Teacher's Perception of Mathematics Learning with an Online System based on Pedagogic Competence's Perspective

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ABSTRACT.
The spread of COVID-19 certainly affected the learning process in schools. Therefore, the researchers wanted to know the teacher's perception of learning mathematics with a pedagogic competency-based system. This research design was a Mixed-Method with an unbalanced mixed research model (*Concurrent Embedded Strategy*). The primary method was qualitative and equipped with a quantitative method as a secondary method. The primary method was used to obtain the primary data, and the secondary method was used to obtain data to support the data obtained from the primary method. The research subjects were mathematics teachers at the junior and senior high school levels in the Province of the Special Region of Yogyakarta, with 30 teachers as subjects. Quantitative data analysis techniques were carried out by calculating the average of each competency which was then grouped with an interval scale. The questionnaire results were data reduction, presentation, and conclusion in the qualitative data analysis technique. The research results indicated a teacher's competence in applying pedagogy competence in online learning. It was caused by the limited interaction of teachers and students, unstable internet networks, and low student motivation. Hence, teachers did not know the students' potential to develop or not. In addition, pedagogic competencies could be applied easily because teachers could apply online applications in practice. Learning sources, methods, and learning instruments were also adjusted to the needs. Learning outcomes could be seen from the tasks that students did, and the assessment process also became more efficient.

Keywords: pedagogic competence, online learning, mathematics learning, teachers' perception.

1. INTRODUCTION

Education is also an activity with a specific purpose or goal directed at developing the humans' potential both as human beings and as a society to the fullest [1]. Education is a broader process when compared to other processes in schools. The social activity that is likely to remain and develop in society is education. The function of informal education or education outside of school, such as in a complex society, cannot be separated from the specialization and institutionalization processes in formal education experienced. [2]. Mathematics education is one part of national education that influences the development of modern technology and science. To master and utilize modern technology requires a strong enough mastery of mathematics in order to produce reliable and competent

human resources in the face of these various developments. [3]. The process that includes development in processing logic and patterns in thinking between teachers and students in a learning environment that is intentionally created by teachers with various learning techniques so that mathematics learning activities can grow and develop optimally, so that students can carry out learning activities efficiently and effectively, this is what is called learning mathematics [4].

To produce effective and efficient learning requires several parties' roles. One of them is the teacher's role. The teacher's role is as a mere teacher, academic educator, and character, moral, and cultural educator for students [5]. Effective learning requires teachers to have a clear idea of the expected learning objectives and achieve the planned learning experience [6]. Teachers are required to display their skills in front of the class. One of these skills is the ability to deliver lessons to students. Teachers need to be familiar with various learning strategies to choose the most appropriate strategy for teaching a particular field of study. In order to achieve learning objectives, every teacher is required to properly understand the strategies in learning that will be used. The selection of the right strategy in learning can have an impact on the level of mastery or student achievement [7].

Based on Law Number 14 of 2005 concerning Teachers and Lecturers, to ensure quality education services in accordance with the demands of the times, teachers are required to develop their competencies. The teacher competencies in question include pedagogic competence, personality competence, social competence, and professional competence. These competencies can be obtained through professional education. Teachers have a broad influence in the world of education, because teachers are implementers in the administration of education in schools who are responsible for education so that education can be carried out properly. Therefore, teachers must have competence in terms of teaching. Competence that must be possessed by every teacher in every level of education is pedagogic competence [6]. One of the teacher's characteristics can be said to be competent if he has good pedagogic competence, which can improve the quality of teaching and learning so that the learning process can run well [8]. Pedagogic competence is a competence that specifically describes and distinguishes the profession between teachers and other professions. The ability to master the theory of development and absolute learning theories is only found in the teacher. Therefore, it is necessary to raise awareness regarding mastery of the material in the development of students, theories in learning, development of the curriculum, techniques in evaluation, mastery of models and methods of teaching, in addition to mastery of subjects and science and technology. related to the teaching given to students. [9].

