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Increasing Student Competency Through Catia V5 Software Training

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Abstract

The current era demands that all aspects of engineering be carried out automatically, including creating technical drawings, which were previously done manually, now being replaced with drawings using CAD (Computer Aided Design) software, which offers automatic drawings. This problem impacts the industrial world, which requires skilled workers in the field of design. In the manufacturing industry, Catia V5 is widely used in product designs because it is faster and easier to use than paper and drawing tools. This Catia V5 Software training aims to improve students' 2D and 3D drawing abilities. This activity was done online in 6 meetings via the Zoom Meeting application. The impact of the success of this program is in the form of increasing students' knowledge and understanding of 2D and 3D sketching via Catia V5 and being able to operate the features of Catia V5.

Keywords: Catia V5, Competencies, Engineering, Training

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1. Introduction

Indonesia is one of the countries affected by the COVID-19 pandemic. Education in Indonesia is also one of the fields affected by the COVID-19 pandemic (Aeni, 2021; Bahtiar, 2021; Dewi, 2020). In addition to maintaining distance, education in Indonesia also issued a policy to close schools and replace the teaching and learning process with an online system.

In the context of education, educational institutions need to prepare students with relevant skills required by the industry when they graduate (Abdurakhman & Rusli, 2015; Arifuddin et al., 2022). Technical and vocational education (T&E) is very important in meeting these demands. The existence of a government policy to conduct online learning can provide benefits to mastering technological advances (Cholik, 2021).

The current era demands that all aspects of engineering or technology be automated. This development also occurs in the engineering design process. Engineering drawings that were originally done manually began to be abandoned and replaced by making drawings using CAD (Computer Aided Design) software that offers automatic drawing creation (Afnison & Alwi, 2019; Bintara et al., 2021). The variety of software for making engineering drawings varies, including AutoDesk Inventor, AutoCAD, Solidworks, ProEng, Catia V5, and so on.

As a result, the industry requires a workforce that is skilled in design. One of the indispensable technical skills in various industries is using 3D design and modeling software, such as Catia V5 (Communier et al., 2015; Tickoo, 2018). Catia V5 is a software used in product design, engineering, and manufacturing and has become a standard in many industries, including automotive, aerospace, and general manufacturing. In the manufacturing industry, Catia V5 is widely used in product designs because it is faster and easier to use than paper media and drawing tools (Fadhilah et al., 2021; Saputra, 2019).

Catia V5 is a computer program developed by a well-known IBM software company. This program is widely used for engineering purposes because of its excellent features for performing CAD (Computer Aided Design), CAM (Computer Aided Manufacture), and CAE (Computer Aided Engineering) (Garg & Baliyan, 2021). Another advantage of Catia V5 is that it can analyze the strength of a design and present it in an attractive 3D form. Making a frame model using the Catia V5 program will greatly assist the team in getting a 3D visualization of the frame. In contrast, the frame strength analysis is very useful in determining the type of material and design improvement efforts.

Based on the author's observations of several schools, it is rare for schools to teach Catia V5 to their students. Although not taught and not included in the school curriculum, understanding 2D and 3D design is very important to learn. Therefore, the author conducted a service activity through Catia V5 training to improve skills in 2D and 3D drawings. Besides being used to create 2D and 3D models, Catia V5 software is also used to analyze the strength of design construction (Artana et al., 2022; Basori & Rudianto, 2014). This strength test aims to select the appropriate material thickness. The material selection is not too thick, so it is not expensive but still strong.

This community service program is conducted by introducing and providing training in using Catia V5 software to produce technical drawings (Communier et al., 2015; Lukman et al., 2018). The mastery of CAD by teachers and technicians will help students to have superior competencies. These advantages can be used to compete in the labor market. Mastery of this software can also be a reference for young people, especially students and technicians, to learn other software brands. The general impact can improve the quality of human resources of the nation and state in the arena of global competition. In order to improve student competence through Catia V5 training, there needs to be good planning and cooperation between educational institutions, industry and government. The training should be designed comprehensively to ensure that students truly master and apply the software in a real-world context. Thus, Catia V5 training can be an important step in preparing young people for success in the ever-changing and evolving world of work.

2. Implementation

This activity is the main work program of implementing Community Service (PKM), carried out for 6 days.
- At the first meeting, on March 1, 2022, participants were given material on introducing the function and use of basic tools in the 2D sketch menu and creating 3D parts using the circle feature.

