A Literature Review of Scientific and STEAM Approach in 2013 and Merdeka Curriculum

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Abstract

Scientific approach is a learning process that is designed in such a way that students actively construct concepts, laws, or principles. Meanwhile, STEAM approach is an integrated approach that combines science, technology, engineering, art, and mathematics as a means of developing student skills in the 21st century. The research aims to investigate and describe the crucial changes from the scientific approach in the 2013 curriculum to the STEAM approach in the Merdeka Curriculum. The research used is qualitative and focuses on documentary studies. The research instrument used observational field notes sourced from literature such as books, scientific journals, and reference books. The data were analyzed in a qualitatively descriptive way. The research Findings showed that there are several crucial changes from the scientific approach in the 2013 curriculum to the STEAM approach in the Merdeka Curriculum, namely in terms of objectives, principles, and learning stages.

Keywords: Scientific Approach, STEAM Approach. 2013 Curriculum, Merdeka Curriculum

INTRODUCTION

The Law of the Republic of Indonesia Number 20 (2003) stated that the curriculum is a set of plans and rules that include objectives, content, and learning materials, as well as guidelines for learning steps to achieve certain educational goals. Further, Sofyan (2016) said that the curriculum is the basis of the educational program. Thus, curriculum is the basis of educational programs in Indonesia and contains all plans, rules, and guidelines for learning steps to achieve certain educational goals.

Further, the fact is that the curriculum in Indonesia has changed significantly. Uhbiyati (2008) in Muhammedi (2016) stated that there were several periods of implementing the curriculum in Indonesia, namely the simple curriculum (1947–1964), curriculum reform (1968–1975), process skills-based curriculum (1984–1999), and competency-based curriculum (2004–2006), and finally the curriculum with a scientific approach to the 2013 curriculum. Meanwhile, Muhammedi (2016) added that Indonesia had made curriculum changes 12 times, with details of 3 times during the Orde Lama (Orla), 6 times during the Orde Baru (Orba), and 3 times during the reform

period. Thus, Indonesia underwent curriculum changes 12 times in several periods, namely during the Orde Lama (Orla), Orde Baru (Orba), and Reform periods, including simple curriculum (1947–1964), curriculum reform (1968–1975), process skills-based curriculum (1984–1999), and competency-based curriculum (2004–2006), and finally the curriculum with a scientific approach to the 2013 curriculum.

Then, Wulandari (2020) defined the 2013 curriculum as the development of a competency-based curriculum (KBK) and a school-based curriculum (KTSP). Furthermore, Subadi et al. (2013) in Meliawati et al. (2015) in Wulandari (2020) stated that the 2013 Curriculum sets Graduate Competency Standards (SKL) as qualification criteria for graduation abilities, which include attitudes, knowledge, and skills. Thus, the 2013 curriculum is a development of the Competency-Based Curriculum (KBK) and the school-Based Curriculum (KTSP), in which the curriculum stipulates Graduate Competency Standards (SKL) as qualification criteria for graduation abilities, which include attitudes, knowledge, and skills.

As a matter of fact, the 2013 curriculum has changed to a Merdeka Curriculum. Further, Rahayu et al. (2022) stated that the Merdeka Curriculum focuses on freedom and creative thinking. While Indarta et al. (2022) added, The Merdeka Curriculum exists as an answer to the intense competition for human resources globally in the 21st century. Thus, the Merdeka Curriculum is present as an answer to the intense competition for human resources globally in the 21st century, in which the curriculum focuses on freedom and creative thinking.

Then, Fahrurrozie (2018) stated that in carrying out curriculum development, it is necessary to have an approach used to develop learning strategies. Further, Khasanah (2015) defines a learning approach as a path that will be followed by teachers and students in achieving instructional goals for a particular instructional unit. Meanwhile, Aflalo (2012) stated the learning approach refers to philosophical concepts and didactic methods related to teaching and learning strategies. Thus, the learning approach refers to philosophical concepts and didactic methods related to teaching and learning strategies, which are likened to a path that will be taken by teachers and students in achieving instructional goals for a particular learning unit.

Furthermore, The Ministry of Education Indonesia (2013) stated that the 2013 curriculum can be implemented successfully by using a scientific approach. Furthermore, Abhyasari, et al. (2020) defined A scientific approach is an approach

that is designed to the maximum extent possible so that students actively improve their competence in attitudes, knowledge, and skills through various stages, namely: observing, formulating problems, formulating hypotheses, collecting data in various ways, analysing data, drawing conclusions, and using techniques for communicating concepts. Further, Saefuddin & Berdiati (2014) in Indrilla (2018) Added to that, the scientific approach aims to support and help students find and utilize their knowledge. Thus, the scientific approach is a learning approach designed to help students actively discover and improve their knowledge and skills through observing, formulating problems, formulating hypotheses, collecting data with various techniques, analysing data, drawing conclusions, and communicating concepts.