Viewed from the aspect of the learning process, pedagogic competence is an ability possessed by every teacher on the ability to manage learning with students. Pedagogic competence is an ability to manage learning activities with students which includes understanding of students, design and implementation in learning, evaluation of learning outcomes, and development of students to actualize their various potentials. [6]. According to Permendiknas No. 16 of 2007 standards of pedagogic competence include several core competencies, including: (1) Mastering the characteristics of students in terms of moral, physical, spiritual, cultural, social, emotional, and intellectual, (2) Mastering theories in learning and principles -Learning principles that can be used to educate, (3) Develop curriculum related to the subjects taught, (4) Organize educational learning activities, (5) Utilize information and communication technology for interests in learning, (6) Facilitate potential development of students to actualize various kinds of potential they have, (7) Communicate effectively, empathically, and politely with students, (8) Conduct assessments, evaluations in the process and learning outcomes, (9) Utilize the results of assessments and evaluations to the interests of the implementation of learning, (10) Take reflective actions to improve improve quality in learning.

In 2020 there was the spread of the Covid-19 virus, then the World Health Organization (WHO) determined that the Covid-19 virus was a pandemic because the virus had spread more widely throughout the world, including Indonesia. The COVID-19 virus is a new disease that has become a pandemic. Because the transmission is relatively fast, the level of morality cannot be ignored, and there is no definitive therapy, this disease must be watched out for. There are still many knowledge gaps in this field, so further studies are needed [10]. The primary prevention was to limit the people's mobilization at risk until the incubation period. Other preventions to increase the body's resistance were consuming healthy food, washing hands more, wearing a mask when in a risky or crowded area, exercising, getting enough rest, eating well-done food, and seeking treatment immediately if sick [11].

One of the impacts of this incident was on the education sector. The government provided a policy by stopping school learning activities for an undetermined time. For the time being, learning activities were carried out using an online system. Online learning was done online via the internet and can be done remotely, without meeting directly in the room, and the learning time was more flexible [12]. A UGM Public Policy Specialist, Agustinus Subarsono, M.Sc., M.A., Ph.D., said that online distance education during the Covid-19 pandemic still left several societal problems, including in the Special Region Yogyakarta area. There were several obstacles in implementing learning with systems in the network. The lack of smooth internet networks was a significant obstacle to implementing secondary education during the Covid-19 pandemic. Not all regions could access the internet properly, so the learning process was disrupted. Not only

that, another problem was the limited cost of accessing the internet. When learning took place online, the need for an internet quota would also increase. In addition, the limited time for parents to accompany their children while participating in distance learning was also an obstacle, where not all parents could accompany their children during the online learning process. Meanwhile, many teachers experienced the problem of limited skills in using information and communication technology. Not all teachers were familiar with the technology used during online learning [13]. Not only teachers but lecturers also required adaptation in the current health emergency. Even though they could not meet face-to-face, lecturers must think hard so that the lessons conveyed could still attract students to follow them. The preparation of learning materials was updated to adapt to the application used [14]. In addition, Online Learning Models are used to combine face-to-face learning, which by itself serves as a support for students in lectures. This is based on the idea that pure online learning is not fully implemented in most universities in Indonesia [15].

Since March 2020, learning has been carried out through an online system. The implementation of online learning generally would lead to teacher perceptions of teacher responses regarding the implementation of online mathematics learning when viewed from pedagogic competence. That pedagogic competence would be more accessible if applied when learning was carried out face-to-face. The implementation of mathematics learning remotely between teachers and students differed from face-to-face learning. Readiness from the teacher's side was also vital to note, considering that teachers must continue to carry out effective and efficient learning to achieve later learning objectives. In the learning implementation, teacher control was reduced, and an assessment of how teachers perceived online mathematics learning was needed. This perception was crucial to be studied by the education service because the perception could be used as a teacher's evaluation to implement further learning. Based on the description above, this research aimed to find out how the mapping and teacher reasons were related to teachers' perceptions of learning mathematics with an online system in terms of pedagogic competence.