- At the second meeting, on March 2, 2022, 10 participants attended. Participants were taught to use 2D features, namely circles, and 3D features, namely multi-pads.
- In the third meeting, on March 4, 2022, 10 participants attended. Participants were taught to use 2D features, namely lines and circles. Participants are also taught to use 3D features: shaft, circular pattern, and pocket.
- At the fourth meeting, on March 7, 2022, there were 10 participants. Participants were taught to use 2D features, namely circles and rectangles.
- The fifth meeting, as shown in Figure 4, results from Catia V5 training held on March 8, 2022, with 10 participants attending. Participants were taught to use 2D features: line, circle, project 3D element, and quick trim.
- At the sixth or final meeting, on March 9, 10 participants attended. Participants were taught to use 2D features: line, circle, rectangle, and corner. Participants were also taught to use 3D features, namely shaft, pocket, and mirror.

The implementation of community service related to increasing youth competence through Catia V5 software training is carried out online through the Zoom meeting application in 6 meetings with a discussion of different materials at each meeting with Catia V5 training materials in the form of

1. Basic socialization of Catia V5
2. 2D (Circle) and 3D (Multi Pad) Features
3. 2D (Line) and 3D (Shaft, Circular Pattern, and Pocket) Features
4. 2D (Rectangle) and 3D (Mirror) features
5. 2D features of Line, Circle, Project 3D Element, and Quick Trim
6. Advanced Assistance for Catia V5 Training

Community service activities apply the training method in community service activities through demonstrations or pilots for realization (Basri et al., 2022). The equipment used for training and demo practice of making drawings for 3D Printing machines is the CADCAM software called Catia V5 (Tickoo, 2018).

3. Results

The implementation of the Catia V5 software training program was carried out starting on February 28, 2022, starting with creating a WhatsApp group as a communication medium and providing modules in the form of Catia V5 software material. Then, on March 1-9, 2022, online training was conducted using the Zoom meeting application with target participants of students aged 16-18 years in Mangunjaya Village, Bekasi Regency, West Java. The series of activities during the program is running as shown in chart 1, as follows pn *software*.
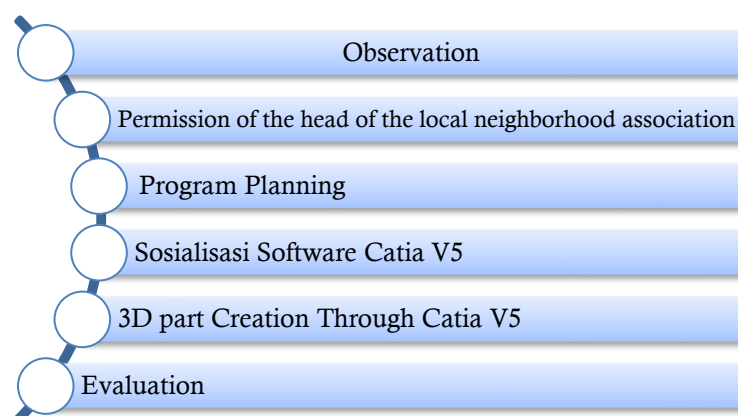

Observation

Permission of the head of the local neighborhood association

Program Planning

Sosialisasi Software Catia V5

3D part Creation Through Catia V5

Evaluation

Figure 1. Program Implementation Stage

Community service activities related to increasing student competence through Catia V5 training were conducted for 6 days. At the first meeting, on March 1, 2022, participants were given material on introducing the function and use of basic tools in the 2D sketch menu and creating 3D parts

using the circle feature. In this section, the author explains one by one related to the features contained in the 2D sketch menu, such as creating horizontal and vertical straight lines using the line feature, creating circles using the circle feature, giving dimensions or sizes using the constraining feature, and creating squares and several other flat shapes using the rectangle feature. After introducing 2D sketches, it is continued by explaining the features contained in the 3D toolbar and taught to convert 2D sketches that have been made into 3D parts using the pad feature (Lukman et al., 2018).

At the second meeting, on March 2, 2022, 10 participants attended. Participants were taught to use 2D features, namely circles, and 3D features, namely multi-pads. The difference between a pad and a multi-pad is that a pad is used for 1 plane or 1 thickness only, like the first exercise. The multi-pad is used for 3 planes or 3 thicknesses, each different (Azharul & Fadel, 2020), as seen in Figure 2. The multi-pad is used for 3 fields or 3 thicknesses, each different (Azharul & Fadel, 2020), as seen in Figure 2. During the meeting, participants are given time to work and for the results to be sent in the form of photos, screenshots, or parts in the WhatsApp group as follows At the third meeting, precisely on March 4 2022, there were 10 participants. Participants are taught to use 2D features, namely lines and circles. Participants are also taught to use 3D features: shaft, circular pattern, and pocket. Shafts are used to create 3D images by rotating about their central axis. Circular pattern reproduces objects in a circular direction by selecting the object you want to reproduce. Pocket is used to reduce or remove 3D shapes according to the shape of the sketch created previously (Nuâ et al., 2017).

