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Steam Content in Integrated Science Learning Model Project Based Learning (PjBL) in Madrasah Ibtidaiyah

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ABSTRACT

21st Century Learning encourages students to have the skills needed for life in the future. One learning approach that is relevant to 21st Century skills is Science, Technology, Engineering, Art and Mathematics or STEAM. STEAM-loaded learning can be applied from basic education to higher education. This study aims to analyze the content of STEAM in science learning for plant generative reproduction in Class V Madrasah Ibtidaiyah Mumtaza Islamic School, South Tangerang City which is integrated with the Project Based Learning (PjBL) learning model. The method used in this research is descriptive qualitative with data collection techniques in the form of interviews, observations and documentation. The results of the study show that in fact, in learning science in Class V, integrated PjBL, which looks simple, already contains the STEAM component. The STEAM components contained are: (1) Science is seen when students identify the flower part, (2) Technology is in simple technology, namely the scissors used by students, (3) Engineering in the form of students' techniques in making circles and attaching flower parts, (4) Art contained when students decorate their work, and (5) Mathematics is seen when students make a circle with a certain diameter.

Keywords: *Madrasah Ibtidaiyah, Science Learning, Steam Content*

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INTRODUCTION

In the 21st century, various real problems have to be faced by students in life. The real problems in life cannot be solved easily through traditional education. Because in traditional education the learning given to students only focuses on student knowledge. To face the problems of the 21st century, students can not only use knowledge, but they need skills that must be mastered (M. H. Rohman et al., 2021). The formation of these student skills requires education that emphasizes knowledge and skills in learning. With this

education has a very important role, this role prepares students to face problems to face their future.

Moreover, in the 21st century, with technological developments that are so advanced, many jobs require and are even carried out by technology, so students need to form skills to deal with real problems in life. 21st century learning is a solution as a way to deal with real problems in life, because 21st century learning places more emphasis on skills (Nurulita et al., 2022). In curriculum 13 which is implemented in elementary school learning, it explains that elementary school students must have and be embedded in 21st century students or so-called 4Cs, namely Critical thinking, Collaboration, Creative, and Communication (Muchson, 2023).

21st century learning also requires learning models, methods, strategies, and techniques. A teacher must be able to select and determine the appropriate learning components, so that the 21st century learning objectives in shaping skill competencies can be achieved. Included in science learning, science learning basically has a goal to increase their interest and knowledge about the world in which they live. So that science learning needs a learning model and the right approach, so that knowledge about nature or the world as a place to live can be easily understood by elementary school students. One suitable learning model in science learning is the project based learning (PjBL) model with the STEAM approach (Subiki et al., 2023).

Angga in his article entitled the application of STEAM integrated problem based learning to improve students' 4C abilities. The results of his research explain that the 4C skills of third grade elementary school students can be improved by using the STEAM integrated PBL methodology. Syntax learning is implemented with a 100% Problem Based Learning (PBL) implementation level. 90% of students scored higher than the KBM on the posttest, according to the results. Scores above 80 were obtained by all groups. In addition, the 4C's ability for N-gain results for pupils is 0.57, or 57% (Angga, 2022). Then Eni Kustiyah Rumiyati conducted research on learning science through the STEAM model (6e Learning by DesignTM) for class VII students. The results of the research explain that students work in groups, and there are two cycles. Cycle I produced a score range of 60 to 95, with an average of 70. (25 students completed) Cycle II scores ranged from 65 to 100, with an average of 80. (30 students completed) In the initial condition for as many as 24 students, cycle I as many as 28 students, and cycle II for as many as 32 students, students' attitudes have a good minimum score. In the initial conditions, students obtained a minimum skill score of 20, in the first cycle 25, and in the second cycle 30. In the first cycle, there were 26 active students and 32 in the second cycle. Thus, the learning outcomes of students in class VII can be improved by teaching the STEAM-based 6E Learning by Design TM model of the interaction of living things (Rumiyati, 2022).

Furthermore, research conducted by Nanik Rahmawati is described in his article, "Analysis of media needs and augmented reality-based teaching materials in science learning with the STEAM approach to 21st century skills for elementary school teachers. The study explains the results, which show that the full potential of AR in STEAM learning has not been realized in schools; students still need more intensive socialization

and training, as well as media and AR-based science teaching materials in STEAM learning for 21st century skills in elementary schools (Rahmawati, 2020). The three studies above focused on learning using the STEAM approach and formed the basis of this research. Meanwhile, this study describes the content of STEAM in integrated science learning with the project based learning (PjBL) model at Madrasah Ibtidaiyah, whose purpose is to see how the STEAM approach is used in science learning with the project based learning (PjBL) model (Dayanti et al., 2022).