2. METHOD

The research subjects were mathematics teachers at the junior and senior high school levels in the Special Region of Yogyakarta. Sampling was done using the *non-probability sampling* technique utilizing *convenience sampling*, and the subjects used in the research were 30 mathematics teachers. Data collection in this study was carried out in two ways, namely by using questionnaires and interviews. The questionnaire used in this study was compiled based on the Likret scale and using google form.

Interviews were conducted on several selected respondents by telephone to strengthen the data obtained through the questionnaire.

This research begins by identifying indicators on research variables. Furthermore, it is compiled into a research instrument in the form of questionnaire statements (qualitative and quantitative) and interview guidelines that will be used. After the instrument is compiled, it is then given to the material expert as material for validation. If the instrument in the questionnaire has been approved and declared valid by the material expert, then the instrument will be used in data collection. The instrument will be tested to measure validity and reliability empirically using google form and the results will be analyzed using SPSS 24 software. Valid and reliable statement items will then be used for data collection in research. The research process is carried out by sending a google form questionnaire link to the teacher. The results of the questionnaire will be analyzed and then the researchers conducted interviews with several respondents. The data that has been obtained will be thoroughly analyzed and then combined to become new findings, namely research results. The steps in this study are presented in the form of Figure 1 as follows:
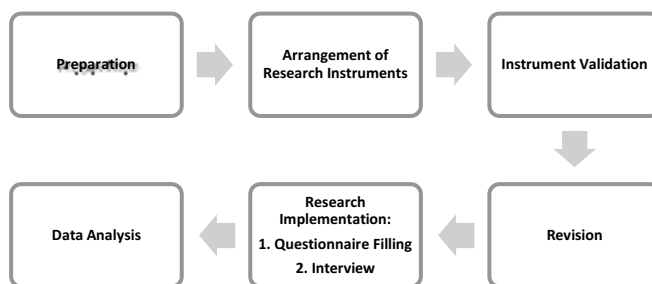

FIGURE 1. Research steps

3. RESULTS

The questionnaire instrument consists of 18 statement items that have been validated by the validator, then tested. The questionnaire trial process was conducted *online* via personal *WhatsApp* messages to spread the questionnaire link to respondents. After the trial process for 13 respondents was completed, the researcher calculated the instrument validity and reliability using SPSS 24 *software*. The results of the analysis of 18 statements were only 11 valid statements. In this research, an instrument was said to be valid if $r_{count} > r_{table}$ with $\alpha = 0.05$ and *vice versa* if $r_{count} < r_{table}$ the item was invalid. Seven items in the

questionnaire were not valid, so the seven items were not used in the subsequent analysis. Furthermore, seven questionnaire statements were not used, then *renumbering* of the items in the questionnaire statement was carried out. In addition, the research instrument was also reliable, so the instrument could be used. In this research, a questionnaire was said to be reliable if the *Cronbach's Alpha* value was > 0.60. Conversely, the questionnaire was unreliable if the *Cronbach's Alpha* value was < 0.60. The interpretation of the reliability of the 11 valid questionnaire statements was said to be *acceptable* this is because it includes in the excellent category. So that the data to be more diverse, the research results would be divided into two categories, namely by gender and length of teaching. The categories based on gender consist of data obtained from male and female respondents. Meanwhile, the category of the length

of teaching consisted of data obtained from respondents with teaching lengths of 0-10 years, 11-20 years, and 21-30 years. Will be discussed in general in addition to these two categories. Based on research conducted through a questionnaire with a total of 30 respondents, the data obtained will then be analyzed and the results of the research will be discussed as follows:

3.1. Based on Gender

Teachers' perceptions of learning mathematics with an online system were viewed through pedagogic competence's perspective based on gender, namely, male and female teachers. Furthermore, it gets the following results:

