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Empowering Teachers in Implementing the Project to Strengthen Students' Pancasila Profile Using STEAM-based Learning for Optimizing Sustainable Development Goals (SDGs) in Junior High School

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Abstract
Teachers play a crucial role in preparing quality human resources. One Junior High School in Sragen has implemented the Kurikulum Merdeka (Merdeka Curriculum). Based on interviews, teachers are still experiencing challenges in developing learning instruments and implementing the Science, Technology, Engineering, Art, and Mathematics (STEAM) model and the Project to Strengthen Students' Pancasila Profile. This community service team, Research Group Innovation in Science Classroom (ISC) provided training for teachers on the implementation of STEAM in the Merdeka Curriculum. The training included planning, implementation, mentoring, evaluation, and reporting. This Community Service Program has improved teachers' skills in implementing the Merdeka Curriculum and supporting the Sustainable Development Goals.
Keywords: Merdeka curriculum, STEAM approach, sustainable development.

INTRODUCTION

Sustainable Development Goals (SDGs) can be achieved through high-quality education. Thus, ensuring equal access to quality education for all is important. Education has a significant impact on increasing human resources as it influences a country's overall growth, productivity, and public welfare. Education improves understanding and prepares individuals to anticipate change. It also fosters talents and skills that align with the character and values of the nation. The objectives of the Indonesian Education System are to build citizens who are "faithful to the Almighty, virtuous, healthy, conscious, independent, democratic, and responsible."

Teachers play an important role in achieving those goals. One of the Junior High Schools (JHS) in Plupuh, Sragen, has been implementing the Merdeka Curriculum. However, many problems and obstacles are faced when implementing the Merdeka Curriculum. Based on interviews, teachers are still experiencing difficulties in preparing and implementing teaching instruments that align with the Merdeka Curriculum. Teachers also face challenges in implementing the Science, Technology, Engineering, Art, and Mathematics (STEAM) learning model, as well as the evaluation of the Project to Strengthen Students' Pancasila Profile. These conditions underscore the need for proper training to improve teachers' skills in implementing the Merdeka Curriculum, STEAM, and the Project to Strengthen Students' Pancasila Profile.

The partner school is located in Sragen Regency, Central Java, about 17 km from the Sebelas Maret University campus in Surakarta. It has 30 teachers and 577 students spread out into 19 classes (seven classes for seventh graders, six classes for eighth graders, and six classes for ninth graders). All the teachers are government employees with varying lengths of service time.

The learning process is an activity aimed at educating students. Managing learning is one of the roles played by a teacher in the learning process, namely to create optimal learning conditions and

neutralize disturbances. Teachers not only transfer knowledge to students but must also manage the students' conditions. As stated by Juhji (2016), a teacher needs to implement various methods and approaches to stimulate students to play an active role and explore their potential. The results of Probosari, Utami, Widyastuti's research (2019) show that some teachers have not been able to integrate several fields of science in an integrated manner and how to evaluate them.

Teachers' roles in learning include 1). Planning, preparing teaching and learning objectives, and preparing learning instruments. 2). Organizing and connecting or combining all sources to reach the objectives. 3). Leading and motivating participants. 4). Supervising students during the learning process. Teachers are the main motivators and are responsible for managing learning components by creating proper and systematic learning management to achieve the goals. Kamaludin et al. (2019) stated that effective management in learning is the key to utilizing various resources to achieve learning effectively and efficiently. Saputro (2016) stated that proper management demands proper knowledge and skills from teachers. Teachers need to prepare facilities and infrastructure to support quality learning. Teachers must prepare lesson plans, compile student worksheets, create learning media, and compile assessments.

