (Jasmine, 2019).

3. Cooperative Learning

Several definitions of cooperative learning have been formulated. The most widely used in higher education may be from David and Roger Johnson of the University of Minnesota. According to the Johnson & Johnson model, cooperative learning is the instruction that involves students working in teams to achieve common goals, under conditions that include the following elements:

- 1) Positive interdependence
- 2) Individual accountability.
- 3) Face-to-face promotional interactions.
- 4) Proper use of collaborative skills.
5. Group processing.

Cooperative learning is not just a synonym for students working in groups. Learning exercises only as cooperative learning as far as the five listed elements are present.

Various innovations in the form of new learning methods, media that can help students more easily understand the material, as well as simple steps that may be applied in learning, proved to give birth to great teachers. They come not only from the city but also from far corners of the country from the hubbub of information technology (Joenaidy, 2019). Steam learning concept is one form of innovation that was born through a long discussion. Characteristics of steam approach, namely:

- 1) Interdisciplinary based on collaborative, research and practice, so creativity continues to run by integrating existing subjects (Rose & Smith, 2011).
- 2) The integrative ability of art has a role in connecting all subjects by developing existing creativity (Gibson & Larson, 2007).

STEAM refers to 21st-century learning. In this case, learners are required to think critically, creatively, and innovatively. Interaction between learners and teachers can be referred to as oral symbiosis. Students are required to be able to think critically and teachers who provide infrastructure. Therefore, to realize this, an educator must also use models and learning methods that support it, one of which is the steam learning model.

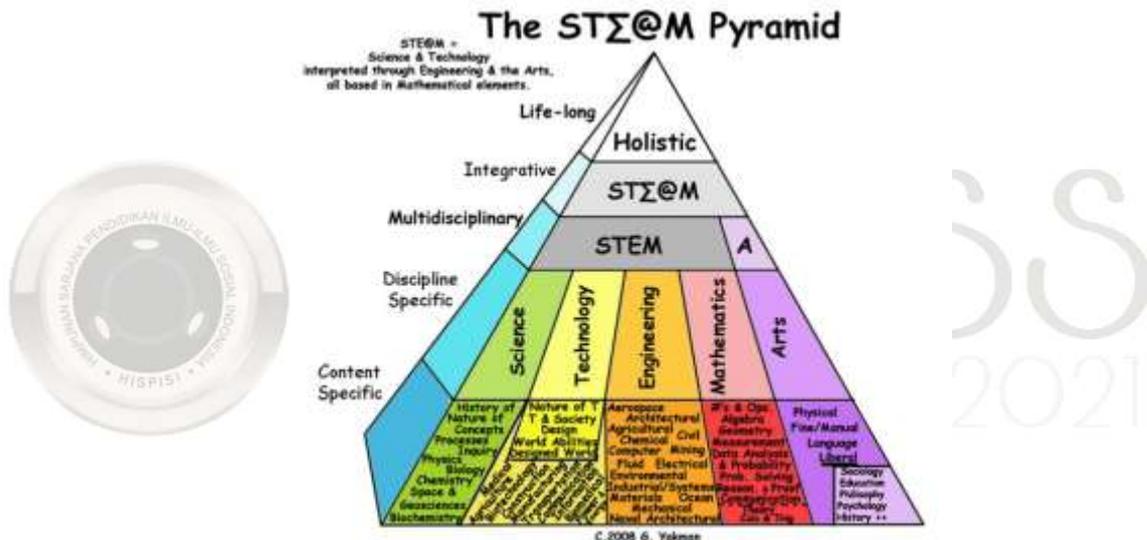


Image 1. The STEAM Pyramid

As seen in the image above, Science, Technology, Engineering, Art, and Mathematics (STEM) approaches are shifted to STEAM, with "A" stands for Arts and Humanities. Added "Art" to be able to develop the creativity of students. The origin of the term STEAM was in the 1990s by the National Science Foundation (NSF) in the US. In many of the education reforms taking place today, STEM is considered a supportive approach that emphasizes a multidisciplinary approach to better prepare students for STEM jobs and competes in the global economy. STEAM's approach including the Arts and Humanities (Geography, Citizenship, and History) has attracted attention over the past five years as a more recent phenomenon. Simply put is combining science, technology, engineering, and mathematics with the arts and humanities in paradigms. There is no doubt that the role of teachers in the classroom is transferring from being the one in charge of designing the learning experience to the facilitator who helps students take responsibility for their learning, through methods and practices that emphasize problem-solving and hypothesis testing in an environment that increases the level of motivation students may have (Bedar & Al-Shboul, 2020).

