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Advancing Science Education Potential: A Community Outreach Initiative for Teachers at SD Negeri 173637 Narumonda

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ABSTRACT

In the realm of education, one of the challenges encountered is the limited ability of teachers to utilize science laboratory equipment and create engaging visualizations for classroom learning. This issue adversely affects students' mastery of science concepts. To address this problem, teachers need to use teaching media as aids in the learning process, which is expected to improve student learning outcomes significantly. One proposed medium is using science teaching aids and the Biorender application, which play a critical role in helping students understand the concepts being taught. Students are expected to comprehend the material more efficiently by using teaching aids and modules, reinforcing conceptual mastery, developing skills, and increasing their learning interests. The methods used in this activity included lectures and practical tutorials, where teachers were introduced to the use of science teaching aids and the application of Biorender to create engaging visualizations for classroom teaching. After participating in this activity, SD Negeri 173637 Narumonda teachers gained additional knowledge. They acquired new skills in using science teaching aids and the Biorender application. This enables them to implement more engaging and effective teaching techniques in science lessons, improving students' understanding and interest in learning.

Keyword: Science Kit, Biorender Application, Science Practice Module

1. Introduction

Natural Sciences is a cornerstone of human understanding, rooted in systematically organized knowledge derived from observation and experimentation. This discipline offers universally applicable insights, providing a robust world exploration framework. Depdiknas [1] highlights that Natural Sciences is both an accumulation of data and a dynamic process aimed at comprehending the natural laws that govern all aspects of existence. The essence of science extends beyond mere knowledge accumulation. It is a process—a series of structured steps employed by scientists to uncover and explain the mysteries of nature. Bramasti [2] emphasizes that science delves into studying natural objects through consistent and universal principles applicable across time and space. This investigative journey enables humanity to demystify once incomprehensible phenomena. Science opens a window into understanding our environment. Natural Sciences is far more than a repository of facts; it represents a way of thinking and engaging with the natural world. By combining knowledge and process, science offers tools for understanding the intricacies of existence while inspiring awe at the marvels of the universe. Through this lens, science educates and deepens our connection with the world around us.

Natural Sciences is inherently linked to experimentation, offering students a hands-on approach to understanding the natural world. However, the field extends beyond experiments to include concepts derived from human observations and reasoning about natural phenomena. This dual approach underscores the importance of practical teaching aids in science education, providing a tangible bridge between abstract theories and real-world understanding [3, 4]. To teach science effectively, educators must implement strategies that streamline learning and captivate students' interest. Roestiyah highlights the importance of mastering presentation techniques, including using applications that make science lessons more appealing and accessible. These strategies ensure that students can efficiently grasp scientific concepts and achieve learning goals [5]. The role of teaching aids, particularly in today's era of rapid scientific and technological advancements, cannot be overstated. As Irfan emphasizes, media tools are critical teaching aids that support educators in delivering complex material. Their use in science education is precious in simplifying abstract concepts and engaging students more effectively [6]. Practical teaching aids are pivotal in science education by helping students visualize and understand scientific concepts. Wahyudi and Gunada argue that such tools are instrumental in clarifying lessons, strengthening students' conceptual mastery, and fostering skill development. When integrated into science teaching, these aids transform lessons into interactive and meaningful learning experiences [7, 8]. Creating an engaging and effective science learning environment requires seamlessly integrating various elements: hands-on experiments, teaching aids, captivating applications, and strategic methodologies. By combining these components, educators can craft interactive lessons that deepen students' understanding of science and inspire a lasting appreciation for the subject [9]. Wiyatmo notes that such approaches foster an ideal learning atmosphere, encouraging students to explore and internalize scientific knowledge enthusiastically [3, 10].

2. Implementation Method

2.1. Applying science modules and drawing application

Implementing learning media involves using science practicum modules, science KIT tools, and the Biorender application to enhance students' visualization in science lessons, making the learning process more engaging, as shown in Figure 1 below.



Figure 1. Science Learning Media

2.2. Community Service Location

This community service activity was conducted at the partner institution, SD Negeri 173637 Narumonda, located in Siantar Narumonda District, Toba Samosir Regency, North Sumatra Province, which is 216 km away from the capital city of Medan, as shown in Figure 2.

