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Enhancing the competency of vocational students through 3D CAD training using Solidworks

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ABSTRACT

Computer-aided design (CAD) is one of the competencies taught to vocational students. The software commonly used is AutoCAD, which focuses on constructing two-dimensional (2D) drawings. AutoCAD can also create three-dimensional (3D) drawings, but its features are limited. Based on these conditions, through community service activities, Politeknik Kampar improves the competence of students of SMK Negeri 1 Bangkinang Kota, Department of Mechanical Engineering. This activity aims to strengthen the CAD competence of vocational students using Solidworks software. The results of the training activities show the level of success with indications of a positive response from the participants and the participant's understanding of the material being taught.

ABSTRAK

Computer-aided design (CAD) merupakan salah satu kompetensi yang diajarkan kepada siswa smk. Software yang biasa digunakan adalah AutoCAD yang fokus pada konstruksi gambar dua dimensi (2D). AutoCAD juga dapat digunakan untuk membuat Gambar tiga dimesnsi (3D), tetapi fiturnya sangat terbatas. Berdasarkan kondisi tersebut, Politeknik Kampar turut serta dalam meningkatkan kompetensi siswa SMK Negeri 1 Bangkinang Kota, Jurusan Teknik Pemesinan melalui kegiatan pengabdian kepada masyarakat. Tujuan kegiatan ini adalah untuk meningkatkan kompetensi CAD dari siswa smk menggunakan software Solidworks. Hasil kegiatan pelatihan menunjukkan tingkat keberhasilan dengan indikasi adanya adanya respon yang positif dari peserta serta pemahaman peserta terhadap materi yang diajarkan.

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1. Introduction

Vocational high schools provide practical experience to their students to create a skilled and experienced workforce. Vocational terms relate to skills and experience. Vocational schools can also be specific skill-based education that develops students' expertise in particular fields. Vocational high school students need some experience in specific skills when completing their studies at school. Generally, high school students in the mechanical engineering department are equipped with mechanical skills such as turning, milling, and welding [1] and automotive repair skills [2]. However, mechanical ability must be complemented by design ability. One of the expected design skills is the ability to draw techniques using computer-aided design (CAD) [3-5].

CAD is one of the main competencies that must be mastered by vocational students, especially vocational students in the Mechanical Engineering Department. CAD is a computer program for drawing a product part. The product you want to draw can be represented by lines or symbols with a specific meaning. CAD can be in the form of two-dimensional drawings and or three-dimensional drawings [4-5]. The software commonly used for drawing is AutoCAD. AutoCAD software focuses more on two-dimensional (2D) drawings. AutoCAD has minimal features in producing three-dimensional (3D) images. Meanwhile, product design must show the actual shape before the mechanical manufacturing process in 3D form. Therefore, it is needed to increase the ability to design in the form of 3D products.

Apart from AutoCAD software, Solidworks is a CAD software with full 3D design features [6-7]. Solidworks is displayed in a more straightforward user interface but has broad functions. Solidworks can also be used for simulating a system's working mechanism and analyzing a product's quality or

mechanical properties [8-9]. Simulation can be used to minimize or avoid the risk of failure in product manufacturing to produce time and cost efficiencies.

Politeknik Kampar, as a vocational education institution, is a place for preparing the nation's young generation who are independent and ready to work in the world of work. Based on these problems, the Department of Machine Maintenance and Repair at Politeknik Kampar wants to participate in improving the competence of vocational students, especially students of SMK Negeri 1 Bangkinang Kota, through community service activities by providing CAD training using Solidworks for students at SMK Negeri 1 Bangkinang Kota. This training was conducted to increase CAD competence from vocational students, especially using Solidworks to draw 3D-shaped objects, in addition to the AutoCAD competencies that students already get at school.

2. Method

2.1. Preparation

Implementing this community service activity in 3D CAD training using Solidworks begins with preparing materials, assignment letters, discussion of materials by the team, and preparation of activity plans. The critical thing in this preparatory period is to survey SMK Negeri 1 Bangkingan Kota as a partner to meet and discuss with teachers at the school.

2.2. Implementation

The implementation of this service activity is carried out in two stages. The first stage is delivering theoretical material, and the second is practical activities. Educational material is needed to provide basic knowledge to trainees about the basic principles of CAD using Solidworks software. This activity is shown in Figure 1. A suitable material is used in this training so that participants can directly operate and apply the CAD knowledge they have been given. Practical activities are shown in Figure 2.

