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THE TRAINING OF PHYSICS OLYMPIAD FOR STUDENTS AT SMAIT AL-AULIYA BALIKPAPAN

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ABSTRACT

The Capital City of Indonesia will be moved from Jakarta to Penajam Paser Utara, East Kalimantan. Balikpapan, as the nearest big city from Penajam Paser Utara, has a huge potential in the development of science and technology in the future. However, achieving greater potential requires dedication, effort and hard work. Through this community service activity, it is expected that the enthusiasm of the young generation, especially high school students, related to the world of science (Physics) will increase. In this activity, the community engagement team provides a training regarding problem solving to physics olympaid question. Lecturing (material enrichment) and group discussion (answering examples of Physics Olympiad questions) methods were used in this activity. The result shows that the students' ability in problem solving skill increased. It can be seen from the pre-test and post-test scores. Furthermore, one of the trained students won the competition in city level, Balikpapan City, and had a chance to join the competition in province level. Based on the result, Balikpapan's young generation has an enermous potential to develop science and technology. Hopefully, in the future this activity can be held in a wider and sustainable scope.

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Keywords: Physics, Olympiad, Balikpapan, Science.

INTRODUCTION

Science plays an important role in the development of a civilization. In the developing countries, science is no longer used as a benchmark for success. It makes the developing countries face difficulties to grow and become to developed countries. In Indonesia, particularly in East Kalimantan, students show minimal enthuasiasm for science. It can be seen from the low participation of students in science competitions and enrollment of students in science class. Based on the Basic Education Data of the Directorate General of Early Childhood Education, Primary Education and Secondary Education, the total students across all educational levels in East Kalimantan amounts to 871.312, with the number of high school and vocational high school students stands at 165.743 (Kemdikbud, 2023).

Given this figure, it is extremely uncommon for these students to participate in international-level competitions representing Indonesia. This fact indicates that the enthusiasm for science among students in East Kalimantan remains notably low. To boost excitement and engagement in science, it is essential to offer support and aid to students (Agung & Sudiatmika, 2014). Through this method, it is expected that students are more easily comprehend science concepts that are applicable in real-world (Munif, 2019).

National Science Olympiad (OSN) in Indonesia is a science-based competition for students ranging from elementary to high school levels (Muliani et al., 2018). The OSN is

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a series of routine activities organized from the regency/city to the provincial level, culminating in the national event, to qualify for international olympiad competitions (Doyan et al., 2018). The olympiad serve as a platform to nurture and foster the skills of the younger generation of scientists (Yaqutunnafis, 2020).

Through Olympiads, students are provided with the opportunity to showcase their abilities optimally at both the national and international levels (Ernawati et al., 2021). The OSN is carried out to cultivate students' characters, fostering traits of honesty, creativity, discipline, sportsmanship, resilience, diligence, and patriotism (Mellyzar et al., 2021). Furthermore, the OSN competition has several main objectives, namely (Erfan et al., 2019):

a. Mapping students according to their interests in the field of science
b. Identify students who demonstrate excellence or achievement at the city/district, provincial, and national levels.
c. Granting awards or rewards to exceptional students.
d. Developing students' critical, innovative, and creative thinking abilities, as well as higher-order thinking skills.
e. Fostering students' character to compete, persevere, and be willing to take on challenges.

By engaging in the Olympiad, students from primary to secondary levels have the chance to compete in a sportsmanlike manner and strive for excellence in their fields. Consequently, it is anticipated that these Olympic participants will serve as agents of chagne for enhancing the quality of education in Indonesia (Munawir et al., 2022).

The OSN events progress through several phases, starting from the school level and culminating at the national level. Students who qualify and succeed in the school-level selections proceed to the city/district science olympiad. Those who excel at this level then advance to the provincial competitions. Finally, participants who qualify at the provincial level proceed to the national competition, adhering to the predetermined schedule and location. The OSN offers a total of 30 medals, comprising 5 gold, 10 silver, and 15 bronze medals (Erfan et al., 2019).

