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Learning Difficulties Faced by Students in Online Learning of CAD Software: Lessons from Covid-19 Pandemic

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ABSTRACT
Online learning has been implemented for theoretical courses in Universitas Negeri Padang since 2018, but online learning for practical courses was implemented only after the Covid-19 pandemic hit. Two of the practical courses at Civil Engineering Department that must be carried out online during the pandemic are Planning Drawing course for students of Building Engineering Education Study Program and CAD Application course for students of D-III Civil Engineering Study Program. Both of these courses teach students the skills of using CAD software for construction drawings. Although most students already had the learning facility (laptop), and the learning resources provided by lecturers are quite complete and varied, student learning outcomes were still not satisfactory. Using a mixed-methods approach, this study attempts to reveal the learning difficulties faced by students in online learning of CAD software. The results showed that students face varied difficulties in learning CAD software online. Accurately Reflect Learning was the highest learning difficulty factor experienced by students with a percentage of 46.2%, while Student Engagement was the lowest learning difficulty factor experienced by students with a percentage 24.68%.

Keywords: *Learning Difficulties, Online Learning, CAD Learning.*

1. INTRODUCTION

The COVID-19 pandemic in 2020-2021 had forced the government to temporarily close schools, cease face-to-face instruction, and implement physical distancing. Inevitably, university and schools were forced to migrate to full online learning. [1]

Online learning is learning that is carried out online, using learning applications and social networks. This method of learning is carried out without face-to-face meetings but through available *platforms.* All forms of study material are distributed online, communication is also carried out online, and tests are also carried out *online*. This online learning system is assisted by several applications, such as Google Classroom, Google Meet, Edmodo, and Zoom. [2]

In Universitas Negeri Padang, online learning has been implemented for theoretical courses since 2018, but online learning for practical courses was implemented only after the Covid-19 pandemic hit. Two of the practical courses at Civil Engineering Department that must be carried out online during the pandemic are Planning Drawing course for students of Building Engineering Education Study Program and CAD Application course for students of D-III Civil Engineering Study Program. Both of these courses teach students the skills of using CAD software for construction drawings. At the beginning, most lecturers are optimistic that students are already familiar with the online learning process. Most students had the learning facility (laptop & CAD software), and learning resources provided by lecturers are quite complete and varied

However, in reality, after 2 semesters of online learning, student learning outcomes were still not satisfactory. On interviews conducted with a lecturer of the course, it was stated that students' ability to master CAD software tended to be low. Students seemed less enthusiastic in practicing the material explained by lecturers in the modules and learning videos. According to the lecturer, modules are arranged in such a way to make it easier for students to learn an follow the step-by-step instruction. But when in online meeting (synchronous learning) the lecturer gave the students drawing assignments, quite a lot of students could not

finish the task. Those students do not understand the basic commands of CAD and how to use them.

Based on the facts described above, this study attempts to reveal the learning difficulties faced by students in online learning of CAD software.

1.1. Online Learning

Online learning is a program of organizing learning in a network to reach a broad target group. In the learning process it is not carried out face to face but uses electronic media to make it easier for students to learn anytime and anywhere as long as they have an internet network. Online learning uses multimedia technology, virtual classes, CD ROMs, video streaming, voice messages, email, and telephone conferences, animated online text and online video streaming. It provides effective learning methods, such as practicing with related feedback, combining collaborative activities with independent learning, personalizing learning based on student needs and using simulations and games [3].

1.2. Online Learning Characteristics

Characteristics of online learning are [4]:

a. Learning material is presented in the form of text, graphics, and various multimedia elements.
b. Communication takes place in video conferencing, chat rooms, or discussion forums.
c. Can use various CD-ROM-based learning elements to improve learning communication.
d. Teaching materials are relatively easy to update.
e. Increase interaction between students and educators.
f. Allows both formal and informal forms of learning communication.
g. Can use a wide variety of learning resources on the internet.