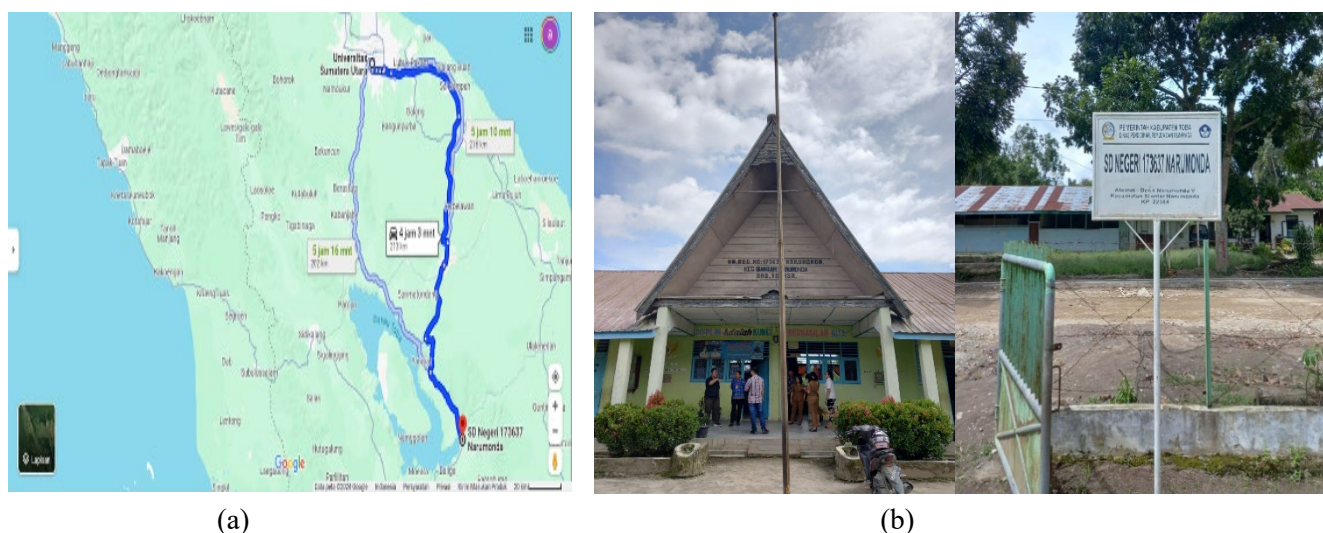


Figure 2. (a) G-map Location of the partner institution from Medan; (b) SD Negeri 173637

2.3. Technical implementation for the teacher

The implementation methods for the community service activity at SD Negeri 173637 Narumonda are as follows:

1. **Lecture Method:** This method was used to deliver material through PowerPoint slide presentations.
2. **Question-and-Answer Method:** This approach was employed to gauge participants' understanding of the material presented by the team.
3. **Discussion Method:** Facilitators and participants engaged in dialogue to address challenges encountered in conducting science practices in the classroom.
4. **Simulation and Practice Method:** This method taught the teachers how to use the BioRender application and science teaching aids effectively.
5. **Monitoring and Evaluation:** The team monitored and evaluated the outcomes of the practice sessions using the BioRender application and science teaching aids.

3. Results and Discussion

In line with the outreach program and the use of the BioRender application, the community service team conducted a satisfaction survey among teachers at SD Negeri 173637 after the hands-on practice session held on October 1, 2024—the study aimed to gain insights into the knowledge participants acquired during the activity. Based on observations, discussions, and interviews with randomly selected participants, it was found that the program was highly beneficial. Participants reported finding it easier to understand and use simple science teaching aids. They expressed confidence in conducting brief surveys to follow up on their proficiency in using BioRender to create engaging visual materials for classroom learning (Figure 3). The science teaching aids provided by the community service team played a crucial role in the learning process. These tools helped clarify the concepts being taught, making it easier for students to grasp the material presented by their teachers. In addition, using teaching aids strengthened the understanding of the subject matter and supported the development of students' skills. However, some teachers faced challenges in mastering the BioRender application. This difficulty stemmed from their unfamiliarity with the latest technology, including navigating the application registration process and dealing with the English language used within the app. Survey results revealed that about 80% of teachers understood using BioRender. On the other hand, some teachers expressed a lack of understanding of both the application and the teaching aids. These challenges were primarily due to their limited experience with science teaching tools and visual applications in educational activities. Many teachers were more accustomed to traditional methods, such as lectures and question-and-answer sessions, for classroom instruction. Therefore, the initiatives undertaken by the community service team were precious for the teachers at SD Negeri 173637 Narumonda. The program helped them improve their teaching methods, making learning more interactive and engaging for their students.



(a)



(b)

Figure 3. (a) Photo session with the headmaster and the teachers; (b) sharing the teaching kit and bio renders application to teachers

4. Conclusion

This community service activity demonstrated the potential of innovative educational tools to transform the teaching and learning process. Throughout the program, teachers were introduced to the BioRender application and simple science teaching aids, which proved to be highly effective in enhancing classroom instruction. Participants expressed great enthusiasm for the material based on observations during the sessions, including interactive discussions and question-and-answer activities. They discovered new ways to present complex science concepts more clearly and engagingly, making learning more manageable, effective, and enjoyable. The program had a notable impact on the participants. Teachers who previously relied on traditional lecture methods began to explore and appreciate the value of interactive and visual teaching aids. Using BioRender allowed them to create visually appealing and informative materials that could captivate students' attention. At the same time, the simple science teaching aids enabled hands-on learning experiences. These changes contributed to a more dynamic classroom environment where students could better understand and retain the material being taught. In conclusion, the program equipped teachers with new skills and knowledge and laid the groundwork for a more innovative and interactive teaching culture.

5. Conflict of interest

The authors declare there are no conflicts of interest

6. Acknowledgements

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