

## The Steam Approach: Theory and Its Implementation in History Learning

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**Abstract:** *This article is expected to provide an understanding of history learning with the STEAM approach. In the era of Industrial Revolution 4.0, history learning that is memorized and textual must change. History learning is not only explaining past events but relating them to current conditions so that these events are meaningful to students' reality. In addition, the demands in this era are that students master science, have metacognitive skills, can think critically and creatively, and can communicate or collaborate effectively. This means that history learning must be done in an integrated and comprehensive manner. For this reason, learning history also needs to be done using the STEAM approach (Science, Technology, Engineering, Art, and Mathematics). The STEAM approach is contextual learning, where students get an integrated learning experience to be able to understand the phenomena that occur in the surrounding environment. Unfortunately, this approach is still not well understood by most history teachers. The concept of mathematics, one of the STEAM elements, is considered less relevant to history subject matter. In fact, to be able to understand historical material, mathematical understanding is needed, namely the ability to calculate and think logically, sequentially, and systematically in solving problems. The results showed that the STEAM approach can encourage students to learn to explore all their abilities, namely the ability to think critically, logically, reflectively, metacognitively, and creatively. In addition, it encourages collaboration, cooperation, and communication activities because learning history with the STEAM approach is done in groups. Thus, learning history with the STEAM approach is a solution to the demands of the Industrial Revolution 4.0 era which requires students to have 21st-century skills, so that learning history is not only theoretical but can be a project that can produce work.*

**Keywords:** history learning, STEAM approach, 21<sup>st</sup>-century skills

### Introduction

The discourse of learning history with the STEAM approach (Science, Technology, Engineering, Art, and Mathematics) is an interesting study to be discussed as a research study. The rapid development of information technology is a necessity that must be faced and adapted to improve the quality of history learning. This is related to the demands in the Revolutionary Era 4.0 which requires the creation of high-quality human resources and 21st-century skills, namely the skills of critical thinking, communication, cooperation, and collaboration with both individuals and communities and networks. Thus, learning history must be carried out comprehensively, transdisciplinary, and integrated, to provide learning experiences that are beneficial to students' lives.

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In this Revolutionary Era 4.0, learning, including history learning, must change its orientation from teacher-oriented to student-oriented. This is because it is the students who will utilize their learning experience in the real life of society. Therefore, history learning should emphasize the interests of the present and the future. History learning is not only textual but prioritized contextual, namely linking material with the environment, other relevant subject matter, and present conditions. This means that history learning does not only rely on textbooks as a learning resource but must use various learning resources, such as archives, historical figures, local customs and culture, and so on, to train students' critical thinking in analyzing historical events with various sources to produce rational and wise conclusions.

Referring to the opinion of Nugroho Notosusanto's "History for the Present" and Benedict Cross, history is the present, then learning history is not only learning knowledge of past events but the meaning of these past events for the benefit of the present life. This is in line with the opinion of San Wineburg who said that the purpose of learning history is to humanize humans. History is all human activities that have occurred in the past. Human activities are very complex, therefore, to be able to study comprehensively, an integrated approach with various disciplines is needed, to obtain meaning from the events studied for students' real lives. For this reason, a multidisciplinary and transdisciplinary learning approach is needed. One approach that collaborates various disciplines is the STEAM approach, namely Science, Technology, Engineering, Art, and Mathematics.

However, the results of the study showed that history teachers were skeptical about the STEAM approach, some history teachers stated that it was difficult to apply art and mathematics elements in learning activities. Teachers still think that history lessons are memorization, not numerical calculation subjects. (Lestari, 2022) whereas in a historical event there is a calculation of numbers to examine the number of days, months, and years in a certain period, in which there are elements of change, development, repetition, and sustainability. (Kuntowijoyo) by the spirit of the times. While the element of art that becomes the teacher's difficulty is applying the element of beauty in learning.

