Integrating Hands-on and Virtual Learning for Environmental Sustainability: Eco Enzyme Soap Making at SMP Stella Matutina

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ABSTRACT

This Community Service Program aimed to implement and evaluate an Experimental Hybrid Learning Model at SMP Stella Matutina, Salatiga, Central Java. The program focused on enhancing students' conceptual understanding and practical skills by integrating concrete and virtual experiences in eco enzyme soap making. The program led to a significant increase in students' knowledge of environmental issues and their practical abilities in eco enzyme production. Moreover, students showed improved engagement in both physical and virtual learning environments. This hybrid learning approach proved effective in achieving educational goals and holds potential for broader implementation in other educational contexts.

keywords: *concrete experience, eco-enzyme soap, experimental, hybrid learning, virtual experience*

1. INTRODUCTION

Innovation in learning methods is crucial. Experiential Hybrid Learning has emerged as a promising approach, combining the power of concrete experiences with the flexibility and reach of virtual technologies **(Green et al., 2024)**. This approach not only bridges the gap between theory and practice, but also prepares students with essential 21st-century skills such as problem-solving, collaboration, and digital literacy **(World Economic Forum, 2020).**
Regarding advanced technology, in general the **U.S. Department of Education (2014)** states that modern technological tools make it possible to carry out design, media production, self-expression, research, analysis, communication, collaboration and computer programming 8 Higher Education Institutions in the Digital Era: Thinking, Modeling and Good Practices It is usually carried out in various professions and scientific disciplines and what is no less important is that advanced technological facilities are a very important part of being ready to carry out lectures/learning and have a career **(Warger *et al.*, 2009).** Interacting with digital learning environments will support the development of deeper learning skills, such as problem solving, critical thinking, and inquiry. Apart from that, the goal of achieving educational improvement and increasing participation in learning science, technology, engineering and mathematics will

be difficult to achieve without being integrated with the use of technology. Even though advances in ICT have now been recognized for their usefulness in advancing the world of education, the response to the use of ICT advances in the teaching and learning process is considered to be still slow. Most programs to face these challenges are limited to relying solely on a subject that utilizes technology **(Wedman & Diggs, 2001)**, rather than creating actual or virtual learning environments where technology can develop and be integral to the learning process.

Experiential Hybrid Learning can be defined as a learning model that integrates hands-on experience with simulations and virtual interactions, allowing students to engage in a more dynamic and contextual learning process **(Peng et al., 2019)**. This model combines the best elements of traditional experiential learning with the transformative potential of digital technologies in education **(Donnelly, 2009)**. Overall, experiential learning provides a well-rounded educational experience that prepares students for success in their future careers and personal endeavors. As students actively engage in practical experiences, students can deepen their understanding of complex concepts and develop critical skills that are essential to thriving in today's fast-paced and competitive world **(Essa et al., 2023).**

This community service program aims to implement and evaluate the effectiveness of the Experimental Hybrid Learning model at SMP Stela Matutina, a junior high school in Salatiga, Central Java, Indonesia. The specific objectives of this community service program include: Improving students' conceptual understanding and practical skills through the integration of concrete and virtual experiences. Developing teachers' capacity in designing and facilitating experimental hybrid learning. Evaluating the impact of this learning model on students' motivation, engagement, and learning outcomes. Implementation of Experimental Hybrid Learning in the context of Indonesian junior high schools, community service in meeting IKU and MBKM. This program is also expected to provide real contributions in improving the quality of education and the relevance of learning in junior high schools in Indonesia while encouraging the active involvement of students and teachers in a more interactive and applicable learning process.

SMP Stela Matutina is a junior high school located in Salatiga City. The number of students is around 174 and the teaching staff is 22 people, this school continues to strive to develop innovative teaching methods. The goal is to encourage students' creativity and courage in being creative. One of the innovations implemented is the use of virtual simulators in the library. This approach not only enriches the learning method but also succeeds in increasing students' interest in visiting and utilizing library facilities. In addition, this school as the Marsudirini Foundation pays great attention to environmental sustainability programs in accordance with the teachings of Laudato Si. This teaching is an initiative inspired by the encyclical 'Laudato Si: On the Care of Our Common Home' published by Pope Francis in 2015. This encyclical highlights the importance of environmental care and invites all humanity to be involved in efforts to maintain and care for the earth as a common home. In the context of Catholic teachings, the Laudato Si program includes various initiatives and actions to increase awareness and concern for the environment. This teaching is packaged in the 'kemarsudirinian' activity. SMP Stela Matutina is a junior high school located in Salatiga City.