The PjBL learning model creates a "constructivist" learning environment where students build their own knowledge and educators become facilitators. This PjBL model can cultivate high order thinking (HOT) in implementing scientific learning (observing, associating, experimenting, discussing, and communicating) and 21st century learning (4C: critical thinking, collaboration, creativity, and communication) (Trinaldi & , Mefliza Afriani, Herman Budiyono, Rustam, 2022). The PjBL model can be used to improve 21st century 4C skills by being integrated with the STEAM approach. The need to prepare students for education and provide them with the knowledge and skills they need to succeed as innovators in the 21st-century world and workplace has received increasing attention in recent years. To answer this demand, STEM (Science, Technology, Engineering, and Mathematics), which later developed into STEAM with the addition of the arts, has gained popularity among educators, parents, businesses, and institutions around the world (A. D. Rohman & Musa, 2022).

Direct participation or involvement of students in STEAM aims to foster an early love of science and art. Everyone uses a variety of methods to do research and discovery in STEAM and engage creativity. So this is especially useful for students, not only for the future of current students but also for the future of the country (Boice et al., 2021). Relevant learning is essential in training students to be innovators in a changing world. Worldwide, STEAM-based education is more advanced than STEM-based education. Environmental principles or science learning can also be integrated with STEAM. The idea of transdisciplinary learning is incorporated into STEAM, which means that students learn through a blend of original disciplines and are also able to solve challenges given in real-world contexts. Therefore, the authors conducted a study on STEAM content in integrated science learning with project based learning (PjBL) models at Madrasah Ibtidaiyah with the aim of seeing how to use the STEAM approach in science learning with a project based learning (PjBL) model.

RESEARCH METHODOLOGY

This study uses a qualitative descriptive research type, which is intended to answer how the content of STEAM in integrated science learning is a project-based learning (PjBL) model at Madrasah Ibtidaiyah. The data collection techniques used in this study were observation, interviews, and documentation. The first step for the researcher is to make observations to determine the initial location of the study and conduct preliminary research. Furthermore, the researcher conducted interviews with the relevant informants to collect more precise and clear information. Finally, the researcher continued with the

documentation. This research information was obtained from the principal, teaching teachers who implemented STEAM in science learning with the PjBL model, and students who carried out science learning with STEAM.

After the data was obtained, the researcher continued to analyze the data. Researchers analyze the data in three steps: data reduction, data presentation, and drawing conclusions. The initial stage of data reduction is the process where researchers take and select information from observations, interviews, and documentation. The second stage of the information is then processed to facilitate researchers in conveying the information and presented in the form of stories; this is referred to as "data presentation." The final stage occurs after the researcher takes, selects, and presents the data. The researcher continues to draw conclusions by providing his arguments.

RESULT AND DISCUSSION

TABLE 1. PROJECT BASED LEARNING: STUDENTS MAKE "PARTS OF A FLOWER BOARD"

STEAM Components	Definition	Content in Science Learning
Science	The ability to identify scientific information, formulate and analyze problems, conduct experiments with the scientific method, collect data and analyze it towards a conclusion, then apply it in the real world, which also has a role in finding solutions.	Students dissect and identify parts of a flower to determine whether it is a perfect flower or not.
Technology	Skills in using various technologies, learning to develop technology, and analyzing technology can influence the thinking of students and society.	Students use simple technologies such as scissors, glue sticks, and tape dispensers.
Engineering	The ability to develop technology with more creative and innovative designs through the incorporation of various scientific fields.	Students make a circle out of cardboard and attach the flower parts to the cardboard with various techniques and patterns.
Art	Ability in writing, communication, poetry, video presentation, model making.	Students decorate a circle containing flower parts and present it in front of the class.
Mathematics	The ability to analyze and convey ideas, formulations, and solve mathematical problems in their application.	Students make a circle on a cardboard with a certain diameter that has been determined by the teacher.

Science, Technology, Engineering, Art and Mathematic (STEAM)

The development of the STEAM approach begins with STEM. STEM itself is an approach that integrates the fields of science, technology, engineering, and mathematics. However, there is the addition of an "art" element, so STEM is now developing into STEAM. With the addition of the word "art" in STEM, it is considered to be able to better integrate the skills (hard and soft) needed by children. STEAM (Science, Technology, Engineering, Arts, and Mathematics) is a breakthrough in education that combines several aspects of science into one cohesive learning idea (Marín-Marín et al., 2021).

