Online Workshop with Service Learning Method to Meet the Needs of Tinkercad Users from the Engineering Field

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Abstract

The COVID-19 pandemic has greatly affected the learning process in practice, especially for people in the engineering field. Activities stopped and learning activities become very obstructed for a long time. Tinkercad is a simulator application that could be used as a learning tool or medium in engineering. The service learning method is used as a way of teaching and learning that links positive and meaningful action in society. Service learning uses demonstrations and experiments are used to transfer knowledge to society. A workshop elaborating the use of Tinkercad based on the service learning method was carried out online through community service activities to meet community needs in the engineering field. The workshop results showed that the service learning method was sufficient to help the community to meet the learning needs of engineering practices. A thorough demonstrations by instructors and experiments done by participants guided by assistants, produced a satisfactory result for more than 90% of the workshop participants. Periodic literacy provision was a follow-up to improve the abilities of all participants who have take part in workshop activities.

Keywords: COVID-19, practice, service learning, Tinkercad, workshop

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Introduction

The Indonesian government confirmed its first case of COVID-19 on March 2, 2020, although there had been some speculation that COVID-19 had already entered Indonesia prior to that time. This outbreak was declared a global health emergency (S. A. Putri et al., 2020). The spread of the virus which had increased and expanded over time had resulted in this condition being declared a pandemic by the World Health Organization (WHO). The pandemic condition had hampered all human daily activities. The Indonesian government had to take many steps and policies to overcome this pandemic problem. One of the first steps taken by the government was to disseminate information about the social distancing procedure to the community (R. N. Putri et al., 2020).

The COVID-19 pandemic has had impacts and constraints on the world of education and the learning process, especially learning processes that must be carried out in practice. This has also greatly impacted education and training for the community in engineering fields. Activities become stalled and learning activities become very hampered for quite a long time. However, with the passage of time and the emergence of many needs, learning applications were developing rapidly to overcome many problems, including practical learning. Web-based programming helps people to use and utilize various supporting applications so that people can still do learning with ease. Practice can be done in front of a computer screen using some kind of software.

Tinkercad is a computer-aided design (CAD) software program that assists individuals and organizations in the manufacturing industries and promotion. Tinkercad also serves the healthcare and architecture sectors. Tinkercad can create 3D designs that are important in prototyping (Abburi et al., 2021). Tinkercad can also be used as a learning tool or media for people who want to build an electronics project but in a simulated manner (without using physical tools) (Kelly, 2014).

Service learning is a way of teaching and learning that connects positive and meaningful actions in society with academic learning, personal development, and responsibility as a citizen (Nusanti, 2014). Demonstrations are used to clarify an understanding or to show the learning process (Gany et al., 2020). The implementation of service learning is more real if it is equipped with experiments through joint activities doing exercises or experiments to find out the effect

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or consequences of an action (Oviana & Maulidar, 2013). Therefore service learning through demonstrations and experiments is a more responsible step in transferring and developing knowledge, attitudes, values, and skills for the community.

Based on the background described earlier, community service during the COVID-19 pandemic for people who need online technical learning was provided through activities in the form of workshops (Sadikin & Hamidah, 2020; Hayati, 2020). The Tinkercad Workshop based on the service learning method applied through demonstrations and experiments was proposed in community service activities to meet community needs in the engineering field which was then carried out online via the internet.

Methods

The strategy undertaken to achieve the expected conditions based on service learning was a service method used in community service activities through Tinkercad workshops. This activity was carried out online to fulfill the needs of the engineering field. The service learning method can improve the service of providing learning materials in the engineering field so that it is more useful, especially because the implementation of this workshop had to be carried out online which has its own level of difficulty in the delivery of the learning process.

The service learning method was applied in this community service activity in the form of providing material with demonstrations. Demonstrations were given in the form of case examples that showed the use of Tinkercad as a fulfillment of engineering needs which made it very easy in the form of simulations that were perceived very close to real conditions. In addition, the service learning method was also demonstrated through joint experiments in small classes with special assistance. This becomes a community service strategy so that it is expected that the community can better understand the learning process provided.

