



Technology-Based Interactive Mathematics Learning: A Case Study of Community Service Activities at SMA PGRI Cicalengka

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Abstract

This community service activity was conducted through collaboration between the Mathematics Study Program of the Republic of Indonesia National University and SMA PGRI Cicalengka, involving 80 participants consisting of 12th-grade students. The one-day program aimed to enhance students' understanding of mathematics applications in science and technology (IPTEK), including programming algorithm simulations, through interactive lectures. The sessions focused on developing logical thinking, strategic problem-solving skills, and awareness of mathematics' role in daily life. The event began with an opening ceremony attended by school representatives, faculty members, and university officials. Two main sessions were delivered: the first covered practical applications of mathematics in everyday contexts, while the second highlighted its role in advancing IPTEK through online gaming. Active participation was observed during Q&A sessions. The program concluded with a satisfaction survey, with results analyzed and published as part of the activity's outcomes. Overall, this initiative successfully introduced students to the interdisciplinary relevance of mathematics while fostering engagement through interactive learning. Follow-up evaluations will assess its impact on strengthening students' appreciation of mathematics in technological and real-world applications.

Keywords: Community service, mathematics education, science and technology.

1. Introduction

Sustainable Development Goals (SDGs) represent the continuation and refinement of the Millennium Development Goals (MDGs), with a more comprehensive scope that integrates environmental sustainability and social inclusion (Sachs, 2012; Griggs et al., 2013). While the MDGs consisted of only 8 Goals and 21 Targets, primarily focused on reducing extreme poverty, the SDGs offer 17 Goals and 169 Targets designed to address systemic challenges such as inequality, climate change, and ecosystem degradation through transformative and inclusive approaches (United Nations, 2015; Panuluh & Fitri, 2015).

In this context, science and technology (IPTEK) serve as crucial catalysts for achieving the SDGs, particularly through digital transformation aligned with the Fourth Industrial Revolution and region-specific innovations (UN ESCAP, 2022). Generation Z (born 1995–2012), as digital natives (Prensky, 2020), holds significant potential to drive S&T innovation (Fridayani et al., 2022; Herawati et al., 2022). However, excessive passive engagement with digital devices may impair their critical thinking skills (Twenge et al., 2019), posing a challenge to their role in future problem-solving.

A strong foundation in mathematical concepts is essential for (IPTEK) development, as computational thinking a core competency for algorithm design relies on mathematical logic (Wing, 2006). Yet, many students perceive mathematics as abstract and irrelevant (Aguilar, 2021), a perception exacerbated by the lack of hands-on experience with mathematics-based software (Viberg et al., 2020). Pedagogical strategies that emphasize real-world applications, such as mathematical mindset approaches, could bridge this gap and demonstrate mathematics' role in achieving SDGs (Yadav, 2021).

Community Service Activities (PKM), as part of the Tri Dharma of Higher Education, provide a framework for universities to contribute to society through SDG-oriented initiatives (UNESCO, 2021). By identifying community needs especially among mathematics-dependent sectors academic programs can align PKM with their expertise, fostering sustainable development through education.

2. Materials and Methods

2.1. Materials

The object of this study was students of Senior High School (SMA) PGRI Cicalengka, consisting of 80 students from various majors.

2.2. Methods

This community service activity was carried out through collaboration between the Mathematics Study Program of the Republic of Indonesia National University and SMA PGRI Cicalengka. The event took place over one day at SMA PGRI Cicalengka, targeting 12th-grade students.

The activity aimed to equip students with knowledge on the application of mathematics in science and technology (IPTEK), including mathematical applications and programming algorithm simulations. To achieve this, the event used a lecture-based method, helping students develop logical thinking, strategic formulation, effective solution evaluation, and an understanding of mathematics' role in daily life.

3. Results and Discussion

The event began with an opening ceremony attended by all 12th-grade students of SMA PGRI Cicalengka, the school committee chair, guidance counselors, and the organizing committee (including lecturers and mathematics students). Additionally, the Dean of the Faculty of Mathematics and Natural Sciences at the Republic of Indonesia National University and the Director of Community Service were present.



Figure 1: Opening Ceremony

The first session, led by Mr. Abdul Gazir, a mathematics lecturer, covered the application of mathematics in daily life, followed by a Q&A moderated by two students.



Figure 2: Delivery of Topic 1



Figure 3: Q&A on Topic 1

The second session, delivered by Mr. Tubagus, discussed the role of mathematics in advancing science and technology (IPTEK) through online gaming applications. All participants actively engaged in both sessions.



Figure 4: Delivery of Topic 1



Figure 5: Q&A on Topic 2

The event concluded with a satisfaction survey and questionnaire distributed to students and school representatives. The results were analyzed and published as an output of the community service initiative.



Figure 6: Completing the Questionnaire

Figure 6 shows the atmosphere inside a classroom being used for a questionnaire activity. The participants, who appear to be students in scout uniforms, are seated at their desks with papers and writing instruments in hand, indicating that they are seriously answering the questionnaire.

Overall, this image represents a participatory moment in data collection, possibly as part of a research activity, educational survey, or program evaluation. The activity also highlights active engagement between the facilitators and the participants.



Figure 7: Closing Ceremony and Group Photo

Figure 7 depicts a presentation or socialization activity taking place in a classroom or school hall. A speaker is seen standing at the front of the room, delivering material to participants who are seated neatly and facing forward. The atmosphere is educational and interactive, where students are gaining new knowledge through the speaker's presentation. This activity could be part of a community service program, training session, seminar, or workshop involving the active role of external parties within the school environment.

4. Conclusion

This community service initiative was a collaborative effort between the Mathematics Study Program of the Republic of Indonesia National University and SMA PGRI Cicalengka, involving 85 students and teachers. The goal was to introduce the role of mathematics in science and technology (IPTEK), including programming algorithm simulations, using an interactive lecture method.

The event featured presentations on the application of mathematics in daily life and its significance in online gaming, with active participation from attendees. A follow-up evaluation through questionnaires will assess the program's effectiveness in enhancing students' understanding of mathematics' importance.

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