Improving students' skills requires proper learning. Proper learning needs skillful teachers. Indonesian teachers also need to develop students' Pancasila Profiles. Teachers must master various innovative teaching models and approaches to improve their teaching practices. Based on interviews with teachers, teachers still have difficulty in preparing learning tools that apply the STEAM (Science, Technology, Engineering, Art, and Mathematics) approach. Teachers still have difficulty connecting learning topics with daily life using the STEAM approach, which supports the SDGs. Sustainable Development Goals (SDGs) are a global and national commitment to public welfare. The SDGs covers 17 objectives, as dictated by the UN General Secretary in September 2015. The seventeen goals are : 1). No Poverty, 2). No Hunger, 3).Life Healthy and Prosperous, 4). Education Quality, 5). Gender Equality, 6). Clean Water and Adequate Sanitation, 7). Clean and Affordable Energy, 8). Decent Work and Economic Growth, 9). Industry, Innovation, and Infrastructure, 10). Reducing Inequality, 11). Sustainable Cities and Settlements. 12). Responsible Consumption and Production, 13). Handling Climate Change, 14). Ocean Ecosystem, 15). Land Ecosystem, 16). Peace, Justice, and Strong Institutions, 17). Partnership to Achieve Goals (https://sdgs.bappenas.go.id/)

Implementing learning with a STEAM approach can train students to apply their knowledge in solving various problems found in life (Atiaturrahmaniah, Aryana, Suastra, 2022). STEAM combines "arts" with STEM learning to improve students' engagement, creativity, innovation, problem-solving skills, and other cognitive skills (Liao, 2016). STEAM also improves students' teamwork, communication, and adaptability necessary for career and economic advancement (Colucci-Gray et al., 2017). The STEAM learning approach allows students to expand their knowledge and develop the skills needed to thrive in the 21st century—such as communication, critical thinking, leadership, teamwork, creativity, and resilience. STEAM was initiated by the Rhode Island School of Design. STEAM added "arts" to the STEM framework. STEAM aims to foster thriving innovation by combining the mind of a scientist or technologist with that of an artist or designer. The addition of "arts" to the STEM framework is important because it emphasizes practices such as modeling, developing explanations, and generating criticism and evaluation—practices that are also emphasized in mathematics and science education. Art, in this case, is not just coloring or scribbling on paper with crayons or paint but shows non-analytical and creative thinking. Creativity helps in solving problems "outside the box." Everything from typical art, music, and dance to "new" art, such as 3D printing, falls into the category of art (Perignat & Katz-Buonincontro, 2018).

Various studies show that art supports creativity and innovation. STEM on its own is not enough; it must be combined with "arts" to become STEAM. The combination of STEM with the arts (STEAM) can provide opportunities to drive innovation. The arts enrich interdisciplinary learning and engage students in ways that traditional pedagogy does not. Excluding "A" from STEAM means excluding some students. Art can be seen as a way in which students can reflect on, create, express, and represent ideas; as an alternative to reading, writing, speaking, and listening. STEAM empowers teachers to use engaging, project-based learning. STEAM makes learning inclusive, where all students can be actively involved and contribute. In contrast to traditional teaching, the STEAM framework unites knowledge and increases synergy dynamics between process modeling, math, and science content.

The STEAM approach provides the opportunity for holistic learning. Even if students do not choose a career in STEAM fields, the skills gained from STEAM learning can be transferred into almost

any field. STEM/STEAM learning will prepare students for the rest of their lives, regardless of the profession they choose in the future. STEM/STEAM teaches students critical thinking and problem-solving skills that can be used throughout life. Empirical research has shown that art in learning can improve students' creativity, critical thinking, innovation, collaboration, and interpersonal communication skills (NAEA, 2016). Art in learning can also improve cognitive skills such as spatial reasoning, abstract thinking, divergent thinking, self-creativity, openness to experience, and curiosity (Swaminathan & Schellenberg, 2015). Various studies have even linked Nobel laureates to artistic endeavors such as photography, music, performing arts, visual arts, crafts such as carpentry, and creative writing. Non-art educators have struggled with various strategies for introducing the arts to enhance student creativity and innovative thinking in STEM curricula (Rabkin & Hedberg, 2011).

