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Strengthening Sciencitic Literacy Through STEM Learning in Elementary Schools: Community Service Efforts in Rural Areas

Tomi Apra Santosa^{1*}, Mohammad Edy Nurtamam², Sukini³, Ilwandri⁴, Andi Sri Wahyuni Wulandari⁵, Sanju Aprilisia⁶, Elismayanti Rembe⁷, Insira Insani Fitri⁸

^{1,4,8}Akademi Teknik Adikarya, Indonesia

²Universitas Trunojoyo Madura, Indonesia

³ Universitas Widya Dharma Klaten, Indonesia

⁵Universitas Muslim Indonesia, Indonesia

⁶Universitas Terbuka, Indonesia

⁷STAIN Mandailing Natal, Indonesia

Email:santosa2021@yahoo.com^{1*}

Abstrak

Keterampilan literasi sains yang kuat merupakan pondasi penting bagi generasi muda. Penelitian ini bertujuan untuk mengkaji bagaimana pembelajaran STEM (Science, Technology, Engineering, Mathematics) dapat digunakan untuk meningkatkan literasi sains pada siswa sekolah dasar, khususnya di daerah pedesaan. Penelitian ini menggunakan pendekatan pengabdian masyarakat. Kegiatan pengabdian masyarakat ini melibatkan pelaksanaan program pembelajaran STEM yang dirancang khusus untuk siswa sekolah dasar di daerah pedesaan. Program ini memadukan aktivitas belajar berbasis sains, teknologi, rekayasa, dan matematika secara terintegrasi. Hasil dari penelitian ini yaitu pembelajaran STEM dalam meningkatkan literasi sains siswa sekolah dasar di daerah pedesaan. Temuan dari penelitian ini dapat memberikan kontribusi bagi pengembangan praktik pembelajaran yang lebih inovatif dan efektif untuk meningkatkan literasi sains siswa, khususnya di daerah pedesaan. Penelitian ini juga diharapkan dapat mendorong sinergi antara akademisi dan masyarakat dalam upaya peningkatan kualitas pendidikan sains di daerah pedesaan.

Kata Kunci: *Literasi Sains; STEM; Pembelajaran Inovatif*

Abstract

Strong science literacy skills are an important foundation for the younger generation. This study aims to examine how STEM (Science, Technology, Engineering, Mathematics) learning can be used to improve science literacy in elementary school students, especially in rural areas. This research uses a community service approach. This community service activity involves the implementation of STEM learning programs designed specifically for elementary school students in rural areas. This program integrates science, technology, engineering, and mathematics-based learning activities. The result of this study is STEM learning in improving the science literacy of elementary school students in rural areas. The findings of this study can contribute to the development of more innovative and effective learning practices to improve students' science literacy, especially in rural areas. This research is also expected to encourage synergy between academics and the community in an effort to improve the quality of science education in rural areas.

Keywords: *Science Literacy; STEM; Innovative Learning*

INTRODUCTION

Strong science literacy is very important for the younger generation in facing the development of science and technology. In the ever-evolving digital era, science and technology information is increasingly abundant and complex (Fives et al., 2014). Therefore, the younger generation needs to have the ability to understand and evaluate the information well. Strong science literacy helps them in building their analytical, synthesis, and evaluation skills, so they can make wise and fact-based decisions in the face of global challenges. Strong science literacy also helps the younger generation in developing critical and creative thinking skills (Gormally et al., 2012; Kelley et al., 2020). By understanding the concepts of science and technology, they can find innovative and effective solutions to social and environmental problems. In addition, strong science literacy also helps them in building awareness and concern for global issues, such as climate change, health, and security. Thus, the young generation can be part of the solutions and positive changes that occur in society, as well as become insightful and sustainable leaders in the future. (Cavagnetto, 2010)

Science literacy in primary school students in Indonesia, especially in rural areas, still faces significant challenges. The analysis of science literacy skills in elementary school students shows that the average percentage achievement in aspects of science content, process, and context is still low. The results of the study show that students still lack understanding of the material and have a low mastery of concepts, so they are not fully able to apply science knowledge in real life (Wahyu et al., 2020). This condition is caused by the lack of supporting facilities in the science learning process and the lack of students' ability to solve complex types of problems. Therefore, this study suggests that teachers should pay more attention to improving students' science literacy skills, especially through the use of more interactive and problem-based learning methods. Thus, students can more effectively understand and apply science knowledge in daily life. Therefore, students must now be connected with learning related to technology (Fives et al., 2014).