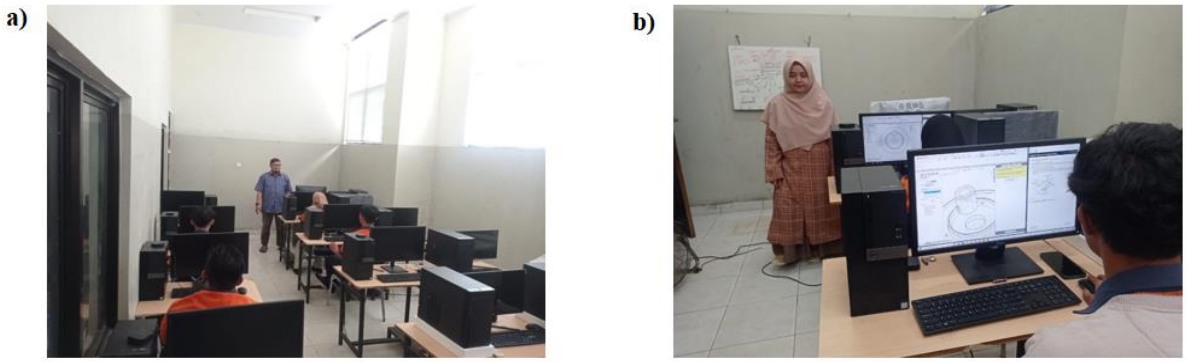

Figure 1. (a) Opening of training activities; (b) Giving theoretical material.

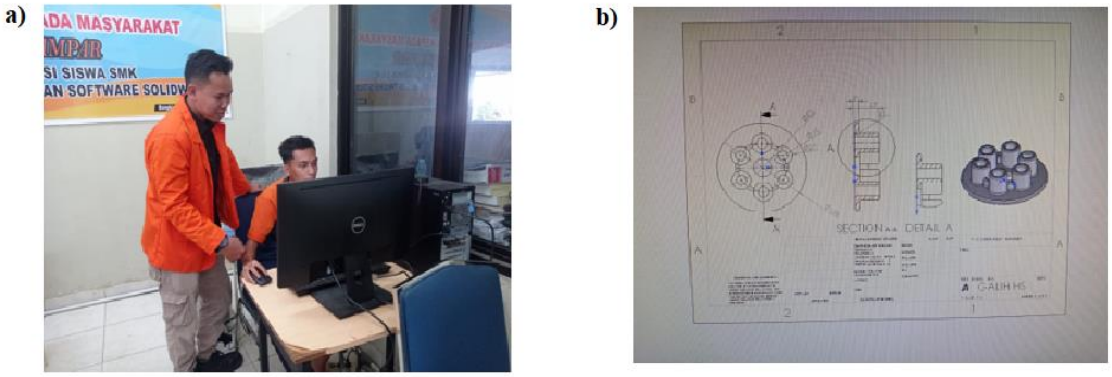

Figure 2. (a) practical activities by participants; (b) The practical results of the participants.

2.3. Evaluation

Evaluation of activities is carried out during the training process and after the training. Evaluation is carried out on the aspect of achieving the training objectives and also the implementation of the activity. The evaluation was carried out through questionnaires and instructor assessment of the participants. Proficiency in operating Solidworks is an indicator of success in implementing this CAD training.

3. Results and Discussion

3.1. Community service activities

This community service activity involves collaboration between agencies, namely the Center for Research and Community Service, the Department of Machine Maintenance and Repair, Politeknik Kampar, and SMK Negeri 1 Bangkinang Kota, as partners. The Department of Machine Maintenance and Repair, Politeknik Kampar, is supported by quality and professional human resources and complete and adequate facilities and infrastructure to help this training activity. The facilities and infrastructure in the Department of Machinery Maintenance and Repair, Politeknik Kampar, are comfortable classrooms for theoretical training, have professional and experienced lecturers and technicians, and have complete facilities, namely personal computers (PCs) equipped with Solidworks.

Meanwhile, the potential possessed by SMK Negeri 1 Bangkinang Kota students who participated in this activity was a strong will and ability to receive training to improve skills and competence. This form of collaboration will present strategic and positive synergy between higher education institutions and the community around the Politeknik Kampar. The community, in this case, are students of SMK Negeri 1 Bangkinang Kota who have received training to improve their competency in CAD skills using Solidworks. Through this activity, Politeknik Kampar plays a fundamental role in efforts to strengthen community skills through skills improvement training.

3.2. Implementation of community service activities

The training activities were held on November 23-24, 2022. These training activities ran smoothly. The training participants looked enthusiastic about the training material provided. The response can be seen from the beginning to the end of the event; all participants followed well. The training participants were directly confronted with the computer, and the instructor introduced the participants to the 3D Solidworks CAD software. The instructor teaches the procedures and steps in drawing techniques using Solidworks and immediately practices by making workpieces according to the guidelines provided. After the participants were proficient, the participants were given an instructor assignment in which the participants had to make a technical drawing of a product produced by students of the Department of Machine Maintenance and Repair, Politeknik Kampar.