At the fourth meeting, precisely on March 7 2022, there were 10 participants. Participants are taught to use 2D features, namely circles and rectangles. Participants are also taught to use 3D features, namely pad, pocket, and mirror. Mirrors reflect image objects with lines or axes assumed to be mirrors. During the meeting, participants are given time to work on it, and the results are sent in the form of photos sc,reenshots, or parts to the WhatsApp group to achieve the objectives of this training. The following is a documentation session on training activities for making 2D sketches into 3D parts, as seen in Figure 3.
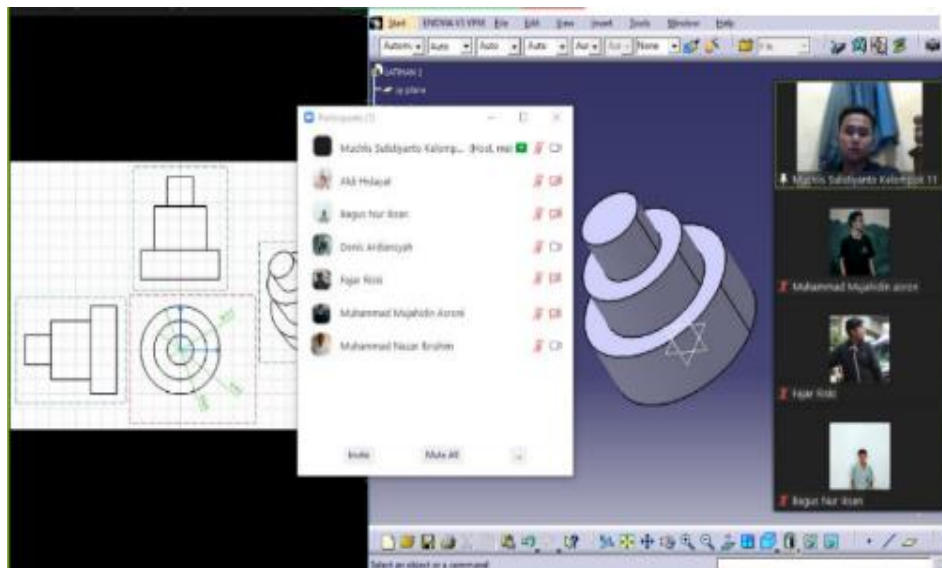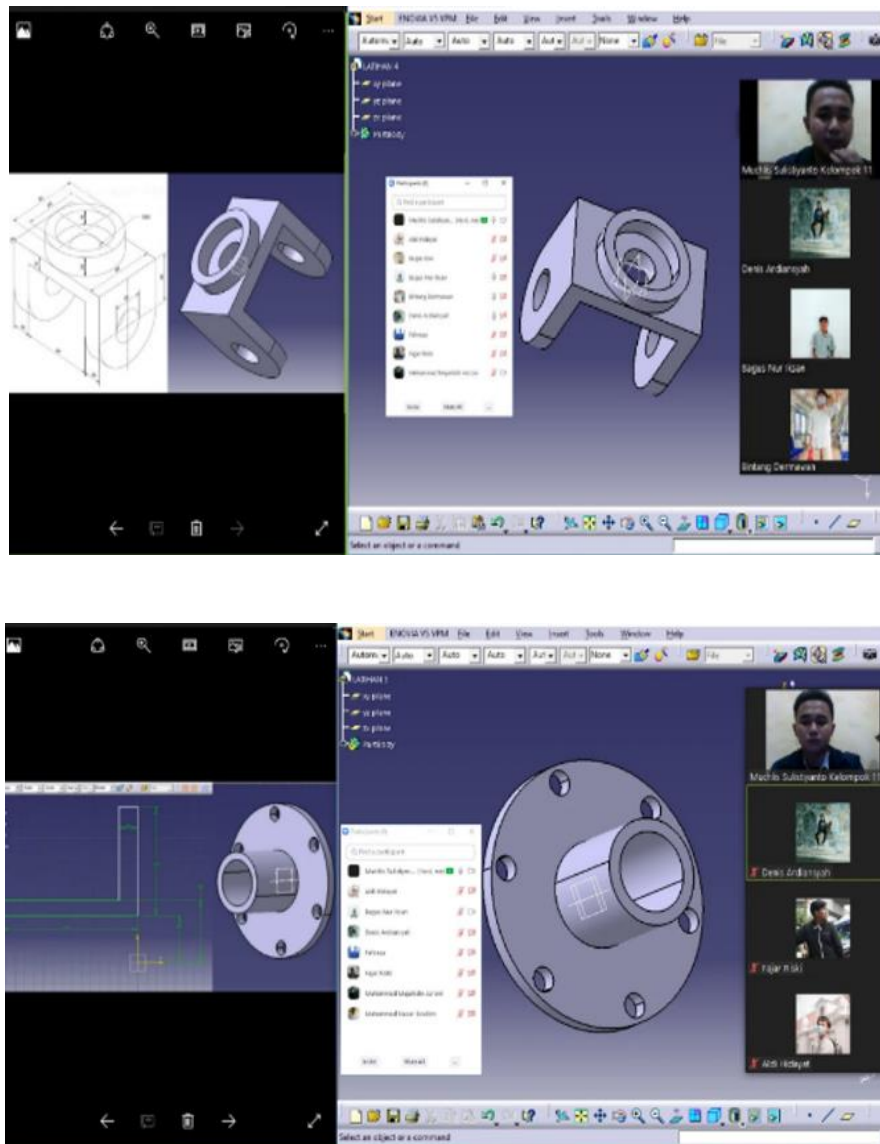
Figure 2 Socialization of Catia V5 Device Introduction