The selection process encompassed nine fields at the high school or equivalent level, including mathematics, chemistry, physics, computer science, biology, economics, geography, earth sciences, and astronomy (Masyarakat & Mipa, 2023). Each field possesses its unique characteristics. Among them, one of the most distinct and challenging fields in the high school/equivalent level is physics. The Olympiad assesses material through questions of significantly high complexity levels (Mariyati et al., 2019).

Olympiad questions demand problem-solving skills. To develop these abilities, students are anticipated to comprehend the problem-solving process. This includes proficiency in selecting and identifying relevant conditions and concepts, seeking generalizations, devising a resolution strategy, and organizing previously acquired knowledge (Ariyanti et al., 2019). Commonly faced challenges include the struggle of students in comprehending the competition materials in the olympiad. Students are accustomed to solving simple and easy problems, which hinders their ability to navigate complex problem-solving, particularly in the context of the olympiad. This was also the experience shared by students at SMAIT Al-Auliya.

The school supports students in preparing for the olympiad by offering coaching and direct assistance. This aid focuses on enhancing students' reasoning abilities, deepening their understanding of the material, and honing their skills in solving intricate physics questions specific to the Olympics. Developing students' reasoning abilities requires, naturally, the presence of qualified human resources to guide and support them (Mujiasih, 2013). Preparation for enrolling students in olympiad cannot be separated from the important role of schools, especially teachers (Karim et al., 2022).

However, the teachers at SMAIT Al-Auliya also face limitations in their understanding of olympiad problems that come with a high level of difficulty. Moreover, teachers also have responsibilities as class

instructors, which makes it challenging to effectively dedicate time to accompany students preparing for the olympiad. Through this community engagement, it is hoped that this initiative can assist students in preparing for the olympiad. Additionally, it aims to support the teachers at the school in guiding students who are participating in the olympiad.

METHOD OF EXECUTION

This Community Service Study (PKM) was carried out through a series of structured steps to facilitate the socialization of household scale biogas applications in Lasah Village. The implementation method used includes the planning stages, implementation of socialization, and impact evaluation. The following are details of the steps taken in carrying out this study:

1. Planning includes identifying target villages, needs analysis and socialization design.
2. Implementation of socialization includes collecting socialization materials, training/workshops, and practical demonstrations and integrated manufacturing training in manufacturing and utilization techniques.
3. Impact evaluation using interviews and field observations, and data analysis.
4. Documentation and Dissemination includes preparing reports and presenting results.

Through this method, it is hoped that this PKM study can achieve valid and useful results in describing the effectiveness of socialization of household-scale biogas applications in villages and its impact on community understanding and participation.

RESULT AND DISCUSSION

The implementation of this activity is divided into two parts that refer to the modified research methodology of Susilowati, (2019), namely the lecture method and group discussions (Susilawati et al., 2019). Lecture activities are material exposure to students regarding some Physics Olympiad materials. This is done with the hope that students who are not familiar with the basics of Physics can be able to understand easily. This is the introduction stage.

The second stage is group discussion. During the group discussion, all students practiced the previous year's olympiad questions and examples of prediction questions made specifically for this training. It is expected that by increasing the number of exercises, students will understand the material provided.

In addition to the two stages above, students are also given an assessment in the form of pre-tests and post-tests, this stage is inserted before the lecture stage and at the end after the group discussion session.

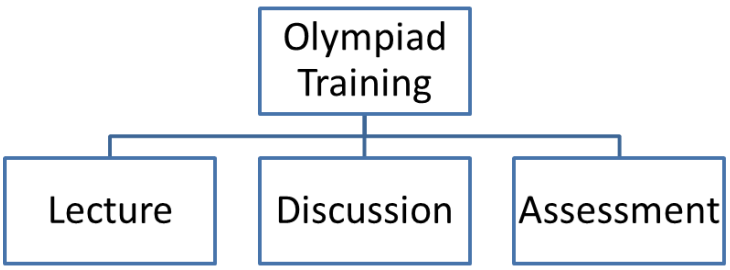

Figure 1 Flowchart of training activities

RESULTS AND DISCUSSION

Training activities have been carried out in three stages. The training was conducted for 12 meetings with materials on mechanics, thermodynamics as well as electricity and magnetism. In detail, the following materials are provided

The 1st meeting until the 8th meeting was held with mechanics material. This material was given in a larger portion compared to other materials because mechanics is the basis of Physics lessons at the high school level of education. In addition, the Physics Olympiad materials that has been carried out at the high school level is based

on the international level competition, namely IPhO, the International Physics Olympiad (IPHO, 2023).