There are several community service activities that have been carried out using the service learning method. One example is the implementation of the Peace Education course at Universitas Kristen Duta Wacana. In practice, there are four relevant communities as the subject of the course objectives. Through the implementation of these activities, it was found that service learning can be used as a learning process approach that integrates academic achievements and student character education (Setyowati & Permata, 2018). Another example

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of such community service activity is assisting in the preparation of metacognitive-based online teaching materials by the Master of Education in the Indonesian Language, a study program of IKIP Siliwangi. This activity was carried out in three stages, namely the preparation stage, the service stage, and the reflection stage. Participants in this activity were junior and senior high school teachers in the Cianjur Regency Region (Mustika & Wikanengsih, 2021).

Tinkercad Circuit is a free open source web-based simulation program whose features can be utilized in addition to drawing 3D designs, it can also be used to design and simulate electronic circuits (Figure 1). Circuit processing using Tinkercad Circuit can be simulated first. Tinkercad also provides a simulation of the Arduino UNO component which can be programmed directly and is widely used in engineering for controlling electronic circuits. Service learning using Tinkercad is very appropriate for users in the engineering field because using Tinkercad will be safer and can avoid unwanted things but can represent actual conditions.
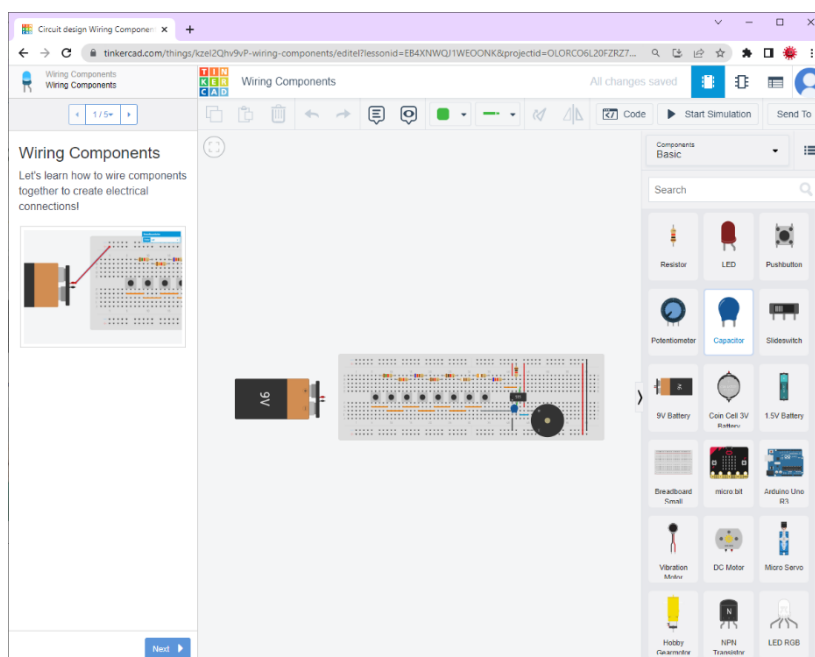

Fig. 1. Tinkercad web-based user interface
Source: https://www.tinkercad.com/

Results and Discussions

The workshop was held for two days including preparation and implementation. This activity was organized by the Faculty of Engineering and the Electrical Engineering Study Program at Universitas Kristen Maranatha in the event of the 55th Anniversary of the Faculty of Engineering. The workshop activities themed "3D design and programming using the online

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platform Autodesk Tinkercad". Preparatory stages were carried out to prepare assistant tutors, strategies for providing material, and how to implement it.

The service learning method was used as a reference in the implementation of this workshop activity. Beginning with defining the target participants from the technical community who would benefit from this activity, but did not rule out the possibility of other parties from other fields who were also interested. Invitations were given to technical schools, alumni, and also high schools (SMA) who also needed this workshop material for practicum. The instructors were people from the education community who are already experienced in using the Tinkercad program. A preparatory meeting was held with the committee and prospective teaching assistants to assist with the implementation of this workshop.