Indeed, based on a search of the literature, there are no research results on the use of the STEAM approach in history learning. Some literature shows that in general the STEAM approach is used in learning natural sciences, such as biology, chemistry, mathematics, and others. Like Titiyatna Hadinugrahaningsih, et al. Writing about, developing 21st Century Skill chemistry classroom, Opportunities, and Challenges of STEAM Integration, explaining the STEAM approach in chemistry learning, the same example, Rifka Anisa, Improving Students' Creative Thinking Ability by Using STEAM-Based Project Based Learning Model (Science, Technology, Engineering, Art, and Mathematics) on Acid and Base Material at SMAN 11 Jambi City. While Allyandra Kurnia, wrote calmly The Effect of Blended Project -Based Learning with STEAM Approach to Spatial Thinking Skill and Geographic skill, explaining the use of the STEAM approach to learning geography subjects. Nurmasari Sartono, with the title "Steam implementation in Biology learning: Efforts to Empower Biology Teachers of Madrasah Aliyah DKI Jakarta". Based on the literature above, learning history with the STEAM approach has not been done maximally. For this reason, this article intends to describe how the implementation of the STEAM approach in learning history. The goal is to be used as a

reference and example for history teachers so that in the end learning is expected to be varied not only lectures and questions and answers.

### **Literature Review**

Learning is the main activity in the education process. The word learning contains two concept elements, namely learning and teaching. Learning is a process characterized by a change in a person. Changes because of learning can be indicated in various forms such as changes in knowledge, understanding, attitudes, behavior, skills, and abilities, as well as changes in other aspects of the learning individual. (Al-Tabany, 2017) This statement is commensurate with Garry and Kingsley who state that learning is a process of changing original behavior through experience and practice. Meanwhile, George J. Mouly states that learning is the process of changing one's behavior due to experience. Thus, it can be said that learning is a process of changing behavior in knowledge, skills, habits, attitudes, understanding, and appreciation in a person because of an experience. Meanwhile, teaching is essentially the process of delivering knowledge from educators to students. Alvin W. Howard, as quoted by Slameto (Slameto, 1995), defines teaching as an activity to try to help, and guide, someone to get, change or develop skills, attitudes, ideals, appreciation, and knowledge (bits of knowledge). The same opinion is expressed by Hamalik (2015) defines teaching as an effort to organize the environment to create learning conditions for students. Thus, learning is a reciprocal process/interaction between the two aspects of learning and teaching to collaborating in an integrated manner into an activity to achieve predetermined goals.

In the learning process, both teachers and students together become actors in the implementation of learning objectives. Learning activities can achieve goals when they run effectively. While learning is a complex activity, learning is not just a transfer of knowledge from teachers to students, but an effort to facilitate the learning process. Therefore, learning activities need to be designed to be effective and efficient. Some things that need to be considered in learning activities are, how to convey subject matter to students, and how to organize interactions between existing learning resources so that they can function optimally so that learning objectives are achieved. According to Jihad, learning design should pay attention that learning is organized with real experiences and authentic environments, because this is needed to enable a person to process learning to understand, learn to work, and do real activities to the fullest. One approach that can fulfill this is the STEAM approach.

The STEAM approach is an integrated learning approach that encourages students to think more broadly about real-world problems. STEAM also supports meaningful learning experiences and problem-solving, this STEAM approach views science, technology, engineering, art, and mathematics are interrelated/integrated. In STEAM, science and technology can be interpreted through art and engineering, including the math component. (Sani, 2019). William said that STEAM

Learning with the STEAM approach has been carried out and researched and has even been published in several journals, including Alfyanda Kurnia Putra, a lecturer at the University of Malang, Indonesia, proving that Mixed Project-Based Learning with the STEAM Approach affects Spatial Thinking Ability and Geographical Skills. Spatial thinking skills and geographic skills are needed in the 21st-century era. In addition, Rifka et al wrote about improving students'

creative thinking skills by using the STEAM-based project-based learning model (Science, Technology, Engineering, Art, and Mathematics) on acid and base materials at SMAN 11 Jambi City. The results showed that there was a significant difference in students' creative thinking skills with the use of the project bases learning model on materials and bases at SMAN 11 Jambi City. From several literacy searches, no research examines the application of the STEAM approach to historical learning.

