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Self-Efficacy of Pre-service Mathematics Teachers in Online Learning Based on Video Conference

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ABSTRACT

Self-efficacy is defined as an individual's belief in their ability to achieve specific goals. For pre-service mathematics teachers, their primary role in the learning process demands a high level of self-efficacy to effectively adapt in the context of online learning based on video conference platforms. Therefore, the purpose of this research is to find out the self-efficacy of pre-service mathematics teachers in online learning based on video conferences. This research is a descriptive quantitative study with the population of all pre-service mathematics teachers of Malikussaleh University for the 2020/2021 academic year. The sample was selected using purposive sampling techniques which amounted to 41 pre-service mathematics teachers. The instrument used is a self-efficacy questionnaire containing 25 statements that have been tested and analyzed for validation. The questionnaire was given after 4 meetings were conducted online video conference-based learning. The results showed that through online learning based on video conference, 24.4% of pre-service mathematics teachers have high self-efficacy, 56.1% of pre-service mathematics teachers have moderate self-efficacy, and 19.5% of pre-service mathematics teachers have low self-efficacy. The implications of these findings can be utilized as a foundation for the development of more effective strategies and approaches in online learning contexts. This research makes a significant contribution to understanding the factors influencing the self-efficacy of pre-service mathematics teachers in facing the challenges of online learning.

Keywords: Online Learning; Self-efficacy; Video Conference.

1. Introduction

The improvement of information technology has advocated the emergence of various innovations in the field of education. One step harnessing network technology and information technology for the development of learning systems in higher education is the online learning system. The implementation of online learning, according to Mustofa et al. (2019), provides benefits, including: 1) the existence of a graph showing an increase in the quality of higher education and the quality of graduates, 2) the formation of unlimited knowledge-sharing communities not confined to one location, 3) increased intensive communication between lecturers and students, 4) unlimited learning resources, and 5) the improvement in the quality of lecturers is due to the ease of obtaining information. Various online learning systems implemented within the campus include the use of applications such as E-Learning, Google Classroom, Zoom, Google Meet, WhatsApp, and other applications. The success of online learning systems depends significantly on several components, including students, lecturers, learning resources, and also information technology. Ideally, each of these components should be integrated to

produce high-quality graduates as well.

Video conferencing-based platforms (such as Zoom, Google Meet, or Microsoft Teams) are used as supporting tools for distance learning. Video conferencing is a service that provides facilities to bring together two or more parties using a broadband internet network (Fonna et al., 2022). Essentially, the concept of video conference involves converting voice through a microphone into audio signals, and images through a camera into visual signals. Both signals are then compressed using a device called a codec. The compressed signals can be disseminated over the internet network, in this case using IP, making it possible to transmit and receive them according to the desired objectives. In this research, online learning assisted by video conference is conducted using the Zoom platform.

In online learning, the beliefs and perceptions of pre-service teacher students regarding the courses being studied are important and are thought to affect student achievement in learning. Self-efficacy is a person's belief in their ability to perform a task, and Schunk (2012) states that it is not the same as knowing what needs to be done. Self-efficacy refers to a person's view of their ability to perform a specific action, while outcome expectation is more related to beliefs about the results that will be obtained from that action.

According to research by Siswanto et al. (2022), which had 616 subjects from various schools and universities during the Covid-19 pandemic, the average self-efficacy of the respondents was in the moderate category. Students who will be able to do enough to do tasks that are considered feasible and avoid situations and behaviors that are beyond their capabilities. In line with Meika et al. (2023), the result also showed that student teachers' mathematics self-efficacy is at a moderate level. The use of video conference is strongly suggested in learning to develop self-efficacy (Fitriyana et al., 2021).

In this study, self-efficacy of pre-service teacher students in mathematics refers to students' self-confidence in their ability to solve problems, complete tasks without comparing themselves to others, thus achieving success in learning mathematics with confidence in the efforts made, predetermined choices, and perseverance. The observed indicators of self-efficacy include belief in one's own abilities, the feeling of being able to solve mathematical problems, the feeling of being able to perform tasks, the feeling of being able to achieve learning achievement targets, and confidence in the efforts made.

Subaidi (2016) stated that difficulties in solving mathematical problems are indicated by the behavior of giving up when encountering difficulties in learning or solving problems. This behavior also arises when students receive information about a subject, indicating that the material is difficult, and students tend to lack confidence in their ability to learn or even solve problems related to that subject. Prospective teacher students may be able to read mathematical material directly from a book but may not understand what they are reading. This is compounded by the fact that the learning process is not conducted face-to-face. Based on the description above, the purpose of this study is to determine

the self-efficacy of pre-service mathematics teachers through online learning using video conferencing.

2. Research and Method

This research uses a survey method with a descriptive quantitative approach. The instrument used is a self-efficacy questionnaire given through Google Form. The questionnaire is given after four meetings of online learning based on video conference (using the Zoom platform).