Many countries determine the importance of STEM and its implementation in STEM education. For example, in the United States, there are many efforts to support STEM education (Jho, Hong & Song, 2016). In recent years there has been a growing focus on preparing learners

for higher education and equipping them with the skills and knowledge they need to become successful innovators in the world of work in the 21st century (Zubaidah, 2019). STEAM originated in America and some schools follow the career path of graduating students, then combine subjects such as science, machinery, engineering, and mathematics, and this is where STEM was formed. Back then, they also incorporated art subjects and expanded more fully into STEAM developed by John Maeda in 2013, former president at the Rhode Island School of Design located at Two College Street Providence, RI 02903-2784 USA. STEAM has gained popularity among educators, parents, companies, and Institutions in various countries as a way to meet those needs (Shatunova, et.al, 2019).

STEAM consists of five items, namely science, technology, engineering, art, and mathematic. In this case, science in the study of history is an example in historical material about pre-scripted humans and the origins of the ancestors of the Indonesian nation and its cultural results. Science, it's in the wind as the ship sails.

Then technology, in this case, technology on history learning, i.e. both students and teachers can utilize existing technology to be able to understand historical material. For example, in the historical material about pre-scripted people and the origins of the ancestors of the Indonesian nation and its cultural results. The technology contained in this material, at the time of the voyage of the arrival of ancestors, used humans as rowers.

Then engineering, engineering here can be said how much the ability of learners to apply or convey about the historical material that he has obtained from previous learning. In historical material about pre-scripted people and the origins of the ancestors of the Indonesian nation and its cultural results. Engineering contained in the material, at the time of sailing, make use of the sail as a driver of the ship when there is a large wind.

After that there is Art, as described in the art sub-chapter above, Art or art in STEAM Education is a pattern of innovation and creativity in learning that is able to bring a real and different atmosphere so that the learning climate comes alive. Art in learning is intended so that the atmosphere of learning becomes fun, lively, meaningful, not monotonous, and able to make students enthusiastic so that it is far from bored and saturated. In this case, art on the study of history is an example in the historical material about pre-scripted humans and the origins of the ancestors of the Indonesian nation and its cultural results. The art contained in the material is to form a ship in a lean manner with the aim that when sailing, the wind can move the ship quickly because of its slim shape.

Then the last mathematic, as described in the mathematic sub-chapter above, mathematic here deals with counting and numbers and is also a tool that learners will always use in their lives, including when one day will plunge into society. In this case, mathematic on teacher history learning can also provide numeracy lessons to students. For example, in the historical material about pre-scripted people and the origins of the ancestors of the Indonesian nation and its cultural results. Mathematic contained in this material, learners can calculate the years from time to time that occurred in pre-scripted times. For example from the neolithic age (young stone age) to the megalithic era (age of large stones) how many years. So that learners can calculate and know the number of years that occurred from the neolithic-megalithic era. Because, mathematic is not only about formulas, but numbers can also be said to be mathematic.

Conclusion and Summary

STEAM is an integrated approach to learning, covering science, technology, engineering, art, and mathematics by focusing on problem-solving through interdisciplinary. Steam's focus approach integrates science, technology, engineering, art, and mathematics into a single learning activity; facilitating learners to develop soft skills and skills in learning; integrating a variety of problem-based learning models; provide opportunities for learners to

understand and learn about various phenomena in their lives; and develop creativity, critical thinking, literacy, communication, and collaboration.

With the steam approach in history learning, students are expected to have high creativity, confidence can work together (in groups), and can also do problem-solving.

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