Despite the emergence of STEAM as a popular pedagogical approach, the definitions and goals of STEAM remain diverse (Perignat & Katz-Buonincontro, 2018). STEAM is explained using various methods, and at least four types of disciplinary integration: transdisciplinary, interdisciplinary, multidisciplinary, and cross-disciplinary (Marshall, 2014). STEAM as transdisciplinary includes the integration of various scientific disciplines and learning rooted in issues of authenticity or inquiry (Quigley et al., 2017). STEAM as interdisciplinary combines several scientific disciplines under a common theme, but each scientific discipline remains separate (Thuneberg, Salmi, & Fenyvesi, 2017). STEAM as multidisciplinary includes collaboration between two or more scientific disciplines but does not combine them (Payton, White, & Mullins, 2017). Lastly, STEAM is cross-disciplinary, focusing on observation in one discipline through the perspective of other disciplines, for example, the physics of music (Gates, 2017).

Interviews with teachers revealed that: a) Teachers have difficulty compiling lesson plans that implement the STEAM approach. b) Teachers have difficulty to evaluate STEAM-based learning.

METHOD

This Community Service Program of Innovation In Science Classroom (ISC), Universitas Sebelas Maret, Surakarta, Central Java, Indonesia, was implemented in June 2024 as follows: 1). Socialization and provision of materials regarding the preparation of STEM-based teaching modules. At the meeting, teachers learned about learning management and how to manage classes using a learning approach that suits the characteristics of topics with a STEAM approach, 2). Training, mentoring, and empowering teachers as creators of STEAM-based learning: compiling teaching modules and lesson plans using a STEAM approach based on SDGs, 3). Evaluation of activities. This stage was done to evaluate and analyze the teaching modules, as well as the difficulties and successes in implementing STEAM-based learning in the classroom.

RESULTS AND DISCUSSION

After this Community Service Program, the teachers are expected to implement proper learning using the STEAM approach. The STEAM approach is used in implementing the Project to Strengthen Students' Pancasila Profile. Teachers are also expected to have insight into how technology can be used for education. The STEAM approach is intended to strengthen awareness of the importance of technology in supporting innovation and more interactive learning.

Teachers can apply the Project to Strengthen Students' Pancasila Profile by applying the local wisdom to lesson materials. For example, they can describe the batik manufacturing process, observe historical objects, make gamelan musical instruments according to local culture, or manage sustainable waste. Students can also be tasked with producing products from materials around them. For example, making light ornaments from bottles. Students can work together to observe natural sweeteners in food during the folk festival in Sragen. They can also observe traditional food processing from tubers, nuts, and cereals.

This Community Service Program is intended to develop teachers' competency through various training and resource support. Through this program, teachers are expected to become project creators who can integrate the STEAM approach with the values of Pancasila. The Pancasila values, which include cooperation, creativity, critical thinking, independence, noble character, and global diversity, are the main basis for every project designed. These projects aim to strengthen students' character and

skills so that they not only develop in cognitive aspects but also in psychomotor and affective aspects (Irawati et al., 2022).

Empowering teachers as facilitators of the STEAM approach is critical to cultivating students equipped with essential 21st-century skills. The STEAM approach is interdisciplinary, offering a dynamic framework that encourages critical thinking, problem-solving, and creativity (Guevara & Valdivia, 2023). The STEAM approach has the potential to foster creativity and innovation in the educational teaching and learning process for sustainable national development (Ogunlade, 2023). Increasing teacher professional development through STEAM ensures that they always follow the latest trends and innovations in their respective fields. Effective teacher training methods are designed to increase teacher competency and readiness in implementing SDGs (Shayan et al., 2022). These methods not only provide necessary knowledge and skills but also build a network of professional support. This allows educators to share best practices and resources and meet challenges that arise in complex interdisciplinary teaching. By fostering creativity and innovation among teachers, educational institutions can foster a culture of continuous improvement and experimentation, ultimately leading to improved student learning outcomes.