The population of this study is all students of the Mathematics Education Study Program of Malikussaleh University for the 2020/2021 academic year. The sample was taken by purposive sampling of 41 pre-service mathematics teachers. The procedures in this study include the following stages: (1) development of research instruments, (2) validation of research instruments, (3) instrument revision, (4) research implementation, and (5) descriptive data analysis.

The instrument used is in the form of a questionnaire to measure the self-efficacy of pre-service teachers. This questionnaire is based on indicators adapted from Novferma (2016), including: 1) Confidence in your own abilities, 2) Feelings of being able to solve mathematical problems, 3) Feelings of being able to carry out the tasks at hand, 4) Feelings of being able to achieve learning achievement targets, and 5) having strong beliefs in the efforts made.

In order to obtain a good questionnaire, self-efficacy questionnaires that use this Likert scale are first tested on pre-service mathematics teachers in their fifth semester, and then the results are analyzed for validity. Of the 25 statements consisting of 12 positive statements and 13 negative statements, it was found that all 25 statements were valid and could be used in research. For every positive statement,a Very Agreed" response (SS) is given a score of 4, an " Agree" response (S) is given a score of 3, a " Disagree" response (TS) is given a score of 2, and a " Strongly Disagreed" response (STS) is given a score of 1. As for negative statements, the score is the opposite.

The data obtained is then used to analyze the self-efficacy of pre-service mathematics teachers towards video conferencing-based online learning. Then the grouping of self-efficacy data into three categories, namely the high, medium, and low,as shown in Table 1 (Arikunto, 2012).

Table 1. The self-efficacy score grouping

Score (X)	Category
$X \geq (\mu + 1{,}0\sigma)$	High
$(\mu - 1{,}0\sigma) \leq X < (\mu + 1{,}0\sigma)$	Medium
$X < (\mu + 1{,}0\sigma)$	Low

3. Result and Discussion

The self-efficacy measured represents five indicators: confidence in one's appearance of oneself owned, feelings of being able to solve mathematical problems, feelings of being able to carry out tasks, feelings of being able to achieve learning targets, and confidence in one's efforts. Furthermore, the

results of the self-efficacy results of pre-service mathematics teachers will be explained in online learning based on video conferencing per indicator. The descriptive results of the first indicator, confidence in their self-appearance, can be seen in Table 2.

Table 2. Descriptive Results of Self-Efficacy of Pre-service Mathematics Teacher

Indicators	Statement	Average	St. Dev	Average Per Indicator	Category
Confidence in the abilities of oneself possessed	In every given task, I am not sure that I can complete it.	3,02	0,69	2,81	Medium
	I am confident that I can understand the material taught with online video conferencing learning.	2,88	0,44		
	I am very enthusiastic about working on mathematics assignments given through online video conference learning.	2,88	0,6		
	I feel less confident in the abilities I have.	2,43	0,7		
	I can be calm when given difficult questions because I believe I have the ability to answer them.	2,81	0,66		
The feeling of being able to solve mathematical problems	I can make a mathematical model of a given daily life-related problem.	2,95	0,46	2,72	Low
	I was confused about determining the first step in solving the problem.	2,52	0,71		
	I am waiting for a friend's help when it is difficult to solve a math problem.	2,67	0,67		
	I can remember the math material well so that I don't encounter any difficulties in solving the problem.	2,74	0,55		
Feelings of being able to carry out the task at hand.	I feel pessimistic about doing tasks when I see that others are faster at completing their tasks.	2,36	0,59	3,09	Medium
	I consider every assignment given through online video conferencing learning to be a challenge.	3,38	0,51		
	I avoid difficult math tasks	2,98	0,77		
	I consider challenges to be part of the process that must be passed	3,69	0,5		
	I was only able to complete the tasks individually	2,93	0,53		
	I was able to find the best alternative in every difficulty of the task	3,19	0,49		
Feeling able to achieve learning achievement targets,	I tend to procrastinate on tasks given online	3,24	0,61	3,24	High
	I have goals to achieve in doing the task.	3,71	0,49		
	I feel unmotivated to participate in online learning through video conferencing	3,24	0,71		
	I am always waiting for the teacher to help me solve problems that I have not	3,07	0,65		

	been able to work on				
Confident in the effort made,	I will achieve what I want as long as it is accompanied by great effort	3,93	0,5	3,17	High
	I was able to persevere in solving difficult problems when others gave up solving the problem	3,17	0,59		
	I doubt myself when I see a friend's answer that is different from mine.	2,81	0,66		
	I am afraid to ask the lecturer when I don't understand the material being taught	3,21	0,71		
	I feel embarrassed if I cannot answer questions from lecturers during online video conference	2,33	0,56		
	I always have a way of dealing with stress when bored in learning in video conferencing-based online learning	3,57	0,5		

From Table 2, it can be seen that the statement that obtained the highest average score was 3.93 with a standard deviation of 0.5, namely 'I will get what I want as long as it is accompanied by great effort'. This shows that even though online students are very motivated and try to gain understanding and solve mathematical problems. This is also due to the role of lecturers in motivating students by interacting directly through video conference platforms.