### Methodology

The research used a qualitative method with an R & D (Research and Development) approach. The steps include 1). Conducting initial observations and observations, 2) collecting research data, 3) analyzing data and designing development, 4.) implementing in learning 5) evaluating. The steps of the research procedure are as follows, *first*, identifying student needs, *second*, developing product design (E-module), *third*, design validation, *fourth*, improving E-module design, *fifth*, product testing, *sixth*, product revision, and *seventh*, usage trial.

The research was conducted at SMAN 49 Jakarta. Data collection techniques were conducted by interview, observation, and direct observation. Data were obtained from core informants and key informants. The core informant is the history teacher, SMAN 49 Jakarta while the key informant is the principal of SMAN 49 Jakarta.

### Findings & Discussion

#### Findings

The STEAM approach is an interdisciplinary approach that integrates Science, Technology, Engineering, Art, and mathematics in history learning activities. The interdisciplinary and integrated STEAM approach allows students to gain learning experiences that can train them to think critically, logically, and systematically. In addition, learning with the STEAM approach can encourage students to be able to solve problems in real-world life. The characteristics of the transdisciplinary STEAM approach require high-level thinking skills (HOTS), this is because learning with the STEAM approach requires students to conduct scientific investigations (science), and apply art and mathematics when designing a technology to solve a problem.

Gunawan (2020) said STEAM learning is an educational concept that focuses on aspects of collaboration, directing children to think critically, and creatively, innovate and find solutions (problem-solving), based on moral values and local culture. STEAM's approach to history learning is collaborative learning that leads to providing motivation, and innovation that can give birth to creative people towards an accomplished society that not only strengthens learning in disciplines. But between disciplines through opportunities to explore the expected connections between science, technology, application of technology, art, and mathematics by utilizing existing facilities in the surrounding environment to solve problems in building positive knowledge. The STEAM approach emphasizes integrated learning, learning is not done separately, but collaborates or applies all components in the theme. In other words, learning history with the steam approach requires students to be able to analyze and think critically in processing materials and using tools in solving daily life problems in their environment.

The explanation of the STEAM approach to learning is described as follows:

Concept	Description
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<p>Science</p>	<p>Science comes from the Latin word "Scientia" which means knowledge. Science can be defined to study certain aspects of nature in an organized, systematic manner and through various renewable scientific methods. According to Gunawan &amp; Asmar (Gunawan &amp; A., 2019) while Sund and Trowbribe formulate that Science is a collection of knowledge and processes. A similar opinion expressed by Kusland Stone states that Science is a collection of knowledge and ways to obtain and use that knowledge. in essence Science is the activity of developing science through various activities, such as learning in education units, research, and development. Learning is intended so that students can utilize the surrounding environment as a means of learning for the development of science. Science developed in learning activities by students with teachers will give birth to various innovations through natural processes with certain methods. This innovation can then be utilized in the real life of learners and can even be widely utilized in the life of society, nation, and state.</p>
<p>Technology</p>	<p>Technology in general is a science related to tools or machines created to help and facilitate humans in solving their problems or jobs. The development of increasingly advanced technology not only affects the industrial sector, but also the field of education and learning. Therefore, teachers must be able to adapt to technological advances and be able to utilize these technological advances in classroom learning. Learning in Era 4.0 certainly requires teachers who are professional, resilient, ready for the challenges of the 21st century, and able to operate technology in learning.</p>
<p>Engineering</p>	<p>The engineering aspect of Steam is the ability and expertise that a person (teacher and student) must operate a tool/object or build something. Referring to the statement of Gunawan and Asmar, (2019) engineering is a way of doing problem-solving techniques, using various materials, designing and creating, and building something that can function. Engineering is the stage after science and technology can be mastered, the next competency is to implement knowledge and technology in real life. The engineering element in learning emphasizes that learning is not only conceptual but must be practiced with teacher guidance so that students gain learning experience and can apply it in everyday life. Practical skills related to real life are important and indispensable for students. This is because skills are the main demand in learning in the 21st century.</p>
<p>Art</p>	<p>In general, art is everything created by humans that contains elements of beauty and can arouse the feelings of themselves and others. Ki Hajar Dewantara said, art is the result of beauty so that it can affect the feelings of</p>