Meanwhile, Santi (2022) stated that Merdeka Curriculum can be implemented by using the STEAM approach (science, technology, engineering, art, and mathematics). Fatmah (2021) in Mabsutsah & Yushardi (2022) define STEAM as a learning approach where students can develop the skills needed to thrive, in this case communication skills, critical thinking skills, leadership skills, teamwork skills, creativity skills, resilience skills, and other skills. Further, Sugiharto (2020) in Santi (2022) stated that the STEAM approach makes learning meaningful for students because it introduces a systematic integration of knowledge, concepts, and skills. Thus, STEAM is a learning approach that is meaningful for students because it introduces the systematic integration of knowledge, concepts, and skills, and students can develop skills needed to thrive, in this case including communication skills, critical thinking skills, leadership, teamwork, creativity, resilience, and other skills.

Based on the considerations above, the researcher is interested in conducting research titled "A Literature Review of Scientific and STEAM Approach in 2013 and Merdeka Curriculum". The researcher wants to know how the crucial changes from the scientific approach in the 2013 curriculum to the STEAM approach in the Merdeka Curriculum.

METHOD

This study used qualitative methods with a focus on documentary studies. Strauss and Corbin in Khankeh (2007) stated that qualitative research is research that can examine people's lives, histories, behaviours, organizational functionalization social movements, or kinship relations. Meanwhile, Sukmadinata (2010) in Yustiawan (2019) stated that documentary studies are data collection techniques that involve the

collection and analysis of written documents, images, and electronics in accordance with the objectives and focus of the problem. Sources of data in this study are documents, archives, and literature related to the 2013 Curriculum, the Independent Curriculum, and the learning approach. This study used a research instrument in the form of observation field notes, and the data analysis technique used was descriptive-qualitative.

FINDING AND DISCUSSION

Finding

Table 1. Findings of the Research

Aspect	Scientific Approach	STEAM Approach
Objectives	The scientific approach aims to improve thinking skills by creating a conducive, active, and productive learning environment, improving the ability to think systemically, improving understanding of concepts, increasing learning motivation, and improving communication skills	The STEAM approach aims to instil in students an understanding that science, technology, engineering, art, and mathematics can be developed simultaneously and continuously, thus that this understanding can be used to solve problems for the sake of human progress and prohibit students from thinking critically, developing innovations, producing ideas, developing skills, and responding to the challenges of the times.
Learning steps	The learning steps in scientific are observing, asking, reasoning, trying, concluding, and communicating.	The learning steps in STEAM are asking, imagining, planning, creating and improving.
Principles	The scientific approach has principles in its implementation, namely: students' self-concept; avoid verbalism; There are opportunities for students to assimilate concepts. Improving students' thinking skills, learning to increase student learning motivation and teacher teaching motivation, as well as training students' competence in communicating	The STEAM approach has implementation components or principles, namely problem solving through innovation and design; adverse relationships between judgment, lesson design, and standards; a combination of more than one STEAM subject being taught and assessed simultaneously; and students are encouraged to consider the beauty and usefulness of art, collaborative environments, and process-based learning. Focus on real-life social-emotional relationships between disciplines and things that happen in life.

Based on the comparison above, the scientific approach and STEAM approach have several differences which are elaborated as follows.

First, concerning to the objectives of the approach found in this study, the scientific approach aims to develop and improve student competence through knowing and understanding the material in depth through student-centred learning. Meanwhile, The STEAM approach aims to develop and enhance students' competencies through creative and effective problem-solving by utilizing the

relationship between knowledge and skills in the form of science, technology, engineering, arts, and mathematics and encouraging students to think more broadly about real-world problems. Thus, it is known that there is innovation in the STEAM approach, namely the use of science, technology, engineering, art, and mathematics, which are combined in such a way in the learning process. Absolutely, this will attract students' attention to be more active, and learning becomes more fun, unique, and meaningful because it is not only focused on deepening the material. In addition, students will be accustomed to recognizing and overcoming problems that occur in the real world. In this case, the author feels that the STEAM approach is in accordance with the objectives of the independent curriculum to prepare and equip students with various skills that are able to prepare them to compete and survive in human resource competition in the future.