Empowering teachers to implement the STEAM approach effectively is critical to optimizing student learning outcomes and ultimately contributing to achieving the SDGs. The STEAM approach integrates the SDGs' goals for achieving sustainable development. For example, designed projects can contribute to the achievement of quality education (SDG 4) through inclusive and effective learning methods. Projects can also support gender equality (SDG 5) by ensuring equal participation of male and female students in various activities. Furthermore, projects related to the environment and technology can encourage action to address climate change (SDG 13), educate students about the importance of protecting the environment, and develop innovative solutions to environmental problems (Namdev & Prajapati, 2024).

Research on the impact of integrating STEAM and SDGs on student learning outcomes has shown significant potential benefits (Hsiao & Su, 2021). Some investigations have revealed that implementing the STEAM-SDGs approach can influence several important aspects of education. Specifically, students' learning outcomes demonstrate increases in content knowledge, the development of critical thinking skills that support complex problem-solving, and more positive attitudes toward sustainability and social responsibility. Research by Hsiao and Su (2021) highlights how this integration not only enriches students' academic understanding. Integrating STEAM-SDGs approach also encourages students to adopt a more proactive attitude toward global issues and enhances their ability to contribute constructively to society and the environment. These findings demonstrate that integrating SDGs into the STEAM curriculum support the holistic development of students.

The integration of the Project to Strengthen Student's Pancasila Profile into the school curriculum will further enhance holistic student development by instilling core national values. These values include diversity and moral principles, which function as the basic foundation for 21st-century education (Maulida, 2023). The implementation of the Project to Strengthen Student Pancasila Profile includes integrating the basic principles of Pancasila into the school curriculum. Training teachers on how to integrate Pancasila values into STEAM-based learning is essential in fostering a sense of national identity and cultural awareness among students. By prioritizing values such as tolerance, respect, and diversity, teachers can create a more inclusive and harmonious learning environment for students from various backgrounds (Irawati et al., 2022). Furthermore, Starkie et al. (2022) highlight the importance of ensuring that STEAM-SDG initiatives are inclusive and accessible. STEAM-SDGs initiative should be available for all students, regardless of their background or abilities. This includes addressing gaps in access to resources, opportunities, and representation in STEAM fields. Inclusive STEM education can contribute to achieving SDG4—just and quality education for sustainable development, sustainable lifestyles, and social equality (Nguyen et al., 2020).

The integration of technology in education is very important for enriching the learning experience (Yakub et al., 2020). The use of digital tools in the teacher training process not only provides access to a wider range of resources but also facilitates more effective collaboration. Digital technology offers a platform that supports the exchange of information and ideas and allows teachers to collaborate in designing and implementing innovative STEAM teaching methods (Maiyah et al., 2024). Through these tools, teachers can utilize a variety of digital resources, such as interactive learning modules, instructional videos, and discussion forums. All of these contribute to the development of deep

understanding and more effective teaching skills. Therefore, technology integration not only enriches teachers' learning experiences but also improves the quality of STEAM teaching by facilitating access to tools and resources that support better pedagogical practices.

Achieving the SDGs through the STEAM-based Project to Strengthen Student Pancasila Profile requires joint efforts to align the project with the overarching SDGs principles. By incorporating themes such as environmental sustainability, social justice, and economic development into the curriculum, teachers can promote a more holistic approach to education. Additionally, empowering students to become active global citizens through the integration of STEAM, Pancasila values, and SDGs can have broad implications for the future. By instilling a sense of social responsibility and community involvement in students, schools can play an important role in forming future leaders and innovators.

CONCLUSION

After attending training teachers' skills in preparing device learning in the Merdeka curriculum and supporting Sustainable Development Goals (SDGs) can be increased. Similar community service activities should be planned and implemented in other schools so that they can carry out STEAM-based Project to Strengthen Students' Pancasila Profile activities in achieving Sustainable Development Goals (SDGs).

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