Learning with the STEAM approach in the learning process harmoniously combines five disciplines, including science, technology, engineering, art, and mathematics. a) In science, a teacher will present knowledge in the form of rules, laws, theories, and concepts that already exist in nature. Natural science can legally be studied empirically by students. b) In technology, students learn how to use media to solve existing problems. However, before applying their skills, students are also given a way to find an idea so that they can make a tool. c) Techniques, students will be given a way to design the system, namely the procedures or rules used in solving problems. d) In art, students learn how to create from an invention or product in order for it to be accepted by the community, as well as how to promote the invention or product. e) In mathematics, students will be taught how the relationship between quantities, spaces, and numbers is used to argue rationally and logically (Wahyuningsih et al., 2020).

The STEAM approach is one of the most advanced learning methods that experts propose to use from early childhood to higher education. This is due to the fact that STEAM can cultivate a wide range of abilities, including critical thinking, problem solving, creativity, group work, independent thinking, initiative, communication, and digital literacy. For students to successfully navigate the problems of globalization, they must master these various talents. Furthermore, technology has advanced rapidly and is now said to be advanced, affecting human life, including in the field of education (Belbase et al., 2021).

In the 21st century, STEAM is very important in learning because it is in accordance with the characteristics of 21st century learning, which has three main subjects in learning: 1) learning and innovation skills; 2) information, media, and technology; and 3) life and career skills. In addition, STEAM in 21st century learning has benefits including teaching and improving children's critical thinking, eliminating barriers to ideas to be more creative, focusing on processes that help lead to innovation, teaching the power of observation from the surrounding environment, according to the times, and involving the role of people (Ridwan et al., 2021).

Therefore, STEAM plays an important role in the formation of competencies possessed by students, especially in shaping the competencies contained in 21st century learning such as critical thinking, creativity, collaboration, and communication (Illene et al., 2023). The development of learning competencies is very important for elementary school students, considering the current situation in which children are faced with increasingly complex problems. The demands of life will be very high in the future as a

result of the development of science and technology. This ability is very important because 21st century learning with competency formation is used as a provision for children to be able to find solutions to the problems they face (Tohani & Aulia, 2022).

Science Learning Using STEAM

The implementation of STEAM-based learning must be in accordance with the learning model so that the desired learning objectives can be achieved. The learning model with the STEAM approach is one of the appropriate learning models in STEAM-based learning. And the learning model with the STEAM approach is active learning. After the learning model with the STEAM approach is considered appropriate, educators must carry out several learning steps properly so that the learning process carried out through the STEAM approach can run optimally and effectively (Pramashela & Suwono, 2023).

The implementation of learning with the STEAM approach in the learning process has five stages, namely: 1) preliminary activities; 2) experience; 3) interaction; 4) communicating the results of the discussion; and 5) reflection and evaluation. Similarly, the STEAM approach to science learning has several learning steps. 1) The preliminary stage begins with an opening using greetings and attendance, then the previous material is studied again and correlated with the material to be studied, and the teacher does not forget to motivate students. In the second stage, students are given a learning experience. In the third stage, students conduct discussions with groups. In the fourth stage, students read the results of group discussions in front of them, and in stage five, the teacher reflects on the results and evaluates student learning outcomes (Priyantini et al., 2021).

In addition to the many benefits of learning using the STEAM learning model, this cannot be separated from the challenges in the implementation process, which include: (1) the availability of insufficient facilities, such as a lack of interactive media and furniture in the classroom, as well as ready-to-use media that can be used to support learning. (2) Insufficient pedagogic support, namely the lack of a pedagogic model on how to apply an attractive STEAM learning model; trainings have been carried out by the government regarding this STEAM learning model but are still lacking or not appropriate because the focus of the training is still just theory. (3) administrative challenges, budget, and availability of STEAM content in Indonesia, which shows that the challenge of using the STEAM learning model is resources; with a lack of available budget and adequate content, teachers will have difficulty implementing STEAM learning. (4) teacher skills. To carry out STEAM learning, it is necessary to have teacher skills in good planning and proper time management. Because of its implementation, there are many steps that must be done (Nuragnia et al., 2021).