	<p>someone who sees it, and art is a human action that can influence and cause feelings of beauty. While Art/art in STEAM elements is a pattern of innovation and creativity in learning that can present a real and different atmosphere so that the learning climate becomes "alive". Art in learning is intended to make the learning atmosphere fun, lively, meaningful, not monotonous, and able to make students enthusiastic so that students do not experience boredom and boredom. (Joenaidy, 2019) Art in STEAM learning can be done by emphasizing the beauty aspect of delivering material through a variety of varied learning methods and fun learning styles.</p>
<p>Mathematics</p>	<p>Etymologically, the word mathematics comes from Ancient Greek, namely Mathema which means study. According to Reys in Irsady Farista, mathematics is the study of patterns and relationships, a way or pattern of thinking, an art, a language, and a tool. According to Russefendy ET in Revyareza, mathematics emphasizes more activities in the world of ratios (reasoning), not emphasizing the results of experiments or observations. Mathematics is formed because of human thoughts, which relate to ideas, processes, and reasoning.</p>

Based on the description in the table above, it can be said that the STEAM approach is essentially learning that not only emphasizes conceptual mastery, but also technical skills. In other words, learning is integrated between conceptual and practical skills. Therefore, the STEAM approach usually uses problem-based learning (PBL) and project-based learning (PjBL) models.

Based on the table above, it can also be said that historical learning with the STEAM approach is very relevant to be used in 21st-century learning. 21st-century learning aims to prepare and equip students with the skills and knowledge they need to become innovators. History learning with the STEAM approach combines five competencies at once. Learners are required to master science (science), technological knowledge (technology), the ability to apply technical knowledge in practical life (engineering), process or present it in other forms and forms that are interesting and beautiful (art) and are proficient in calculating numbers coherently and analyzing logically, systematically. Based on the characteristics of the STEAM approach, it can be said that learning history is not only taught theoretically but practices that can produce a product. Therefore, the learning model used is a project-based learning model. emphasizes more on project-based learning. This is reinforced by Herro & amp (Herro, 2017) who said that the Steam approach allows students to find their creativity and get art products by increasing their problem-solving skills in a positive perspective.

Ironically, based on the results of the research, the history teacher at SMAN 49 Jakarta admitted that he had not implemented history learning with the STEAM approach. He continued to say that in general the STEAM approach is used in learning Natural Sciences. According to his confession, he had difficulty applying art and math in learning history. Based on the observation of the process of history learning activities facilitated by Mr. Andy's teacher, it can be said that the history learning model is still conventional, namely, teacher-oriented, the method used is lecture, and the teacher dominates the process of learning activities. In addition, teachers are still oriented towards learning completeness by spending all the material in the textbook. The material in the textbook by the teacher is copied in the form of PowerPoint.

Indeed, from the results of observations, teachers have used power points that are interesting and follow the rules, which means using technology. In addition, making Powerpoint interesting and pleasing to the eye, of course, must contain art. While the element of mathematics is contained in the calculation of time in the period of a historical event.

The 100% offline, face-to-face history learning has only been re-implemented since the new academic year 2022. This face-to-face learning still requires adaptation from online learning to offline learning. During the Covid Pandemic, learning is carried out remotely through the zoom application, LMS, GoogleClasroom, or WhatsApp. This distance learning does not require students to spend time traveling to school, they can immediately participate in learning activities from home. However, when learning is done directly and held at school, students as learners must come to school. This condition requires both students and teachers to adapt again. They must arrive at school at 6.30 am. This means that students must get used to waking up early so that they are not late for school. From the results of observations, there are still some students who come to school late.

This adaptive learning condition is the reason for teachers to carry out a learning activity process that does not provide too much learning burden to students. Teachers mostly use lectures and question-and-answer methods. Teachers at SMA N 49 share modules according to the subject matter through the WhatsApp group. According to her, learning history with the STEAM approach takes time to plan and costs money. Whereas in general, students who study at SMA 49 are mostly students who come from lower middle-class families.