The significance of this study lies in its potential to provide valuable insights into the practical implementation of Experimental Hybrid Learning at the junior high school level in Indonesia. By combining concrete and virtual experiences, the program not only aims to improve the quality of learning but also to develop a model that can be adapted by other schools across the country. Furthermore, this study contributes to the growing literature on post-pandemic educational innovation. This article will outline the program, implementation, and outcomes of the community service program, as well as their implications for future educational practice and research. Through a comprehensive analysis of quantitative and qualitative data, this study aims to provide an in-depth understanding of the potential and challenges of

Experimental Hybrid Learning in transforming the learning experiences of junior high school students in the digital era.

Figure 1. The Making of Eco-Enzyme in Stella Matutina

Figure 1 showed teachers and students at SMP Stela Matutina are involved in an experimental hybrid learning activity focused on making eco enzymes, using organic waste and brown sugar as the basic material. This practical project, which combines concrete and virtual experiences, shows students actively participating in the process of making eco enzymes. This practical project, which combines concrete and virtual experiences, shows students actively participating in the process of making eco enzymes.

In the pictures, students are seen gathered and enthusiastically mixing organic ingredients into a container. The principal (teacher), who guides the students through the steps, ensures that they understand the process and principles behind making eco enzymes. The last picture shows the eco enzyme bottles that are labeled and stored for 3 months for later use or for further study.

This activity not only provides a practical learning experience but also emphasizes the importance of environmental sustainability. By integrating this project into the curriculum, SMP Stela Matutina promotes critical thinking, problem-solving, and the application of theoretical knowledge in real-world situations.

Purpose of Implementation of Acticities, related to MBKM and IKU PT

The purpose of implementing activities and their relationship to MBKM, IKU, and the focus of community service is the lack of environmental understanding among young people. Lack of understanding of environmental issues among the younger generation is one of the main priorities. This understanding is important to instill awareness and responsibility for environmental sustainability from an early age. Overcoming this problem can be done by ensuring that students are involved in off-campus learning experiences of at least 6 credits. This experience can include participation in environmental projects or internships at institutions that focus on environmental issues. In addition, lecturers who are active off-campus can bring new perspectives and best practices from other domestic universities, enriching the curriculum and learning related to the environment.

Less Interactive Enviromental Education

Interactive environmental education is essential to engage students and make the material easier to understand. Less interactive education can make students less interested and less aware of the importance of environmental conservation. Encouraging interactive learning experiences outside of campus, such as fieldwork or research projects, allows students to learn in a hands-on, applied way. Lecturers who engage in off-campus activities can adopt and implement interactive learning methods that have been successful at other institutions.

The need for Sustainability Practice
There is an urgent need to integrate sustainability practices into education so that students understand and can apply sustainability concepts in their daily lives and future careers. Students who engage in off-campus sustainability projects can see firsthand the application of sustainability concepts, increasing their understanding and commitment to these practices. Lecturers who are active in off-campus sustainability projects can bring their knowledge and practical experience back to the classroom, making learning more relevant and applicable.

