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IMPLEMENTATION OF OUTCOME BASED EDUCATION IN INTEGRATED SCIENCE COURSES BASED ON PROJECT-BASED LEARNING

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ABSTRACT The implementation of Outcome-Based Education (OBE) in integrated science courses, grounded in Project-Based Learning (PBL), represents a transformative approach to modern education. This study explores the integration of OBE principles with PBL to enhance student engagement and achievement in integrated science curricula. By focusing on clearly defined learning outcomes, the OBE framework ensures that students acquire the knowledge, skills, and attitudes necessary for success in their academic and professional endeavours. PBL, as an instructional strategy, encourages students to engage in hands-on, collaborative projects that reflect real-world challenges, fostering critical thinking, problem-solving, and teamwork. The research examines the design, implementation, and assessment of integrated science courses that utilize this combined approach, highlighting its impact on student motivation, understanding of scientific concepts, and overall academic performance. Through qualitative and quantitative analyses, the study provides evidence of the effectiveness of OBE and PBL in promoting deeper learning and retention of knowledge. The findings suggest that this integrated model not only aligns with educational standards but also prepares students for future careers by developing essential competencies. Recommendations for educators and policymakers on best practices for adopting and scaling this innovative teaching methodology are also discussed.

Keywords: *Outcome-Based Education; Project-Based Learning; Integrated Science Courses; Student Engagement.*

1. INTRODUCTION

Outcome Based Education (OBE) is an educational approach that focuses on achieving predetermined learning outcomes [1]. In the context of Integrated Science courses, implementing OBE requires effective teaching strategies to achieve the expected competencies. One strategy that is considered effective is Project-Based Learning (PJBL), which emphasizes learning through relevant and contextual projects [2][3].

PJBL in Integrated Science courses provides students with the opportunity to learn actively and in-depth through direct experience. Students not only understand scientific concepts, but also develop important skills such as problem solving, critical thinking, collaboration, and creativity [4]. This approach allows students to connect theory with practice, increases their involvement in the learning process, and motivates them to achieve optimal results.

The implementation of OBE in PJBL-based Integrated Science courses is also in line with the demands of the 21st century which emphasizes mastery of skills needed in the world of work [5]. By providing challenging and relevant projects, students are trained to think analytically and creatively, and work effectively in teams [6]. In addition, PJBL helps students to develop attitudes of responsibility and leadership, which are very important in their future professional lives.

In implementing OBE and PJBL, the role of lecturers is very crucial. Lecturers not only function as providers of material, but also as facilitators who guide students in the learning process. Lecturers must be able to design challenging and relevant projects, provide constructive feedback, and encourage students to reach their maximum potential [7].

By implementing OBE in PJBL-based Integrated Science courses, it is hoped that a learning environment that is more dynamic, innovative and responsive to change can be created. This will help students to achieve meaningful and relevant learning outcomes, as well as prepare them to face future challenges [8][9][10]. This approach not only improves the quality of education, but also produces graduates who are competent and ready to contribute to global society.

2. METHOD

This qualitative research approach was used to investigate the implementation of OBE in Integrated Science courses based on PJBL. This research uses a qualitative method with a case study model based on grounded theory, as explained by [11], which aims to formulate concepts or theories inductively based on the cases studied. Phenomenological approach [12] used to understand the essence of the events experienced and how people interpret them, especially in investigating participants' thoughts and emotions regarding the implementation of OBE and PPA.

Apart from that, this research also adopted a Community-Based Participatory Research (CBPR) strategy as part of Community Engagement Activities. CBPR emphasizes participatory communication between service partners and practitioners as equal partners in realizing social change, and provides a means for service partner involvement in addressing problems, thereby encouraging knowledge sharing between academics and the community [13].

The research began by defining the main research questions related to the implementation of OBE and PJBL in Integrated Science courses, potential improvements, and existing challenges [14]. A case study design was chosen, and participants were selected through purposive or snowball sampling, including faculty, students, and other stakeholders. Data was collected through observation, semi-structured interviews, testing, and literature study.

Data analysis is carried out interactively during training activities, including data presentation, as well as discussion and drawing conclusions. Thematic analysis was applied to identify and interpret emerging themes. Data presentation and discussion are carried out to present and interpret the data in accordance with the research objectives. Conclusions are drawn to summarize the findings and highlight their contribution to practical problem solving or opportunities for further research.

3. RESULT AND DISCUSSION

On May 14-18 2024, students of the 6th semester Physics Education study program carried out Community Service (PKM) activities with the theme "Utilizing Local Wisdom in Overcoming Environmental Problems through Integrated Science Learning." This activity was carried out in several elementary and middle schools, namely MIS Al Hidayah Baleendah, SMP Mekar Arum, and MTs Persis Ciganitri. The aim of this PKM is to increase public awareness of overcoming environmental problems through an Integrated Science learning approach that integrates local wisdom.

This activity was carried out using a Community-Based Participatory Research (CBPR) approach, which emphasizes active community participation in the research and implementation process. Accompanied by other lecturers, students together with the school community design and implement activities that are relevant to local needs and potential.