The service learning strategy provided to workshop participants was discussed in preparation for the workshop activities. The workshop activity began with several demonstrations starting from the how to run the Tinkercad application program, then the features available in the application, how to use them, and examples of Tinkercad use cases. Examples of use cases starting from electronic circuits and measuring instruments, the use of controllers using Arduino UNO, and 3D designs which are very much needed in practice in the engineering field.

To complement service learning, teaching assistants were given special tutorials and required to think about ways of service in the workshop so that all participants have the opportunity to experiment easily and comfortably accompanied by assistants. Tinkercad has features for certain users as teachers who can observe all student activities during learning activities. This makes it easier for workshop services to be provided and participants can be accompanied as students by teachers (in this case teaching assistants). Through this process of experimenting, it was hoped that all participants would gain practical experience through the service learning provided and ultimately help the engineering community to gain a better understanding.

The workshop was carried out with tutorials delivered by instructors and assisted by assistants. The purpose of the tutorial was to make the material easier to understand and to speed up the improvement of the ability of the participants in urgent practices. The tutoring method was carried out more intensively by providing case studies to each small group of participants so

that it is expected that it would be more beneficial for the participants to experience the assistance firsthand. Participants were also asked to share screens of work that had been made and corrected directly by the assistant. Usage examples were given live by the assistant and solutions were demonstrated practically (by experimenting).

The result of the community service activities in the form of workshops was a benchmark for the success of the service learning method provided. Initial survey was given before participants attending the workshop and post survey was given after attending the workshop to determine whether there was an increase in ability and the success of this workshop activity. In addition, a survey on online implementation was also carried out to measure and to find out the obstacles that occur during the learning process.
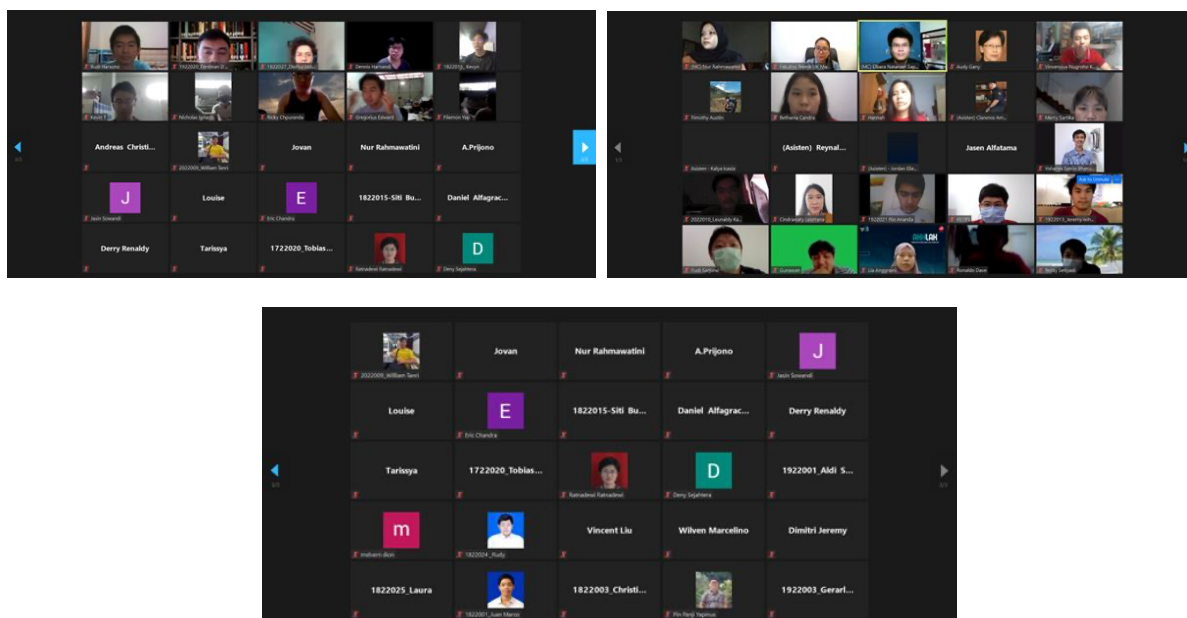

Fig. 2. Community service participants

The number of participants who took part in this activity was 60 people (Figure 2) with the majority of participants being male (83.3%) as shown in Figure 3(a). Generally, the participants were college students, engineering company employees, and engineering lecturers. Most of the participants had heard of Tinkercad, but their participation in this workshop indicated that there was a need to fulfill practical needs in a simulated manner, requiring in-depth learning (63.3%) as shown in Figure 3(b).

