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Dissemination of Student and Lecturer Research Results to Help the Community Overcome Environmental Pollution Due to Tofu Industry Liquid Waste

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ABSTRACT
This community service activity was carried out by the community service team of the Environmental Engineering Study Program, Faculty of Engineering, Solo Christian University of Technology (UKTS). This activity was carried out in collaboration with the Solo Christian University of Technology (UKTS) with the Tofu Industry Owner "DELE EMAS" as a follow-up to the collaboration contained in the Memorandum of Understanding (MOU) agreed by both parties. This activity was carried out at the tofu and tempe industrial center, Krajan Village, Mojosongo Village, Surakarta City. The form of action for this community service activity is the dissemination of research results from students and lecturers of the Environmental Engineering Study Program that are relevant to the community, with the aim that the learning and research activities that have been carried out can be of real benefit to helping the community. This is a form of integration between learning and research activities into community service activities. The results of this activity are able to provide positive benefits both for higher education institutions, especially lecturers and students, as well as for partner communities.

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INTRODUCTION

This Community Service activity was carried out by lecturers and students of the Environmental Engineering Study Program, Faculty of Engineering, Solo Christian University of Technology (UKTS) or also known as Solotech University. This activity was carried out in the odd semester of 2022/2023 at the tofu and tempe industry center, which is located in Krajan Village, Mojosongo Village, Surakarta City. The tofu and tempe industry centers in Kampung Krajan are classified as Micro, Small and Medium Enterprises (MSMEs) whose production processes are still very simple or traditional (Sudaryantiningsih et al., 2017) . The high density of a city with high economic activity has the potential to cause various kinds of environmental problems such as problems of solid waste or garbage, as well as liquid waste originating from domestic and industrial activities. This also happened to the tofu and tempeh industries in Kampung Krajan (YS Pambudi et al., 2020) .

The Tofu Industrial Center in Krajan Village, Mojosongo was chosen to carry out community service activities because this place has many environmental problems, such as water pollution, soil pollution, and air pollution, as a result of the waste of tofu and tempeh production processes. Tofu and tempeh are foods that are much liked by Indonesian people because they are cheap, easy to obtain, and have a high protein content which is good for a person's growth period (Sudaryantiningsih, C et al., 2021) . Most of the production processes carried out by tofu entrepreneurs or tofu factory owners have not carried out the processing and handling of the waste they produce, both solid waste, liquid waste, and exhaust gases. (YS Pambudi et al., 2021) . Regarding wastewater, not all tofu factory owners have a Wastewater Treatment Plant, and if there is a technology used it is still very simple and the effluent does not meet the quality standards set by the government (YS Pambudi et al., 2022) .

The community service action carried out by the community service team for the Environmental Engineering Study Program, Faculty of Engineering, Solo Christian University of Technology (UKTS) is by disseminating the research results of students and lecturers that are relevant to the problems that are currently happening in the field to the people in the area. Kampung Krajan as a form of integration between learning and research activities into a community service activity. Through this action we want to contribute to helping overcome environmental problems that are being faced by the community, as well as training the community to be more empowered so that they can overcome their own problems with the potential and local resources owned by the community . This is in line with the efforts of the government of the Republic of Indonesia, both the central government and local governments, to empower communities to overcome poverty (YS Pambudi et al., 2022) .

The research results of students and lecturers which are disseminated to the public in this activity are the results of final semester student research or student thesis under the guidance of supervisors. The research that was disseminated in this activity was a student research named Virgianto Tara Ama

with the topic of the effect of tofu wastewater disposal on the quality of surface water around the tofu industrial center in Krajan village, as well as student research named Maria Yumima Banoet with the topic of how to make eco-enzymes and the ability of eco-enzymes to deal with surface water pollution around the Kampung Krajan tofu industry center. In completing the research, the two environmental engineering study program students were guided by lecturers namely Cicik Sudaryantiningsih, Elvis Umbu Lolo, Richardus Indra Gunawan, and Yonathan Suryo Pambudi.

The participants who were targeted and attended this activity were community leaders such as the Head of the Rukun Warga (RW), the Head of the Rukun Tetangga (RT), the Head of Family Welfare Development (PKK), and from the Youth element (Karang Taruna), besides that there were participants who were representatives of tofu and tempeh entrepreneurs or craftsmen in Krajan Village, Mojosongo, Surakarta.