Students and schools collaborate to identify materials available in the surrounding environment that can be utilized. This learning not only aims to reduce environmental waste but also to produce products that have marketable value.

Table 1. Details of Activity Implementation

No.	Pre-test	Implementation
1.	Survey, Friday, 10 May 2024	Introduction with the school to collaborate with partners and see the potential of nature that can support this service program.
2.	Waste collection, Friday, May 10, 2024	Collecting water hyacinth waste from the area around the school or from gardens owned by local residents, and then processing it with the aim of producing raw materials used in the manufacture of products.
3.	Training Activities, Tuesday, May 14-18, 2024	Providing training that begins with the delivery of material on the use of waste as a product with selling value, as well as providing views on the design of the product to be made. As well as conducting *pretest activities* before the training starts.
		The community service team prepared tools, materials, and provided training on making crafts from waste to students at MIS Al Hidayah Baleendah, Mekar Arum Junior High School, and MTs Persis Ciganitri. After carrying out the training, the students returned to work on *the post test questions*, with the aim of seeing the difference before and after the implementation of this training.

The presentation of the results of the pretest in relation to community service is shown in the following figure.

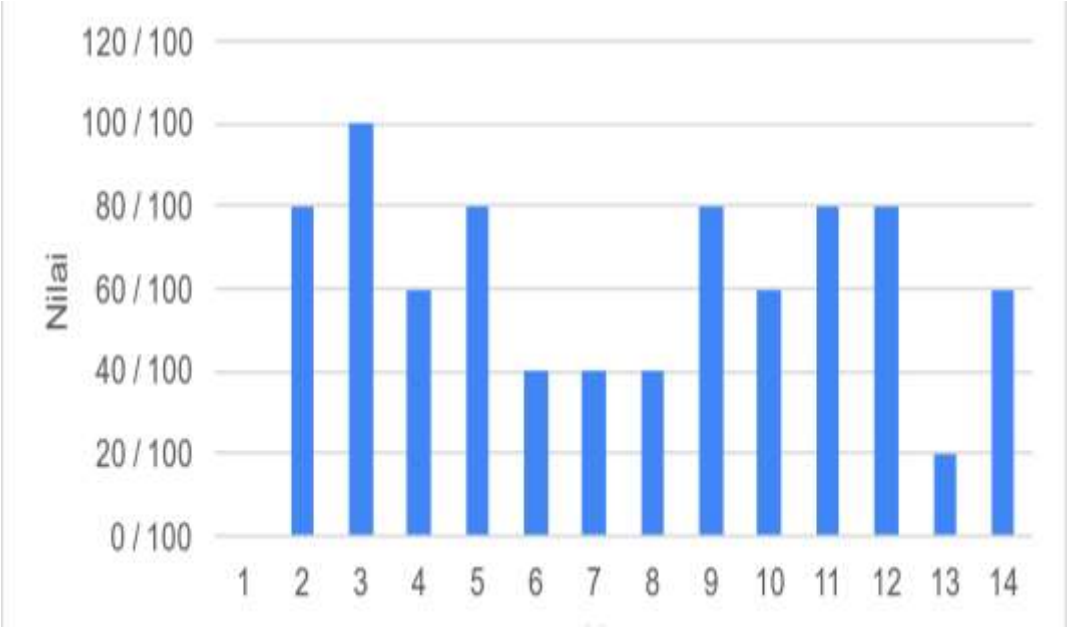

Figure 1. Results from the pretest

The presentation of the results of the post-test in relation to community service is shown in the following figure.