STEM (Science, Technology, Engineering, Mathematics) learning is an integrated learning approach that focuses on developing students' abilities in understanding and applying science, technology, engineering, and mathematics concepts (Aldemir & Kermani, 2017; Knezek et al., 2013; Zulyusri et al., 2023). In this approach, students are taught to think critically and creatively in solving complex problems, as well as to develop analytical, synthetic, and evaluation abilities. STEM learning also helps students develop systematic and data-driven thinking skills, as well as increase awareness and concern for global issues such as the environment and technology. The STEM learning approach also helps improve students' ability to apply science and technology knowledge in daily life (Hughes et al., 2022). In this approach, students are taught to apply science and technology concepts in projects relevant to daily life, such as the design and development of products, systems, and processes. Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems (Wahyu et al., 2020).

STEM (Science, Technology, Engineering, Mathematics) learning has great potential in improving the science literacy of elementary school students. (Kelley et al., 2020) In this approach, students are taught to think critically and creatively in solving complex problems, as well as to develop analytical, synthetic, and evaluation abilities. Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems (So et al., 2022; Sung & Huang, 2024). STEM learning also helps to increase students' awareness and concern for global issues such as the environment and technology. In this approach, students are taught to apply science and technology concepts in projects relevant to daily life, such as the design and development of products, systems, and processes (Zulkifli et al., 2022). Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems.

METHODS

This research method focuses on improving science literacy through a STEM (Science, Technology, Engineering, Mathematics) approach in elementary schools. This study uses a community approach to increase the participation of students and teachers in the science learning process. In this study, teachers and students work together on projects relevant to daily life, such as the design and development of products, systems, and processes. Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems.

RESULT AND DISCUSSION

STEM learning programs designed specifically for elementary school students in rural areas bring innovation in science learning. The integrated application of science, technology, engineering, and mathematics-based learning provides an interesting and interactive learning experience for students. Science experiments, technology simulations, simple engineering activities, and science-related math problem-solving encourage students to be actively involved in the learning process and increase their curiosity (Aldemir & Kermani, 2017). STEM learning programs not only focus on mastering science knowledge, but also encourage the development of students' critical thinking skills and creativity. Through a variety of STEM activities and projects, students are trained to analyze problems, find innovative solutions, and think critically in the context of science. This approach helps students develop problem-solving skills, think logically, and generate creative ideas that are useful in everyday life.

STEM learning programs have proven to be effective in improving science literacy and understanding of science concepts among elementary school students in rural areas. The evaluations showed a significant improvement in science literacy test scores, showing that students who participated in STEM programs had a better understanding of science concepts and were able to apply that knowledge in real-life situations (Sheng et al., 2023). STEM learning programs are designed with limited resources in rural areas in mind. The program makes use of natural resources and simple technology that are easily accessible and operated by students. This allows students to learn science effectively without being hampered by the limitations of infrastructure and equipment (Chung-Ho Su, 2019). STEM learning activities encourage students to work together in teams and improve communication between students. Through collaboration in projects and experiments, students learn to collaborate, share ideas, and help each other in completing tasks. This helps students develop effective communication skills and build a solid sense of cooperation (Ichsan et al., 2023).

Furthermore, STEM (Science, Technology, Engineering, Mathematics) learning has a significant impact on students' science literacy. In this approach, students are taught to think critically and creatively in solving complex problems, as well as to develop analytical, synthetic, and evaluation abilities. Thus, students can more effectively understand and apply science and technology knowledge in daily life (Şimşek et al., 2023). STEM learning also helps to increase students' awareness and concern for global issues such as the environment and technology. In this approach, students are taught to apply science and technology concepts in projects relevant to daily life, such as the design and development of products, systems, and processes. Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems.



Figure 1. STEM learning in students

STEM learning also helps improve students' ability to analyze and solve complex problems. In this approach, students are taught to think systematically and data-driven, as well as to develop critical and creative thinking skills. Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems (Aldemir & Kermani, 2017; Holik & Sanda, 2023). STEM learning also helps improve students' ability to apply science and technology knowledge in daily life. In this approach, students are taught to apply science and technology concepts in projects relevant to daily life, such as the design and development of products, systems, and processes. Thus, students can more effectively understand and apply science and technology knowledge in daily life, as well as improve their ability to develop innovative and effective solutions to social and environmental problems. The STEM learning process can be seen in the picture.

SIMPULAN

From the results of this study, it can be concluded that this research is STEM learning in improving the science literacy of elementary school students in rural areas. The findings of this study can contribute to the development of more innovative and effective learning practices to improve students' science literacy, especially in rural areas. This research is also expected to encourage synergy between academics and the community in an effort to improve the quality of science education in rural areas. . By using a community-based and project-based approach, students can more effectively understand and apply science and technology knowledge in daily life. The results of this study show that STEM approaches can improve students' ability to analyze, synthesize, and evaluate, as well as increase students' awareness and concern for global issues such as the environment and technology. Therefore, the STEM approach can be an effective strategy in improving the science literacy of elementary school students in rural areas.

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