Rusma stated that the characteristics of e-learning learning are [5]:

a. Interactivity. Online learning must be interactive where the material presented to students makes participants interested and creates an interest in studying it more deeply.
b. Independence. Online learning must train students' independence in learning so that students can understand and solve the problems and phenomena they face.
c. Accessibility. Content from online learning must have features that are easy to access so that students can study it again if there are things that have not been understood.
a. Enrichment. The material contained in online learning must be based on the enrichment of students' knowledge which equips students with knowledge that is useful and relevant to the material being studied.

1.3. Difficulty Factors of CAD Online Learning

In learning CAD there are several challenges and difficulties that are important to pay attention to so that the learning process becomes meaningful. Beasley stated 10 factors of difficulty and challenges in learning CAD online as follows [6]:

a. Student Engagement. The presence and participation of students in learning affect the knowledge and understanding of students. This is influenced by the length of time allotted for learning, as well as students' efforts to be active in discussions and utilize learning resources from the campus, and also how the campus maximizes learning resources that can support learning.

b. Risk Taking. In learning CAD students should be allowed to take risks, such as making mistakes in their projects so they can learn. In the CAD learning principle, try and error is the key to success. Students should be allowed to do what they can. The demands to do something perfect should be reduced so that the pressure on students does not cause them to work only for grades.

c. Collaboration. The third difficulty factor in online CAD learning is the application of social aspects of education in the form of collaboration and teamwork. Lack of cooperation between students is usually caused by the pressure that requires them to compete with each other. In online learning, these what causes students tend to do projects individually, resulting in a lack of collaboration and cooperation with other students. In implementing online learning, students should be directed to collaborate with their friends rather than only interacting with software.

d. Government and Industry Participation. In order to thrive, online learning must integrate government and industry participation. The notion that government, can successfully develop, organize, and implement a online learning environment, identify and recruit specific organization and company involvement, and determine what content students should learn and how they should learn it is far from ideal. Online learning is an opportunity to solve the problems facing education today. The key to success in the online educational environment is the distributed, open-sourced work of the crowd, which is more intelligent, more diverse, and more effective than the work of the few.

e. Instructor's New Role. Online learning has changed the concept of traditional learning which is usually carried out in classrooms to technology-based distance learning. In this case, instructors/lecturers must be able to adapt their learning methods and styles to the needs of online learning. In online learning, learning is more student-centered, where it is usually instructor-centered. So that in online learning the role of the instructor changes to that of a facilitator in teaching. Instructors must be able to find solutions on how to keep learning meaningful.

f. Attractive Alternative to Traditional Learning. There are two main benefits of online learning for student: convenience and cost. Universities can expand their client base cheaply and effectively through online learning. But as a result of online implementation, students will experience difficulties in studying CAD in details, so alternatively they will look for CAD courses that are around their homes, but this will be difficult for students with a low economic level to get the facility. In addition, there is a perception that industry is not yet fully committed, and thus students with degrees or certifications from online environments may have difficulties finding a job.

g. Dynamic Course Content. Contents and materials provided for online learning must be dynamic so that they are not monotonous, continually revised and updated. Lecturers commonly encounter challenges related to the additional time to create module or material, as well as the associated costs. As an alternative, instructor can encourage students to participate in content creation, sharing the responsibility. Students can be incentivized to produce quality work by either intrinsic motivation, instructor directives, or external incentives.

h. Personal Learning Environment. In online learning, students have their own personal learning environment. In general, a personal learning environment is a very effective environment for students to do learning because it suits their needs. Moreover, in online learning many aspects are left to students to study independently. But in CAD learning where the principle is related to cognitive, psychology, visualization, design and user experience, this will have limitations that tend to interfere with learning. There are students who cannot perform well if they are not directly guided. Some students are weak in metacognitive so that they don't know what type of learning suits them, etc.