Lack of Creative Education in Enviromental Education
Creative activities are essential in environmental education to encourage innovation and new solutions to environmental problems **(Ufuoma Chima Apoki, 2018)**. Lack of creative activities can hinder the development of new ideas and more enjoyable learning. Involving students in creative activities outside campus, such as environmental innovation competitions or art projects that address environmental issues, can stimulate their creativity and understanding. Lecturers who participate in or lead creative activities outside campus can bring inspiration and new learning methods into the classroom, increasing the dynamics and effectiveness of environmental education. Overall, for each priority problem, the involvement of students and lecturers in off-campus activities is highly prioritized to improve the understanding and application of environmental concepts, as well as encourage more interactive, practical, and creative education **(Kong et al., 2023).**

3. METHOD

This community service method aims to improve students' and teachers' understanding and skills in making liquid soap using eco enzyme, as well as promoting sustainable practices in schools. The first stage is socialization regarding the importance of maintaining a green environment. Followed by training in making environmentally friendly liquid soap, using simple technology, and intensive mentoring. Evaluation is carried out with interactive quizzes via Kahoot. Follow-up plans include the preparation of materials, workshops, evaluations, development of interactive modules, teacher training, implementation in class, creativity workshops, and exhibitions of work, as seen in table 1. Active participation from teachers, students in grades 4-5, and universities is the key to the success of this program.

Table 1. Community Service Methods for Making Eco Enzyme Liquid Soap and Sustainable Environmental Learning.

Problem priority	Implementation Method	Partner's Participation	Sustainability Plan
1. Making liquid soap from eco-enzyme	Socialization: a brief explanation of the importance of a green environment. Training: making liquid soap with eco-enzyme. Mentoring: about making the eco-enzyme.	Present during the activity and actively participating in the implementation satges: teachers, students in grades 7-8, universities (the implementers community service)	1. preparation 2. Workshop 3. Evaluation and feedback

Problem priority	Implementation Method	Partner's Participation	Sustainability Plan
	Evaluation: carried out using a Kahoot quiz on understanding the material that has been given.		
2. Creating a technology simulator for student learning to better understand the making of eco enzymes from preparing materials to the process and becoming environmentally friendly liquid soap.	Socialization: Teacher training. Training: Eco enzyme soap making training. Implementation of technology: simple technology for making liquid soap packaged with simulator technology. Mentoring: about making eco enzyme soap. Evaluation: carried out using the Kahoot quiz.	Present during the activity and actively participating in the implementation satges: teachers, students in grades 7-8, universities (the implementers community service)	1. Development of interactive modules. 2. Teacher training implementation of creativity workshop classes 3. Work result exhibition 4. environmenral education that is less interactive and creative with technology simulator app.
3. The need for sustainability practice	Socialization: a brief explanation of the importance of a green environment. Training: Eco enzyme making training. Application of technology Mentoring: about making eco enzymes. Evaluation: carried out using the Kahoot quiz	Present during the activity and actively participating in the implementation satges: teachers, students in grades 7-8, universities (the implementers community service)	1. Identification of sustainable practices 2. Implementation of pilot projects 3. Scale up of projects

This community service program focuses on the production of liquid soap from eco-enzyme, the development of a technology simulator for student learning, and the implementation of sustainability practices. The activities began with a socialization session on the importance of environmental preservation, followed by training and mentoring in eco-enzyme soap making, as well as the application of simple technology integrated with a simulator. Evaluation was conducted using a Kahoot quiz to assess participants' understanding. The partners involved, including teachers and 7th-8th grade students as well as the university as the implementer of the community service, actively participated in every stage of the program's implementation. To support the program's sustainability, initial preparations were made, workshops were conducted, interactive modules were developed, teachers were trained, and students' work was exhibited. Additionally, the program focused on identifying sustainable practices, implementing pilot projects, and scaling up sustainability projects, with the goal of creating a more interactive and creative environmental education.

4. DISCUSSION

Evaluation of the implementation of experimental hybrid learning activities at SMP Stela Matutina, which aims to improve environmental understanding and awareness through concrete and virtual experiences with eco enzyme soap, was carried out through various comprehensive methods. Initial socialization provided an explanation of the importance of maintaining a green environment, both directly in class and through a learning simulator in the library. Liquid soap making training with eco enzymes was carried out directly to provide practical skills to students, while the programming simulator session was used to introduce relevant concepts and technologies.