The fifth meeting, shown in Figure 4, results from Catia V5 training held on March 8, 2022, with 10 participants attending. Participants were taught to use 2D features: line, circle, project 3D element, and quick trim. Participants were also taught to use 3D features, namely pads. Project 3D element is used to create auxiliary lines. Quick trim is used to cut parts of objects that have boundaries. Meeting On the sixth or last meeting, on March 9, 10 participants attended. Participants were taught to use 2D features: line, circle, rectangle, and corner. Participants were also taught to use 3D features, namely shaft, pocket, and mirror. The corner used for The fifth meeting, as shown in Figure 4, is the result of Catia V5 training held on March 8, 2022, with 10 participants attending. Participants were taught to use 2D features: line, circle, project 3D element, and quick trim. Participants were also taught to use 3D features, namely pads. Project 3D element is used to create auxiliary lines. Quick trim is used to cut parts of objects that have boundaries. Meeting On the sixth or last meeting, on March 9, 10 participants attended. Participants were taught to use 2D features: line, circle, rectangle, and corner. Participants are also taught to use 3D features, namely shaft, pocket, and mirror. The corner gives radius or curvature to an angle formed by two objects (Dewangga & Yamin, 2021).

4. Discussion and Benefits
The participants of this development and training are young students interested in building technology using SLA 3D printing machines. The participants' enthusiasm was quite large as

evidenced by the number of participants and the many questions the speaker gave in the next session. The number of Catia V5 software training participants was 10 participants. The age category of 16-18 years old with different school names. After the delivery of the material, discussions and evaluations were held in the form of answering several questions on the Goggle Form format, the questions were related to testing how much the participants could understand the material provided at this briefing and training. Evaluation of the level of achievement of results, including impact, benefits of activities, benchmarks or tests used, before and after community service activities. The assessment of the level of achievement is given a value on a scale of 1 to 5, where the meaning of the scale can be seen in Table 1.
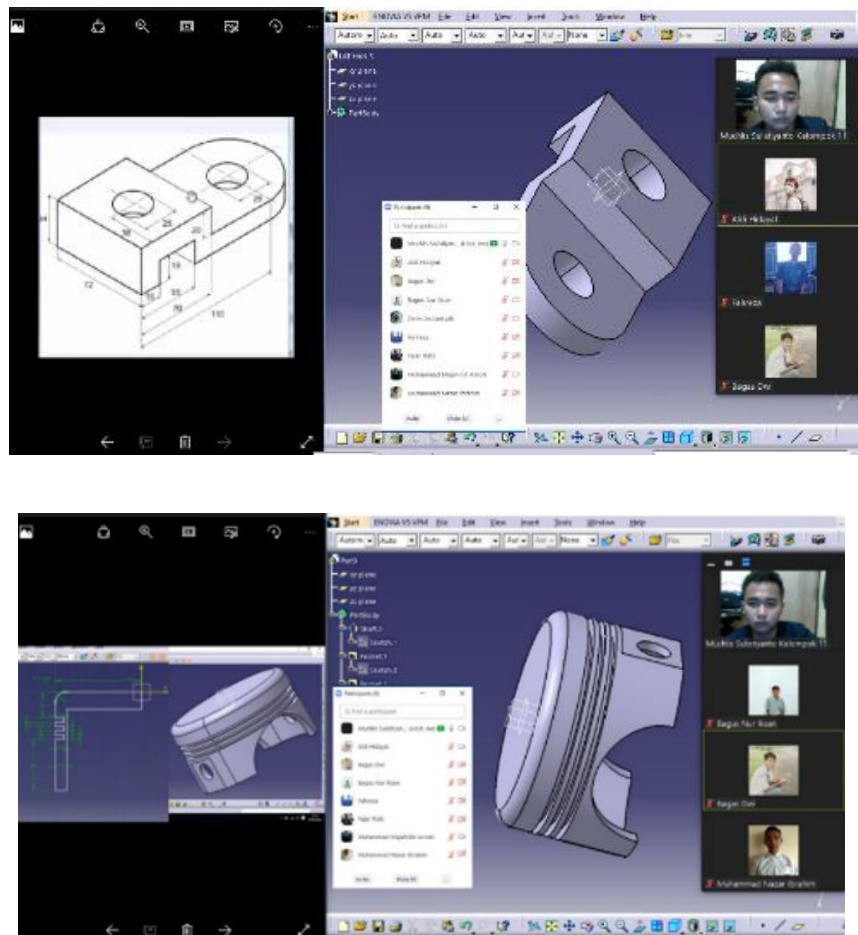