i. Utilizing Peer Reviews. Peer reviews are still very effective in online learning, especially since there are many applications that support online peer reviews. However, in its application to CAD learning, if peer review is applied, the assessment will vary greatly, especially since each student assesses based on his perspective (assessor's mood, preferences, level of difficulty in making an assessment, etc.).

j. Accurately Reflect Learning. The final challenge in online CAD learning is how to accurately assess learning. This challenge is underscored by the limitations of traditional grading systems, which offer students only a letter grade or certificate. For online learning students, a more detailed descriptor is crucial. This can later also be a benchmark for students in reviewing their weaknesses when learning. Current research on electronic portfolios often lacks the utilization of their full potential, emphasizing the need for portfolios to foster student reflection, organize historical data, and provide a comprehensive view of lifelong learning. This portfolio will encourage students to improve their competence.

2. METHODS

This study adopted a descriptive, mixed-methods approach to address the research questions. This approach allowed the researchers to collect data about students' experience in an online learning environment and to clearly understand the learning difficulties from their perspective. This study involved all 57 students of Building Engineering Education study program at Civil Engineering Departmen of Universitas Negeri Padang, who took Planning Drawing course that were conducted online during the pandemic in 2021. The students have been engaged in online learning in both synchronous and asynchronous mode.

The data were collected using a questionnaire to reveal the difficulty factors experienced by students, and in-depth interview to elaborate the reason of those difficulty factors. Sub-indicators of the questionnaire are 9 of the 10 learning difficulty factors proposed by Beasley, except for Government and Industry Participation factor. The questionnaire statements used a Likert scale with five alternative answers, from Strongly Agree to Strongly Disagree. The formula used to analyze data collected from questionnaire is the Degree of Achievement (DA) formula proposed by Lubis [7]. The result was then followed by detailed interview with a small number of respondents, in this case 7, to gain detailed insights from respondents [8].

3. RESULTS AND DISCUSSION

9 difficulty factors of CAD online learning were derived from the literature by Beasley. Questionnaire was distributed to the respondents by using Google Form. Results from data analysis are presented in Table 1 and Figure 1.

Table 1. Difficulty Factors and Level

Difficulty Factors	Difficulty Level
Student Engagement	24.68%
Risk Taking	25.05%
Collaboration	30.94%
Instructor's New Role	39.01%
Attractive Alternative to Traditional Learning	39.01%
Dynamic Course Content	28.13%
Personal Learning Environment	39.83%
Utilizing Peer Review	30.18%
Accurately Reflect Learning	46.20%

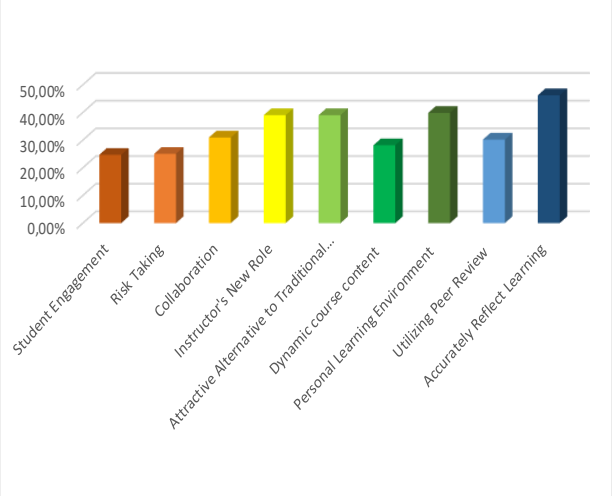

Figure 1. Difficulty Level

Table 1 as well as Figure 1 clearly showed the difficulty level of each factor. Follow-up in-depth interview give explanation of the reason behind the difficulty experienced by students.

Based on the data analysis, students face varied difficulties in learning CAD software online. Accurately Reflect Learning was the highest learning difficulty factor experienced by students with a percentage of 46.2%, while Student Engagement was the lowest learning difficulty factor experienced by students with a percentage 24.68%.