During the soap-making process, students are also given knowledge about the chemical reactions that occur. They learn about fermentation, pH, and the properties of the ingredients used. This not only enriches their understanding of science, but also improves practical skills that can be applied in daily life (figure 2). Project-based learning can improve understanding of scientific concepts among students **(Emilio Duran, Lena Ballone, Jodi Haney, 2009)**. On the other hand, virtual methods are used to provide additional information and support learning. Students can access video tutorials, articles, and discussion forums related to the manufacture of eco enzymes. This digital platform allows students to learn in a more flexible way and at their own pace. The use of technology in education can increase student engagement and expand access to information. By combining these two methods, Stella Matutina Junior High School creates a dynamic and interactive learning environment. Students are not only recipients of information, but also actively participate in the learning process. This is crucial in building the character of students who care about the environment and have the necessary skills to face future challenges.

Figure 2. Students Conduct Training in Making Liquid Soap

Intensive mentoring is also carried out directly, with students gathering in the hall. ensuring that students can apply the knowledge gained both in the school laboratory and through virtual projects. Evaluation is carried out using quizzes after the activity, in a digital quiz format (kahoot), to measure changes in students' knowledge and attitudes towards environmental issues asshown in figure 3.

Figure 3. The students filling the evaluation quiz

Student projects were evaluated based on sustainability and innovation criteria, both in school and in everyday behavior. Direct observation during face-to-face activities and analysis of student interactions on the virtual platform in the library provided insight into classroom dynamics and student participation as seen in figure 4.

Figure 4. Teachers Observe Students During Face-To-Face Activities

Feedback from teachers and facilitators, both verbally and through digital forms, helped in assessing the effectiveness of the learning modules used. Interviews with students and teachers were conducted to gain in-depth perspectives on the impact of the activities (figure 5).

Figure 5. Students Trying the App.

Focus group discussions with various community services (universities) which in this case provide activity initiation, teachers, principals, to evaluate the process and results of activities

collectively. Long-term impact measurement is carried out by follow-up, both directly and through online surveys, to assess changes in student behavior related to sustainable practices. Analysis of participation in environmental education campaigns through social media and other publications helps in assessing the extent to which this program influences a wider audience. Evaluation of partner contributions and involvement is also carried out to assess the success of the collaboration in achieving the set targets. Community service with this hybrid approach is expected to provide short-term benefits in the form of new knowledge and skills, as well as encourage sustainable practices among students, both through direct and virtual experiences.