Second, concerning to the learning steps of the approach found in this study, the scientific approach has five stages in the learning process, namely: observing, asking, trying, associating, and then communicating. Whereas the STEAM approach has four stages, namely: ask (finding problems and solutions), Imagine (imagining products), Plan (product planning), and then Create and Improve (making and testing products). Thus, it is known that the scientific approach begins with the observation stage to find problems, while the STEAM approach begins with the asking stage to identify problems and at the same time find solutions to these problems. In addition, at the end of the scientific approach, it only stops at the stage of communicating the concept, while the STEAM approach ends with the Create and improve product stages. Based on these, it can be said that even though the learning stage in the STEAM approach is shorter than the Scientific Approach, the output produced is better where students are able to produce products.

The last, concerning to principle of the approach found in this study, scientific approach has the principles of student-centred learning, student self-concept learning, and temporarily improving students' thinking skills. Meanwhile, STEAM approach is based on problem solving through innovation and design, a collaborative learning environment, process-based learning, and a focus on developing skills to deal with problems. Thus, it is known that the scientific approach is only principled to free students from determining the direction of their own learning and developing critical thinking skills. While the STEAM approach still has the principle of student-centred

learning. However, there are innovations and collaborations from several elements that make the learning process more meaningful and focus on developing skills to deal with real-world problems.

Discussion

Table 2. Discussion of the Research findings

	Discussion
The Crucial Changes from Scientific Approach in the 2013 Curriculum to the STEAM Approach in the Merdeka Curriculum	• Concerning to the goals of the scientific approach, it aims to develop and improve student competence through knowing and understanding the material in depth through student-centred learning. This finding is in line with Abhyasari et al.'s (2020) definition of A scientific approach is one that is designed to the maximum extent possible thus that students actively improve their competence in attitudes, knowledge, and skills through various stages.
	• Concerning to the goals of the STEAM approach, it is in accordance with the objectives of the Merdeka curriculum to prepare and equip students with various skills that can prepare them to compete and survive in human resource competition in the future. This finding is in line with the objectives of the Merdeka curriculum, according to Indarta et al. (2022), who state that the Merdeka Curriculum exists as an answer to the intense competition for human resources globally in the 21st century. Which in the 21st century requires humans with communication skills, critical thinking skills, leadership skills, teamwork skills, creativity skills, resilience skills, and other skills thus they can compete.
	• Concerning to the principles, the scientific approach is only principled to free students from determining the direction of their own learning and developing critical thinking skills. While the STEAM approach still has the principle of student-centred learning. However, there are innovations and collaborations from several elements that make the learning process more meaningful and focus on developing skills to deal with real-world problems. This finding is in line with Santi (2022), who stated that the STEAM approach makes learning meaningful for students because it introduces a systematic integration of knowledge, concepts, and skills.
	• Concerning to the learning step, the scientific approach has 5 steps starting with the observation stage to find problems, while the STEAM Approach has 4 steps starting with the asking stage to identify problems and simultaneously find solutions to these problems. In addition, at the end of the scientific approach, it only stops at the stage of communicating the concept, while the STEAM approach ends with the create and improve product stage. Thus, even though the learning stages in the STEAM approach are shorter than in the scientific approach, the output produced from the STEAM approach is better because students are able to produce products.

CONCLUSION

Conclusion

The objective of this study is to investigate and describe the crucial changes from the scientific approach in the 2013 curriculum to the STEAM approach in the Merdeka Curriculum. The researcher collected the data through a literature study from books, magazines, scientific journals, and reference books related to research.

From the results of the literature study, it was found that there were several Crucial Changes from the Scientific and STEAM approaches, namely in terms of objectives, learning stages, and principles.

First, in terms of objectives, the scientific approach aims to develop and improve student competence through knowing and understanding the material in depth through student-centred learning. Meanwhile, the STEAM approach aims to develop and enhance students' competencies through creative and effective problem-solving by utilizing the relationship between knowledge and skills in the form of science, technology, engineering, arts, and mathematics and encouraging students to think more broadly about real-world problems.

Second, in terms of learning stages, the scientific approach has five stages in the learning process, namely: observing, asking, trying, associating, and then communicating. Whereas the STEAM approach has four stages, namely: ask (finding problems and solutions), Imagine (imagining products), Plan (product planning), and then Create and Improve (making and testing products).

Third, in terms of principles, the scientific approach is only principled to free students from determining the direction of their learning and developing critical thinking skills. While the STEAM approach still has the principle of student-centred learning. However, there are innovations and collaborations from several elements that make the learning process more meaningful and focus on developing skills to deal with real-world problems.

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