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BASIC WELDING TRAINING SMAW/MMA FOR UNDERGRADUATE STUDENTS OF MECHANICAL ENGINEERING, UNIVERSITAS UDAYANA

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ABSTRACT
There are many institutions, both government and private, which are engaged in welding education and training activities and provide certification of the level of expertise at the level of training attended. The great need in the field of welding has encouraged the Bali Land Transportation Polytechnic to take part in providing opportunities for the community, especially in this case, undergraduate students of Mechanical Engineering at Udayana University to carry out basic welding practices. At the higher education level, welding engineering courses are taught in several departments for both diploma and undergraduate degrees. For undergraduate mechanical engineering programs in general, welding engineering is one of the elective courses, so it can be said that not all mechanical engineering students gain practical experience in the field of welding. The aim of this activity is to provide skills in the field of SMAW/MMA welding to all participants. To support the sustainability of this activity, welding equipment has been donated so that it can be used according to needs. The output target achieved is to be published nationally in an accredited community service journal. The participants' responses to this activity were felt to be very useful and it is hoped that it can be held again in the future.

Keywords: basic welding; electric welding; manual metal arc; shield metal arc welding; welding equipments

INTRODUCTION
The field of metal joining is one of the most important areas in the production or manufacturing industry. The increasing use of metals, including steel, aluminium, and other types, is driving rapid advancements in metal joining technology. Metal joining skills, particularly welding, are highly in demand and quite popular among both the industrial sector and the business world. Knowledge of welding techniques can be acquired through formal education, professional training institutions, or through self-study and practice. The increasingly affordable prices of welding tools and equipment are significantly encouraging public interest in acquiring welding skills.Currently, the unemployment rate among university graduates and vocational high school students is quite high, partly due to the lack of skills mastered upon graduation (Budiyono, et al., 2021). The importance of community service programs, especially in welding training, is crucial in providing opportunities for the community to actively engage in developing welding skills. This is not only beneficial for job seekers in the welding field but also very useful for those in the community who intend to start a welding business.

At the higher education level, welding technology courses are taught in several departments, both for diploma and bachelor's degree programs. For general mechanical engineering bachelor's programs, welding technology is an elective course, so it can be said that not all mechanical engineering students gain practical experience in welding. The Bali Institute of Land Transport through its Higher Education Community Service activities aims to provide opportunities for interested students to participate in basic welding training. The goal of this activity is not only to train welding skills but also to provide welding equipment grants to support practical activities and achieve the best results. The expected outcome of this activity is to be nationally published in an accredited community service journal.

METHOD

The activity took place at the Production Engineering Laboratory, Department of Mechanical Engineering, Universitas Udayana, with participants being undergraduate students in Mechanical Engineering. The stages of the activity included:

1. Preparation of materials and installation of equipment.
   The materials included 3 mm steel plates and SMAW/MMA electric welding equipment.
2. Delivery of a brief lecture
   The lecture covered basic welding techniques.
3. Use of Personal Protective Equipment (PPE)
   The PPE used included aprons, welding goggles, and gloves.
4. Welding practice 1 G
   This started with setting up the welding equipment, maintaining arc stability, and ensuring the continuity of the weld..

During the practical implementation, the welding position used was type 1 G, which is the flat welding position (Groove Welds Plate).

RESULTS AND DISCUSSION

The Community Service activity in higher education aimed to foster cooperation between universities to enhance human resources and provide tangible benefits to the participants. Additionally, this activity opened opportunities for further collaborative activities through MoUs between universities, as mentioned by the Coordinator of the Bachelor of Mechanical Engineering Program and the Vice Dean III of the Faculty of Engineering at Udayana University. The continuity of these activities and the development of other partnership models are very positive aspects for Poltrada Bali to further develop in the future.

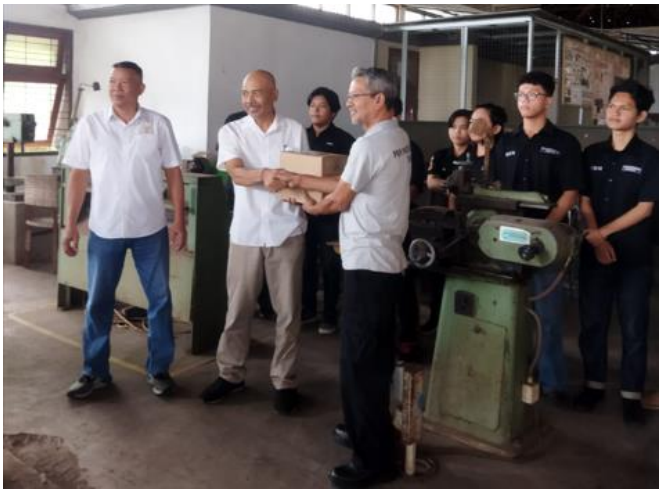

Figure 1. SMAW/MMA Welding Equipment Grant

The implementation of the basic welding training activity began with the donation of welding equipment, followed by the preparation of materials and the installation of tools. Setting the distance between the equipment was crucial to facilitate the instruction process among the participants. A brief introduction was provided, covering how to set up the equipment and the use of personal protective equipment to avoid the risk of workplace accidents.

Figure 2. Briefing and Wearing the Personal Protective Equipment (PPE)

The participants were divided into five groups to prepare themselves and take turns using personal protective equipment (PPE) and practising welding. During the practical session, participants were expected to maintain a stable welding arc and produce continuous weld beads.

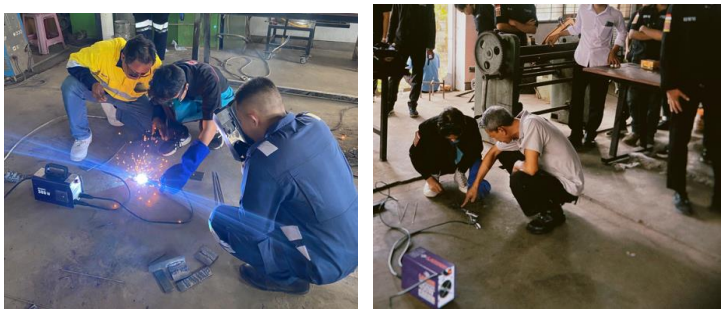

Figure 3. Welding Prectice

The welding position was performed in the flat position with type 1 G or Groove Welds Plate. In the following stages, participants were expected to understand the quality of the weld and become skilled in cleaning the weld. All participants were given clear step-by-step instructions and ample opportunity to practice until they could achieve a good quality weld.

Figure 4. Group Photo

CONCLUSION

The basic welding training activities were carried out successfully within the scheduled time. Participants practiced with enthusiasm and provided positive testimonials regarding the benefits they had gained. All participants were able to effectively practise basic SMAW/MMA welding in the 1 G position, achieving a high quality of weld.

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