The STEAM (Science, Technology, Engineering, Art, and Mathematical) learning model in science education can increase the effectiveness of learning and student creativity. Student creativity can increase students' thinking to be more independent and flexible. Creativity in students can be increased through examples and practice, it can also be developed by exploring, observing, reflecting, and asking questions that stimulate students' thinking. In learning science, students not only know but have to understand a

concept; in learning, students do activities that can support them in processing their own knowledge, not just memorizing the material given by the teacher (Zubaidah, 2019).

STEAM in Integrated Science Learning Model Project Based Learning (PjBL) at Madrasah Ibtidaiyah

PjBL learning includes student-centered learning by providing problems that encourage and motivate students to learn concepts or basic knowledge material directly through real-world experience, making learning more memorable and forming students who can think critically and creatively, and allowing students to relate what they learn to reality (Cahyani & Sulastri, 2021). PjBL is a learning strategy that requires students to work on a project to solve existing problems (Juwanti et al., 2020).

While STEAM is a composition that can create scientific thinking patterns in children through comparing, sorting, grouping, and making patterns. So the activities in STEAM learning are integrated with the PjBL model in science learning at Madrasah Ibtidaiyah, which refers to a project-based learning process with a STEAM (Science, Technology, Engineering, and Mathematical) approach (Mufida et al., 2020).

In this study, students made a project to answer the problem of students' difficulties in understanding the generative development of plants in science learning, so that in learning science, students made a "Parts of Flower Board" project so that students were able to dissect and identify the parts of a flower so that they could determine whether it includes perfect or imperfect flowers. With this activity, learning will be more memorable and provide direct experience to students.

Implementation of STEAM in science learning in class V at Madrasah Ibtidaiyah Mumtaza Islamic School, South Tangerang City. With regard to science, students are able to study nature in a fun and natural way because nature contains things that can be seen, studied, and are close to children's lives. So through dissecting and identifying parts of interest to determine whether it is a perfect or imperfect flower in science learning, students have the ability to identify problems, collect data, and provide conclusions that will answer problems.

Technology—the term "technology"—is not only sophisticated equipment in the form of electronic and digital goods, but technology is all kinds of objects made by humans in the form of tools that help in completing tasks or work. In science learning to make parts of flower board projects students use simple technology in the form of scissors, glue sticks, and tape dispensers, which are simple technology. Cutting and gluing activities using scissors, glue sticks, and tape dispensers will develop students' cognitive, because students know the causes and consequences that underlie how these tools can work or be used.

Engineering (engineering) is defined in this context as how students use materials to design, make, and build everything. In science class, to make a parts of flower board project, students make cardboard in the form of a circle and attach flower parts to the cardboard, which of course requires techniques and patterns that have been designed by students.

Art is able to introduce a real and diverse atmosphere that makes the learning atmosphere interesting. Art in this case can be in the form of singing, dancing, drawing, painting, sculpture, literature, drama, and music. Through art, students can develop their imagination and creativity. In the step of decorating a circle containing flower parts in making Parts of Flower Boards, you will see how each student expresses their emotions, ways of thinking, and creativity (Imam & Nur, 2018).

In mathematics, in the activity of making a circle pattern on cardboard with a diameter that has been determined by the teacher, of course students must have the ability to measure the diameter of the circle, so learning mathematics is done in a fun way but can be memorable (Padangsidimpuan, 2022).

CONCLUSION

From the results and discussion of the research above, it can be concluded that STEAM (Science, Technology, Engineering, Arts, and Mathematics) is a breakthrough in education that combines several aspects of science into one cohesive learning idea. Learning with the STEAM approach is active learning. Moreover, learning has entered the 21st century, where learning does not only increase students' knowledge, but emphasizes skills with 4 competencies: critical thinking, creativity, collaboration, and communication. As a result, in the twenty-first century, learning necessitates a method for developing these competencies, one of which is STEAM.The implementation of STEAM-based learning itself must be in accordance with the learning model used so that the desired learning objectives can be achieved. As a result, the STEAM approach is well suited for use in integrated science learning with the PjBL model in this study at the elementary school level.

Therefore, in learning science in Class V, we integrated PjBL, which looks simple but already contains the STEAM component. The STEAM components contained are: (1) science, seen when students identify the flower part; (2) technology, seen in simple technology, namely the scissors used by students; (3) engineering, seen in the students' techniques in making circles and attaching flower parts; (4) art, seen when students decorate their work; and (5) mathematics, seen when students make a circle with a certain diameter.

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