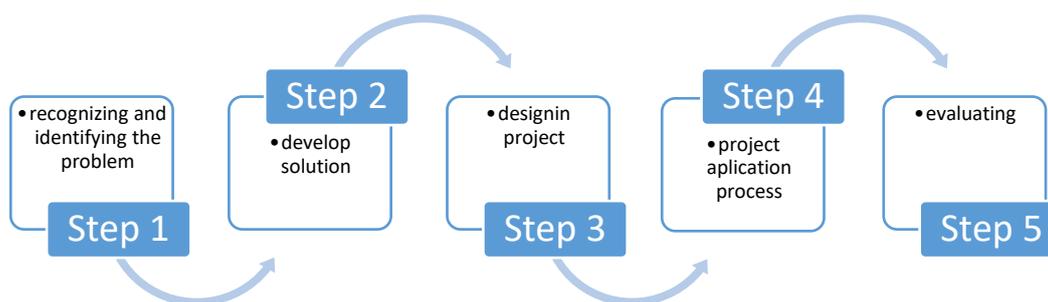
## Discussion

Some of the problems of applying the STEAM approach to history learning, one of which is caused by history teachers not conceptually understanding the STEAM approach in learning, especially history learning. The difficulty of integrating art and mathematics in history learning, from the results of observations because teachers understand the elements of art and mathematics literally, even though from the results of observations without realizing it the teacher has done and integrated art and mathematics in history learning activities. The history subject matter itself contains the main spatial and temporal domains, which of course requires mathematical skills in calculating time in the process of historical motion. While art has been integrated when teachers develop interesting PowerPoint media (technology and engineering), and teachers often explain using various media, methods, and varied learning styles that can create a pleasant learning atmosphere, which of course has elements of art. Learning activities that can make the learning atmosphere lively, meaningful, and fun.

Theoretically, the STEAM approach to learning includes several important components that need to be considered, namely 1). Problem-solving through innovation and design, 2). linkages between assessments, lesson plans, and learning standards, 3). The combination of more than one subject in STEAM and its use in the arts, 4). the collaborative learning environment and process-based learning, 5). Focus on things that happen.

The implementation of the STEAM approach in history subjects with the project-based learning (PjBL) method is as follows.

1. Recognize and identify the problem
2. Developing solutions
3. Designing the project
4. The process of working on the project
5. Evaluate



Based on the diagram above, in essence, the STEAM approach contains several components, namely problem solving through innovation and design, a combination of more than one disciplinary subject, a collaborative learning environment, and process-based learning, a link between assessment, learning plans, and learning streams, and a focus on things that happen in life. Furthermore, the implementation of the STEAM approach in learning the history of liberal democracy period material. developed the syntax of learning history with the STEAM approach:

Table.1 Example syntax of STEAM approach in history learning

Stages	Learning activities
Recognize and identify problems	The teacher and students together discuss the issues raised in accordance with the subject matter.
Developing solutions	Teachers and students create a solution plan and project design
Setting up the project	The teacher provides an example of how to make a project, and the teacher provides a youtube link on how to do the project so that students can do the project at home / outside the classroom, anytime and anywhere it can be replayed.
Making tools (building projects)	The teacher facilitates the student groups to build the designed project. Student groups create projects within a predetermined period
Evaluate and display/exhibit the project	Student groups are given the opportunity to present/exhibit and explain the workings and benefits of the products they have made. The teacher trains the students to evaluate the learning project that has been done.

Sumber: (Sani, Pembelajaran Berbasis HOTS, 2019)

## Conclusion

The STEAM approach is an interdisciplinary approach that integrates five elements, namely science, technology, engineering, art, and mathematics. These five elements can be applied in learning history. The demands of learning in the 4.0 era are not only to convey material theoretically or conceptually but are required to develop the ability to practice knowledge and skills. History learning in the 4.0 era does not only emphasize mastery of

knowledge but also practicing knowledge and skills, therefore the STEAM approach is relevant and can be applied in history learning.

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