IMPLEMENTATIONS AND METHODS

Preparation Phase

The initial activities carried out by the community service team for the Environmental Engineering Study Program, Faculty of Engineering, Solo Christian University of Technology (UKTS) before carrying out activities at the location, namely preparing the necessary technical and non-technical matters such as conducting literature studies, carrying out coordination meetings team, looking for relevant partner groups, obtaining permits from local community leaders, conducting field surveys and interviews with local communities to find out about environmental problems that occur. Next, the team determines the topic and theme of the activity, selects relevant participants, determines the form of the activity and resource persons, and prepares training materials.

Figure 1. Several Community Service Team Preparatory Activities

At this preparatory stage, the team was assisted by the owner of the tofu industry "DELE EMAS" to find the initial information needed before going into the field, besides that the owner of the tofu industry "DELE EMAS" also assisted the team in arranging permits, looking for key informants to be interviewed, and, provide a place that can be used as the implementation of research results dissemination activities.

Implementation Stage

At this stage of implementation, the team took action in the form of disseminating the results of research conducted by students and lecturers of the EnvironmentalEngineering Study Program that were relevant to environmental problems that occurred in the field to participants through lecture methods, questions and answers, discussions, and practice of making eco-enzymes. The aim is for participants to obtain information, raise awareness, accept this information, and finally be able to use this information to solve environmental problems that occur.

Figure 2. Students as Researchers are Assisted by Supervisors Conveying the Results of Their Research to Participants

Furthermore, to find out directly and in depth regarding conditions in the field, as well as to obtain information about the type and variety of environmental problems experienced by the community in the tofu and tempeh industrial center in Krajan Village, the team used the area search method or also known as " Transect Walk ". The Transect Walk was carried out by the team together with key informants, namely local residents who knew about the history and conditions of the village while discussing with local residents who

were met. Through the Transect Walk method , the team can find out more information that is not obtained from the formal meeting process or regular Focus Group Discussion (FGD) (Haque, 2021) .

Figure 3. Students Together with Lecturers and Residents Carry Out a Transect Walk at the Location

Activity Evaluation and Reporting Stage

After the activity is completed, the team evaluates it so that the next community service activity can be better than before. Evaluation is carried out on both technical and non-technical matters so that in the next activity the constraints that arise in this activity can be properly anticipated. Furthermore, the team compiled a report on activities that had been carried out along with documentation, and published activities.

Figure 4. Photo with Community Service Team and Participants

RESULTS AND DISCUSSIONS

Benefits of Activities for Higher Education Institutions Christian University of Technology Solo (UKTS)

1. Carrying out one of the Tri Darma activities of Higher Education, namely Community Service (PKM);
2. Bringing tertiary institutions closer, especially the Environmental Engineering Study Program, Faculty of Engineering, Solo Christian University of Technology (UKTS) to the community, especially the people in Surakarta City;
3. Establishment of mutually beneficial partnerships between Environmental Engineering Study Program Institutions, Faculty of Engineering, Solo Christian University of Technology (UKTS) and the community, especially those in the tofu and tempeh industrial centers in Krajan Village, Mojosongo, Surakarta ;
4. Train students to have a sense of empathy and concern for the surrounding community;
5. Train students ' *soft skills* , especially the ability to communicate with other people, the ability to solve real problems, and the ability to express opinions or ideas in public through presentation activities.

For the Tofu and Tempe Industry Center Community in Krajan Village

1. Communities are able to identify environmental problems that occur in their area and know what the root causes of these environmental problems are;
2. Communities gain new knowledge about appropriate technology that can help overcome environmental problems that occur in the tofu and tempe industry center, Krajan Village, Surakarta;
3. Communities have partners to consult and find solutions to the environmental problems they face.

CONCLUSIONS AND RECOMENDATIONS

This community service activity is carried out by the Environmental Engineering Study Program, Faculty of Engineering, Solo Christian University of Technology (UKTS). Through the dissemination of research results, students and lecturers were able to feel the benefits of the community in the tofu and tempeh industrial centers in Krajan Village, Mojosongo, Surakarta. Through the results of the research, a student named Virgianto Tara Ama was able to make participants understand that tofu waste water that is not treated and disposed of directly into the river can cause water pollution which results in bad odors, skin diseases, and ground water that is not suitable for drinking, while the research carried out conducted by Maria Yumima Banoet made the participants understand how to make eco-enzyme liquids from materials that are easy to obtain, as well as the benefits of eco-enzymes in overcoming surface water pollution by tofu industrial wastewater in Krajan Village. Through this activity students also get practical lessons that can hone their interpersonal skills, such as improving communication skills and teamwork and negotiation. Besides that, through this activity students are also more sensitive to pay attention to

the environment around them, care about other people, and are able to think critically to overcome the difficulties faced by society.

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