3.3. Evaluation of activity results

Community service activities are evaluated during the training process, and training results in achieving training objectives and implementation. Process evaluation is carried out by assessing the training participants by the instructor. Indicators of success in implementing 3D CAD training using Solidworks include mastery of the features used in Solidworks and proficiency in drawing products using Solidworks.

3.4. Supporting factors

Supporting factors in this community service activity are the availability of personal computer (PC) equipment equipped with Solidworks, the curiosity and willingness of the participants, who are pretty significant for 3D CAD training using Solidworks, as well as the enthusiasm and active participation of the activity participants in participating in CAD activities. 3D using Solidworks.

3.5. Inhibiting factors

The inhibiting factors in this community service activity are the short timeframe for carrying out this activity so that the preparation for the implementation of the activity is not optimal, the participant's lack of discipline so that time cannot be used optimally, and the participant's lack of knowledge about using Solidworks.

4. Conclusion

Skills training activities using Solidworks at Politeknik Kampar with the implementing team of the Department of Machine Maintenance and Repair. This training activity was carried out using a combination of methods, namely the delivery of theoretical material related to CAD and Solidworks, demonstrations by the implementing team, and hands-on practice by the participants. The implementation of this training activity went well, based on the observation that the enthusiasm and participation of the participants were relatively high. Some of the obstacles came from the participants, namely the need for more knowledge and discipline.

REFERENCE

[1] Romiyadi, R., Febrianton, A., & Mustika, W. S. (2022). Pembinaan remaja putus sekolah melalui pelatihan keterampilan pengelasan SMAW. *Journal of Community Service in Science and Engineering (JoCSE)*, vol. 1, no. 1, pp. 5-8.

[2] Sugiarto, T., Amin, B., Purwanto, W., Arif, A., & Putra, D. (2019). Peningkatan kompetensi guru dan siswa SMK melalui pelatihan kompetensi kejuruan teknologi otomotif. *Invotek: Jurnal Inovasi Vokasional dan Teknologi*, vol. 19, no. 1, pp. 25-34.

[3] Lapisa, R., Basri, I., Arif, A., & Saputra, H. (2017). Peningkatan kompetensi siswa melalui pelatihan AutoCAD. *Invotek: Jurnal Inovasi Vokasional dan Teknologi*, vol. 17, no. 2, pp. 119-126.

[4] Akhmadi, A. N., Qurohman., M. T., & Syarifudin, S. (2018). Peningkatan kompetensi AutoCAD bagi siswa SMK Ma'arif NU Talang Kabupaten Tegal. *Jurnal Abdimas PHB*, vol. 1, no. 1, pp. 15-21.

[5] Rendi, R., Arifin, J., Herlina, F., Ihsan, S., Hartadi, B., & Syahrillah, G. R. F. (2020). Meningkatkan keterampilan guru SMK menggunakan aplikasi CAD di SMK Isam Sabilal Muhtadin. *Jurnal Pengabdian Al-Ikhlas*, vol. 6, no. 1, pp. 31-36

[6] Afnison, W., & Alwi, E. (2020). Program pelatihan CAD "Solidworks" bagi guru SMKN 2 Payakumbuh sebagai upaya peningkatan kompetensi dan daya saing SMK daerah di tingkat nasional. *Suluah Bendang: Jurnal Ilmiah Pengabdian kepada Masyarakat*, vol. 20, no. 1, pp. 10-20.

[7] Rabbika, A. I., Nugraha, M. H., Widyantoro., Rohman, A., & Fauzi, W. M. (2023). Pelatihan dasar computer-aided design (CAD) pada guru produktif SMK Negeri Manonjaya Kabupaten Tasikmalaya. *Kreatif: Jurnal Pengabdian Masyarakat Sains dan Teknologi*, vol. 1, no. 1, pp. 07-12.

[8] Jalaali, B., Kumolosari, E., & Dinaryanto, O. (2023). Implementasi program peningkatan kompetensi siswa SMK melalui pelatihan CAD dan CFD serta evaluasi berbasis Key Performance Indicator. *Kacanegara Jurnal Pengabdian pada Masyarakat*, vol. 6, no. 1, pp. 89-98.

[9] Lestari, W. D., Edahwati, L., & Adyono, N. (2022). Pelatihan CAD static simulation menggunakan Solidworks di SMK Turen Malang. *E-Dimas: Jurnal Pengabdian kepada Masyarakat*, vol. 13, no. 4, pp. 757-761.

[10] Drastiawati, N. S., Susanti, N. A., Ningsih, T. H., Wulandari, D., & Ganda, A. N. F. (2020). Pelatihan Solidwork sebagai upaya meningkatkan kemampuan teknik menggambar bagi siswa SMKN. *JCES (Journal of Character Education Society)*, vol. 3, no. 3, pp. 439-448.