Figure 3 Socialization of Catia V5 Device Introduction

Table 1. Evaluation Rating Scale

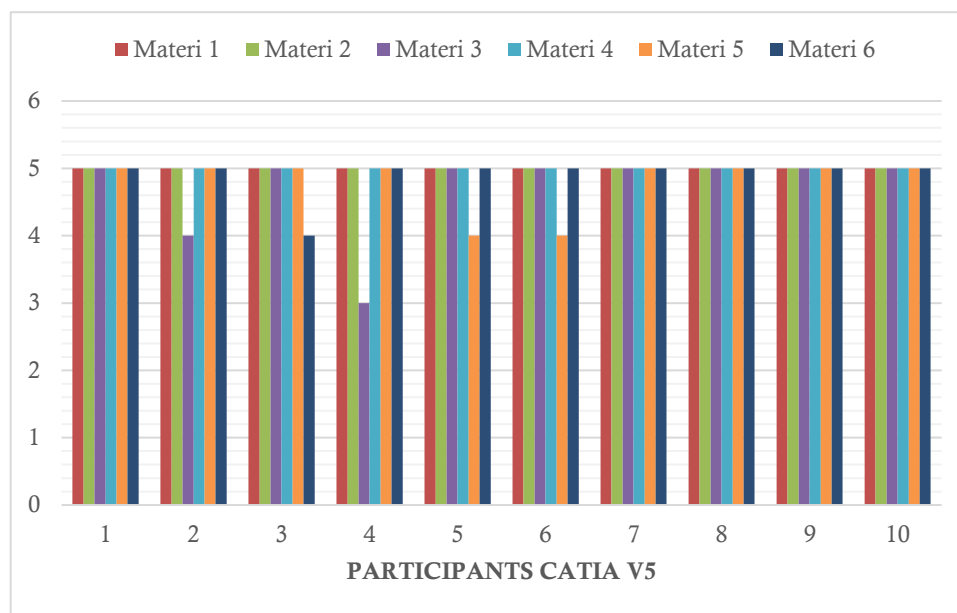| No	Answer Accuary (%)	Value	Category
1	1- 19	1	Very Unclear
2	20 - 39	2	Not clear
3	40 – 59	3	Clear Enough
4	60 – 79	4	Clear
5	80 - 100	5	Very Clear

Figure 4. Graph of Service Participants' Understanding of Training Materials

Based on the value of the bar chart graph in Figure 5, it can be seen that the evaluation results of the material regarding the design of almost all participants understand the material obtained between scores 4 and 5 or in the clear and very clear categories. This result shows that the implementation of this community service has been right on target and fulfills its objectives. The next community service is expected to be in conditions free from the pandemic so that it can be done offline or face-to-face. Some participants also began to ask intensely about the possibility of a further Catia V5 software mentoring program related to the theme of this community service.

5. Conclusion
Based on the program to improve student competence through Catia V5 training, it is concluded that this community service activity has an impact, namely: (1) Increase students' knowledge and understanding of 2D sketches and 3D parts made using Catia V5 and (2) Students can operate and recognize the basic features in Catia V5.

Recommendations
The author can suggest integrating Catia V5 into the formal education curriculum, especially in engineering and vocational programs, because, at this time, many companies require design skills. In the future, this activity should involve more participants from various students throughout Indonesia.

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