After being given mechanics material, students were then provided with thermodynamic material as well as electricity and magnetism. These two materials are additional materials to support the olympiad at the provincial and national levels. Thermodynamics and electricity materials were also given with the assumption that they will broaden students' horizons if they successfully pass the city level.

Table 1. High School Olympiad Training Materials

No	Materials	Description
1	Mechanics	Measurement and vector
2		Kinematics of straight motion
3		Kinematics of circular motion
4		Dinamics of straight motion
5		Dinamics of circular motion
6		Momentum and collision
7		Equilibrium of rigid body
8		Waves
9	Thermodynamics	The kinetic theory of gases
10		Entropy dan the second law of thermodynamics
11	Electricity and Magnetism	Gauss's Law
12		Faraday's Law

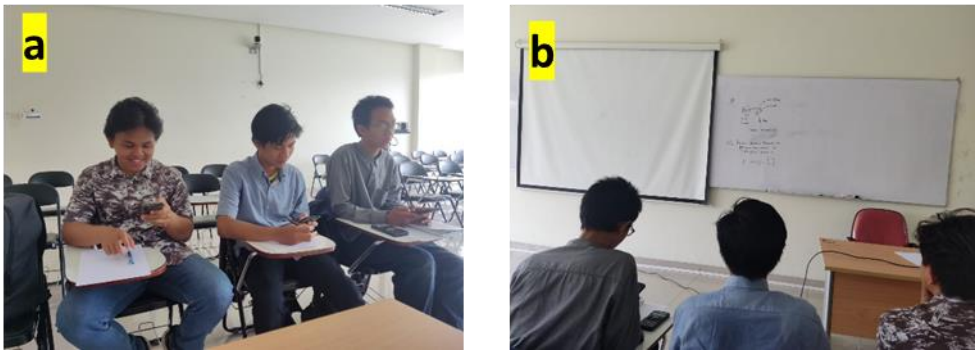

Figure 2 The process of providing material and discussion of the Physics Olympiad

Prior to the lecture and discussions, students were initially given pre-test questions to assess their current level of understanding. The subsequent results outline the pre-test and post-test scores of the participants.

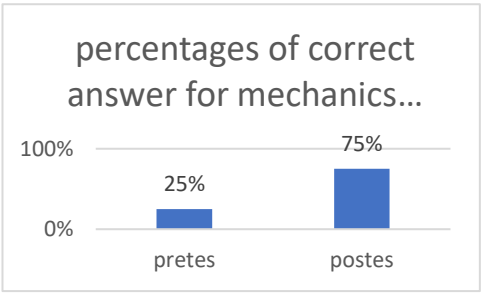

Figure 3. The percentage of mechanics questions answered correctly

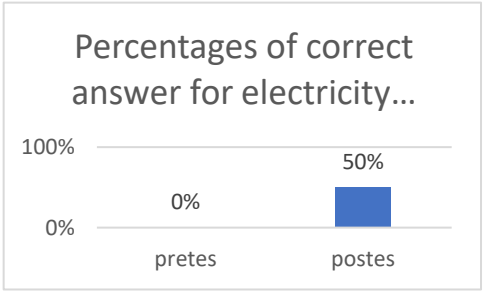

Figure 4. The percentage of electric and magnetism questions answered correctly

Based on these results, an evident enhancement in the skills of participating students was observed. Students' knowledge in mechanics and electricity exhibited a 50% improvement, while there was no noticeable advancement in

thermodynamics (0%). In addition, one of the trained students won the competition in city level, Balikpapan City, and had a chance to join the competition in province level.

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CONCLUSION

The community engagement has resulted in an improvement in physics abilities following the olympiad training process. Sustaining this trend on a broader scale would be highly beneficial.

Author's declaration

Authors' contributions and responsibilities

The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interest.

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