Quantitative Data and Output Achievements

Eco Enzyme Soap Production: 85% of students successfully created eco enzyme soap under the guidance of the teaching team. The final product met the established quality standards, both in texture and fragrance. Interactive Simulation: The use of an interactive simulator demonstrated an improvement in students' understanding of the eco enzyme production process. Based on pre- and post-assessment results, there was a 30% increase in comprehension among students who used the simulator. Kahoot Quiz:The quiz results showed that the majority of students were able to answer the questions correctly, achieving a success rate of 90%. The top three students received eco-friendly tumbler prizes (figure 6).
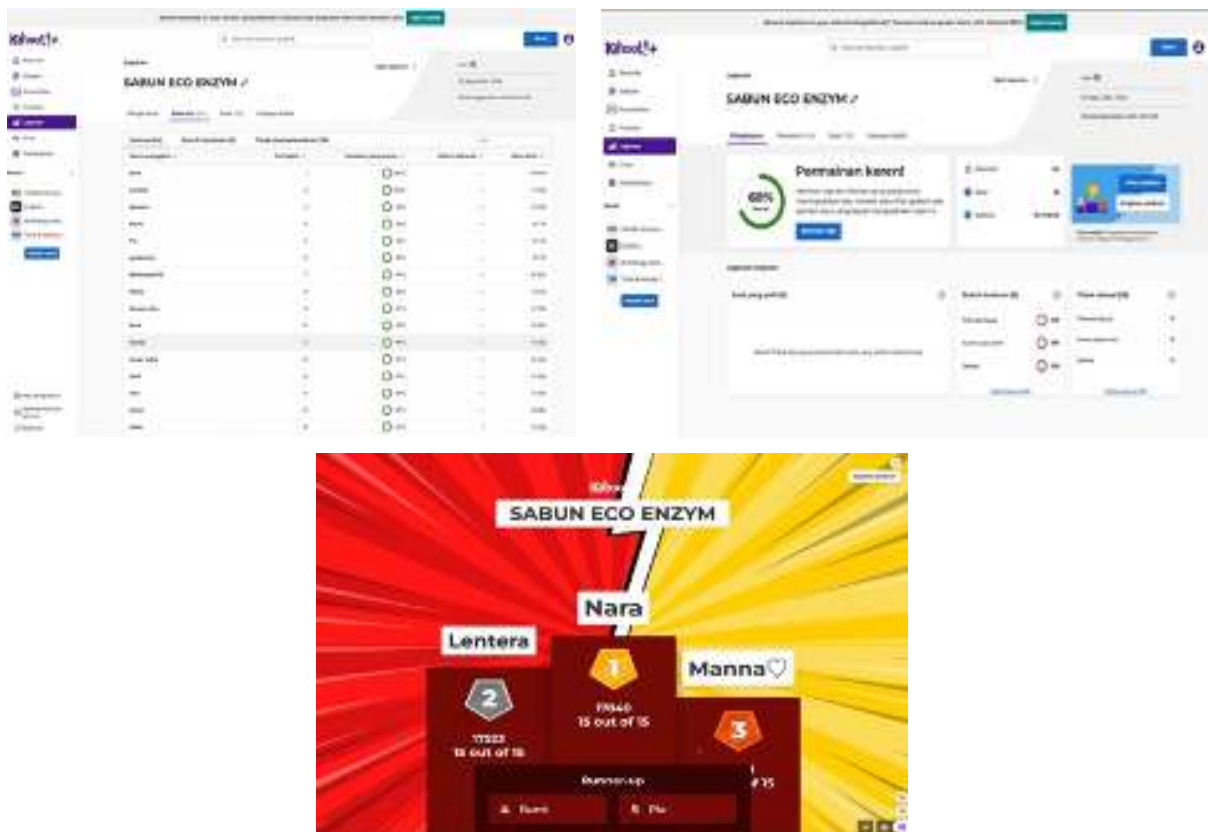

Figure 6. Kahoot Quiz Results as an Evaluation Outcome

One of the feedbacks given by participants said that before this activity, she had only a basic understanding of environmental conservation. Learning about eco enzymes and turning organic waste into useful products like soap deepened her awareness of environmental issues. Through hands-on practice, she realized that small actions, like recycling waste, can significantly impact the environment. This activity also heightened her awareness of reducing single-use plastics. She is motivated to apply this knowledge in my daily life and contribute

more to environmental preservation. The use of an interactive simulator also improved her understanding of the eco enzyme production process.

5. CONCLUSIONS

The community service program at SMP Stella Matutina successfully implemented the Hybrid Experimental Learning model, which integrated concrete and virtual experiences with eco enzyme soap. Through this approach, students were able to improve their conceptual understanding and practical skills. Evaluations conducted through various methods, including surveys, questionnaires, observations, and interviews, showed an increase in students' knowledge and awareness of environmental issues. Intensive hybrid mentoring ensured that students were able to apply the knowledge gained both in the school laboratory and through virtual projects. Feedback from teachers and facilitators also helped in improving the effectiveness of the learning modules used. In addition, focus group discussions with various stakeholders provided a deeper perspective on the impact of the program.

Long-term impact assessments through follow-up surveys showed that the program not only provided short-term benefits in the form of new knowledge and skills, but also encouraged sustainable practices among students. The success of this program is highly dependent on the active participation of teachers, grade 4-5 students, and universities as implementers of community service. Overall, this program shows that the Experimental Hybrid Learning model can be an effective tool to improve the quality of education and the relevance of learning in junior high schools, while encouraging the active involvement of students and teachers in a more interactive and applicable learning process. This program also has the potential to be adapted and implemented in other schools to achieve similar educational goals.

The practical learning in making eco enzyme soap can serve as a model for other schools to incorporate environmental education. By demonstrating positive results, SMP Stella Matutina can set an example for other educational institutions to integrate practical learning into their curriculum. This aligns with the government's efforts to improve environmental education across Indonesia, as stated in the National Action Plan for Environmental Management (2020-2024) by the Ministry of Environment and Forestry.

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