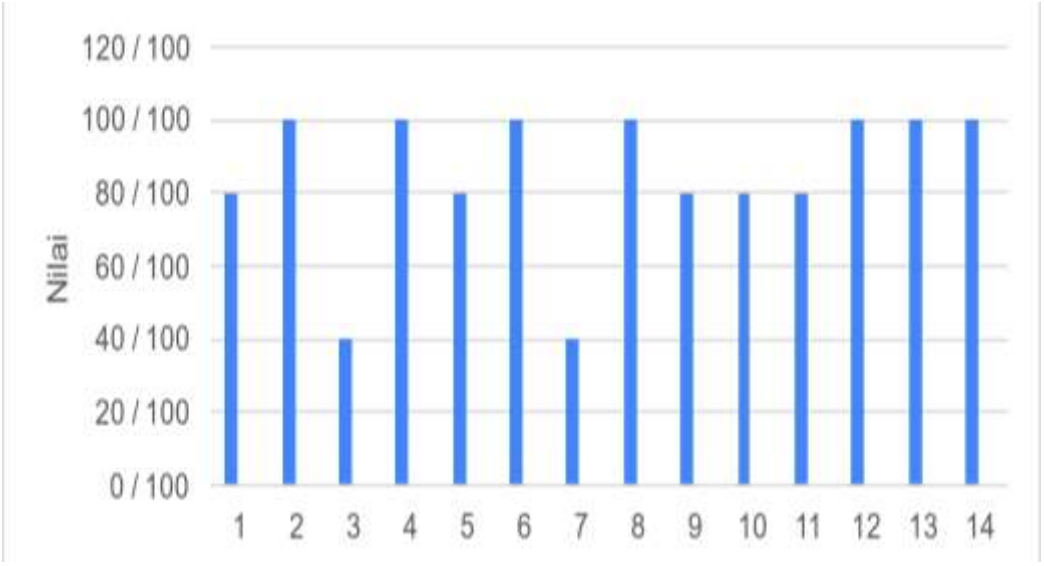

Figure 2. Result form the post-test

Based on the results of the pretest and posttest conducted on each student, it can be seen that their level of understanding varies, as reflected in the graph changes between the pretest and posttest. The pretest and posttest tables show an increase and decrease that illustrates the change in each student's understanding of the material taught. This change reflects an active and responsive learning process to Integrated Science learning implemented through this community service activity.

The increase and decrease in the pretest and posttest graphs indicate that the learning approach given has affected the way students understand and apply the concepts into practice. This shows the effectiveness of teaching methods that integrate local wisdom and sustainable practices in science education. Thus, this PKM activity not only aims to provide knowledge, but also to improve students' understanding and practical skills in the context of environmental protection and sustainable use of local resources.

Figure 3. Community service through Integrated Science Learning

Some of the learning activities carried out during community service include:

Figure 4. Utilization of Plastic Waste into Flower Handicraft

Utilization of Plastic Waste: Students are taught how to process plastic waste into handicrafts such as flowers. This activity not only reduces the amount of plastic waste but also produces decorative products that are worth selling.

Figure 5. The use of leaves as a totebag motif

Utilization of Leaves: Students learn to make beautiful motifs on tote bags using leaves. This technique utilizes natural ingredients to produce unique and environmentally friendly products.

Figure 6. Utilization of coconut waste as a keychain

Utilization of Coconut Coir: Students make keychains from coconut coir. This is an example of how materials that are normally considered waste can be turned into useful and economically valuable products.

Figure 7. The use of water hyacinth plants as coasters

Utilization of Water Hyacinth Waste: Students made coasters from water hyacinth waste, demonstrating that natural ingredients can be processed into practical and attractive household products.

Figure 8. Utilization of bottle and plastic waste using the ecobrick method into chairs

Utilization of Bottle and Plastic Waste with Ecobrick Method: Students are taught how to utilize bottle and plastic waste into chairs using the ecobrick method. It is a creative and effective way to reduce plastic waste and utilize it to create functional products.

The results of this community service activity show that the PJBL approach in Integrated Science learning can effectively integrate local wisdom and sustainable practices. The students showed high enthusiasm for this activity. They not only gain new knowledge but are also motivated to care more about the environment. One of the high school students said, "I am happy to be able to learn a new way to process materials and waste that exist around the environment. This makes me care more and want to contribute more to the environment."

The increase and decrease in pretest and posttest results shows that this project-based learning has affected the way students understand and apply science concepts into real practice. Pretest and posttest data indicate that their level of understanding varies, reflecting an active and responsive learning process. Thematic analysis from interviews and observations shows that this activity has succeeded in increasing environmental awareness and practical skills of students.

The CBPR approach used in PKM ensures that the activities carried out are relevant to local needs and contexts. Through the active participation of the school community, this PKM activity not only provides educational benefits but also promotes local wisdom and environmental sustainability.

4. CONCLUSION

In the context of implementing Outcome Based Education (OBE) in Integrated Science courses using the Project-Based Learning (PJBL) approach, which is combined with the Community-Based Participatory Research (CBPR) strategy, several important things can be concluded: 1). Effectiveness of Project-Based Learning: The PJBL approach provides students with

the opportunity to learn actively and in-depth through direct experience in completing relevant projects.

This not only improves understanding of scientific concepts, but also develops practical skills such as problem solving, critical thinking, and collaboration. 2). Student Involvement and Motivation: Implementation of PJBL and CBPR-based OBE increases student involvement in the learning process by connecting theory with practice and actively involving them in designing and implementing projects. Students are stimulated to achieve meaningful and relevant learning outcomes that positively influence their motivation. 3). 21st Century Skills Development: This approach supports the mastery of skills needed in today's world of work, such as the ability to think analytically, creatively, and the ability to work in teams. This is good preparation for students to face future challenges. 4). Environmental Awareness and Community Empowerment: CBPR-based PKM activities have succeeded in increasing environmental awareness among students and communities by teaching them how to utilize materials found in the surrounding environment to reduce waste and produce marketable products.

Through active community participation, this activity also promotes community empowerment and independence. Thus, the implementation of OBE in PJBL and CBPR-based Integrated Science courses has not only succeeded in improving the quality of education but also prepared students to become competent individuals who care about the environment. This approach shows that education can be an effective tool for social change and environmental sustainability, as well as promoting local wisdom.

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