While the statement that obtained the lowest average score of 2.33 with a standard deviation of 0.56 was 'I am ashamed that I cannot answer questions from lecturers during online video conferences'. The majority of the students agreed that they were afraid of being wrong in answering questions asked by lecturers in online learning through video conferences. Students feel uneasy and timid when responding. Here the role of educators is very large in cultivating their self-confidence to be confident in their abilities. Regarding each indicator's average, the comparison is more evident when observing Figure 1.

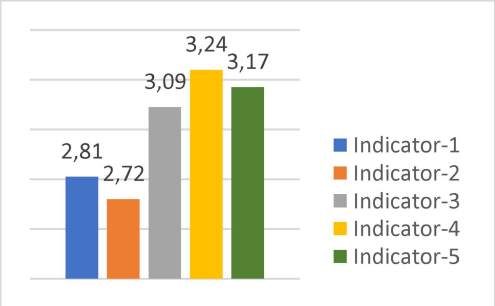

Figure 1. Average Self-Efficacy Per Indicator

In Figure 1, it can be seen that the average score for the first indicator, confidence in one's own abilities, was 2.81 and this is classified as moderate. The second indicator, the feeling of being able to

solve mathematical problems, obtained an average of 2.72, classified as low. The third indicator obtained an average score of 3.09, classified obtained with a moderate,towards the feeling of being able to carry out the task at hand. In the next indicator, namely the feeling of being able to achieve the learning achievement target, obtained an average of 3.24, classified as high. The last indicator, having strong confidence in the effort made, obtained an average of 3.17, classified as high. The overall average was 3.03, classified as moderate. Then, the tudents' self-efficacy into three categories. The Table 3.

Table 3. Self-efficacy score grouping

Category	The Number of Pre-service Teacher
High	10
Medium	23
Low	8

The Table 3 show that the self-efficacy of pre-service teachers towards online learning based on video conferencing is dominated by the moderate level, which reaches 56.1% of the total sample. While at a high level as much as 24.4% and 19.5% have a low level.

The self-efficacy indicator that obtained the highest score was the feeling of being able to achieve learning achievement targets. Here it can be seen that through online learning assisted by video conferencing, pre-service students have targets that must be achieved in doing the tasks given and have high motivation in the learning process, which can have a positive influence on the learning outcomes obtained (Mustakim, 2020; Zahro & Surjanti, 2021). The lowest indicator refers to the feeling of being able to solve mathematical problems. This is due to learning which is usually done face-to-face but turns into face-to-face online. Students are constrained from discussing together when solving problems, whereas they can usually directly discuss together in class. This change has an impact on the self-efficacy of students in solving mathematical problems. This is because the self-confidence in the ability to solve problems owned by pre-service teachers is able to affect their thinking ability (Widyastuti & Nuriadin, 2021).

The self-efficacy of 10 pre-service mathematics teachers is at a high level, which means that they have a strong belief in their ability to face video conference-based online learning, both in terms of solving problems (Marhami et al., 2020) and completing the tasks given. Those who have a high level of self-efficacy can set higher and more challenging goals and often work harder to achieve them (Schunk et al., 2006). Likewise, 23 pre-service mathematics teachers are at a moderate level, which in this case dominates this study. Self-confidence in the ability to be at this level means they will still try and not quickly despair when learning (Herizal, 2021). In addition, the degree of anxiety or calmness they experience when maintaining tasks is at the level of not being too anxious or too optimistic or

confident but still in a state of calm (Sunaryo, 2017). The remaining 8 pre-service math teachers have low self-efficacy. With low self-efficacy, the eight students are more concerned with reducing their efforts and giving up faster in carrying out online learning assisted by video conferencing and carrying out the learning tasks given. Students' views at this level of learning tasks are considered as threats that must be avoided due to a lack of self-ability in carrying out and doing learning tasks (Ferdyansyah et al., 2020).

In general, 80% of pre-service mathematics teachers have good self-efficacy for online learning assisted by video conferencing, using in this study used the Zoom platform. These results provide an illustration that online learning with video conferencing positively affects the self-efficacy. The higher an individual's self-efficacy of an individual, the more cognitively demanding problems to be solved (Pajares et al., 1999). This is consistent with the findings of Fitriyana et al. (2021),Listyawati et al. (2021), and Widyastuti & Nuriadin (2021), which show that the use of video conferencing in learning greatly affects student self-efficacy in a positive way. Additionally, with the help of distance learning with video conferences occur more interactively so as to provide opportunities for students to be more active and motivated in their learning (Candarli & Yuksel, 2012; Permatasari, 2018).

4. Conclussion

Self-efficacy is a level of confidence in one's own ability to complete a task. The results showed that through online learning based on video conference obtained 24.4% of pre-service mathematics teachers obtained high self-efficacy, while 56.1% of pre-service mathematics teachers with moderate self-efficacy, and 19.5% were at a low level.

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