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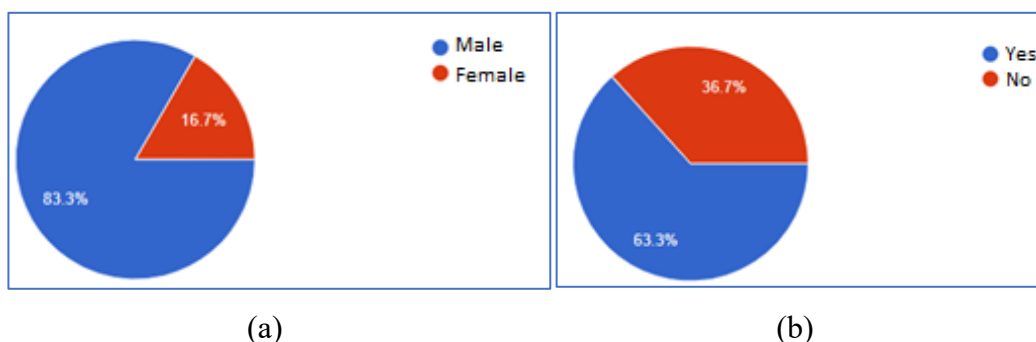
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(a)   (b)

Fig. 3. (a) Workshop participants (b) participants already know Tinkercad before attending the workshop

Table 1 shows that the workshop ran well. Service learning provided through demonstrations and experiments is very helpful for understanding practical Tinkercad learning. This analysis showed that based on the results of the assessment, more than 90% did not experience difficulty in asking questions, and the instructors, and especially assistants were considered very helpful. Meanwhile, 35% of participants experienced internet network connection problems.

Table 1. List of questions related to satisfaction during the workshop

Question	Yes	No
Is this online workshop easy for you to participate?	84%	16%
Do you have difficulty asking questions in this online workshop?	8%	92%
Are you having problems with your internet network connection while attending the workshop?	35%	65%
Assistant really helped you?	97%	3%
The tutor/instructor conveys the material well?	93%	7%
Does the material presented meet your expectations?	87%	13%

The results of the pre-test and post-test showed a slight increase. The average score for the pretest for 60 participants was 46, while the average score for the posttest for 60 participants was 57. There was an increase of 11 points after the workshop. The results of the analysis show that there is an increase in ability, although it is still small. It is possible that because the activities are practical in nature, they need to be carried out routinely, and the learning process is more intensive. In addition, it is possible that the internet connection is not good (only 65% is smooth), so the results of the workshop are not optimal.

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The results of the evaluation of this activity became a follow-up for the next activity. All participants would be periodically informed again and given more in-depth literacy according to practical needs in the field. Instructors and assistants obtained feedback from this activity to improve the tutoring process so that it would be more optimal and beneficial for the community, especially in the engineering field.

Conclusion

Community service activities through workshops using Tinkercad with the service-learning method were good enough to help the community meet their learning needs in the engineering field. This is indicated by the results of service-learning satisfaction provided by participants in this community service activity. Services through demonstrations by resourceful people and experiments guided by assistants carried out in small groups provide more than 90% satisfaction for workshop participants. There were contradictory results between the participants' answers and the results of the pre-test and post-test, which became an evaluation for the implementation of community service. Community service participants feel able to participate in literacy and the services provided well, and there has been an increase in their ability, although it is still small. Providing periodic literacy was a follow-up to improve the ability of all participants who took part in workshop activities.

Acknowledgements

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