Follow-up interviews with respondents confirmed the difficulty factors experienced by students in learning CAD online and the reason behind that. For the Student Engagement factor, respondents said that they did not experience many difficulties attending and taking online classes, as well as taking time to practice. This is similar to the Risk Taking and Dynamic Course Content factors. Respondents stated that in online learning they were given the opportunity to make mistakes so that they could learn from those mistakes. Lecturers provided remedial opportunities for assignments and exams. The course content provided by lecturers was also varied and has accommodated students' different learning styles.

The two factors with the highest level of difficulty are Instructor's New Role and Accurately Reflect Learning. From the interview, an understanding was obtained that these two factors were related. In online learning, the role of the instructor changes to become a facilitator. However, students still need the role of lecturers as guide and validator, especially to ensure that students have taken the correct steps in drawing by using CAD software. This is due to the variety of learning resources provided by lecturers, with a variety of drawing techniques. In these various learning videos provided, there are many variations of steps that can be done for one task. Students need the lecturer's affirmation, which is the best step they can use to complete a task. In offline learning, discussions with friends can help students to accurately reflect/assess their learning. This is more difficult to do in online learning, which results in students having difficulty to accurately reflect their learning. Most students feel that they really need personal direct input from the lecturer, as that can usually be done in offline learning in the computer lab, to ensure that they have done the drawing steps correctly.

4. CONCLUSION

Based on the results of the study, it can be concluded that students of Civil Engineering at Universitas Negeri Padang experienced difficulties in learning CAD online. The highest level of difficulty was found in the Accurately Reflect Learning factor. In order to make online CAD learning more effective, lecturers need to find ways to assist students in assessing their learning; either through online discussions or affirmations in every material provided that there are indeed many drawing steps that can be used or chosen by students to complete their assignments.

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REFERENCES

[1] Barrot JS, Llenares II, Del Rosario LS. Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. Educ Inf Technol (Dordr). 2021, 26(6), pp. 7321-7338. doi: 10.1007/s10639-021-10589-x.

[2] Ivanova, T., Gubanova, N., Shakirova, I., & Masitoh, F. Educational technology as one of the terms for enhancing public speaking skills. Universidad y Sociedad, 2020, 12(2), pp. 154-159.

[3] Adhe, K. R. Pengembangan Media Pembelajaran Daring Matakuliah Kajian PAUD di Jurusan PG PAUD Fakultas Ilmu Pendidikan Universitas Negeri Surabaya. Journal of Early Childhood Care and Education, 2018, 1(1), pp. 26–31. https://doi.org/10.26555/jecce.v1i1.3.

[4] Mustofa, M. I., Chodzirin, M., Sayekti, L., & Fauzan, R. Formulasi Model Perkuliahan Daring Sebagai Upaya Menekan Disparitas Kualitas Perguruan Tinggi. Walisongo Journal of Information Technology, 2019, 1(2). pp. 151-160

[5] Herayanti, L., Habibi, H., & Fuaddunazmi, M. Pengembangan Media Pembelajaran Berbasis

Moodle pada Matakuliah Fisika Dasar. Jurnal Cakrawala Pendidikan. 2017, 36(2). pp. 210-219

[6] Beasley, Z.J. Ten Challenges in CAD Cyber Education. University of Florida Computer-Aided Design & Applications, 15(a), 2018, bbb-ccc.Retrived from : http://www.cadanda.com

[7] Lubis, Syahron. Metodologi Penelitian Pendidikan. Sukabina Press, 2011.

[8] Abdurrahmansyah A, Sugilar H, Ismail I, Warna, D. Online Learning Phenomenon: From the Perspective of Learning Facilities, Curriculum, and Character of Elementary School Students. Education Sciences. 2022; 12(8):508. https://doi.org/10.3390/educsci12080508