Table 1: Teachers' Perception Tendency Based on Gender

| Core Competencies | Category | | | | | |
	Very Difficult	Difficult	Quite Easy	Easy	Very Easy	Total
Male						
1	16.7%	50%	16.7%	16.7%	0%	100%
2	0%	0%	33.3%	33.3%	33.3%	100%
3	0%	0%	0%	66.7%	33.3%	100%
4	0%	50%	16.7%	33.3%	0%	100%
5	0%	0%	0%	33.3%	66.7%	100%
6	0%	66.7%	16.7%	16.7%	0%	100%
7	0%	16.7%	33.3%	33.3%	16.7%	100%
8	0%	16.7%	16.7%	33.3%	33.3%	100%
9	0%	0%	50%	16.7%	33.3%	100%
10	16.7%	0%	50%	0%	33.3%	100%
Female						
1	9.1%	54.5%	27.3%	9.1%	0%	100%
2	9.1%	9.1%	27.3%	54.5%	0%	100%
3	0%	0%	18.2%	81.8%	0%	100%
4	0%	72.7%	27.3%	0%	0%	100%
5	0%	0%	9.1%	81.8%	9.1%	100%
6	0%	81.8%	18.2%	0%	0%	100%
7	0%	0%	27.3%	72.7%	0%	100%
8	0%	9.1%	36.4%	45.5%	9.1%	100%
9	0%	0%	27.3%	72.7%	0%	100%
10	0%	9.1%	27.3%	63.3%	0%	100%

Based on table 1, it can be concluded that the perceptions of male and female teachers about learning mathematics using an online system in terms of pedagogic competence get the results that they experience difficulties when applying core competencies 1, 4, and 6. Furthermore, applying competencies 2, 3, 5, 7, 8, 9, and 10 tended to be easy. In implementing core competency four by male teachers, some found it easy, and others found it challenging. Teachers could not monitor students directly.

Both male and female teachers still found it challenging to apply the three core competencies when learning mathematics was carried out online. Several problems constrain online learning, such as the internet network and students' learning motivation. The difference between male teachers and female teachers was in the application of core competency four, and namely, female teachers thought that these competencies were challenging to apply. However, some male teachers found it easy and others difficult

because male teachers tended to be more relaxed. In contrast, female teachers tended to be more orderly when implementing online mathematics learning.

3.2. Based on Teaching Length

Teachers' perceptions of learning mathematics with an online system viewed from a pedagogic competence perspective based on length of teaching, namely 0-10 years old, 11-20 years old, and 21-30 years old teachers get the following results:

Table 2 : Teacher's Perception Tendency Based on Teaching Length

| Core Competencies | Category | | | | | |
	Very Difficult	Difficult	Quite Easy	Easy	Very Easy	Total
0-10 Years						
1	0%	58.3%	33.3%	8.3%	0%	100%
2	0%	0%	33.3%	58.3%	8.3%	100%
3	0%	0%	0%	91.7%	8.3%	100%
4	0%	66.7%	33.3%	0%	0%	100%
5	0%	0%	8.3%	66.7%	25%	100%
6	0%	83.3%	16.7%	0%	0%	100%
7	0%	25%	75%	0%	0%	100%
8	0%	8.3%	25%	58.3%	8.3%	100%
9	0%	0%	33.3%	58.3%	8.3%	100%
10	0%	0%	33.3%	58.3%	8.3%	100%
11-20 Years						
1	50%	50%	0%	0%	0%	100%
2	50%	50%	0%	0%	0%	100%
3	0%	0%	100%	0%	0%	100%
4	0%	100%	0%	0%	0%	100%
5	0%	0%	0%	100%	0%	100%
6	0%	100%	0%	0%	0%	100%
7	0%	0%	100%	0%	0%	100%
8	0%	50%	50%	0%	0%	100%
9	0%	0%	50%	50%	0%	100%
10	0%	50%	50%	0%	0%	100%
21-30 Years						
1	33.3%	33.3%	0%	33.3%	0%	100%
2	0%	0%	33.3%	33.3%	33.3%	100%
3	0%	0%	0%	66.7%	33.3%	100%
4	0%	33.3%	0%	66.7%	0%	100%
5	0%	0%	0%	33.3%	66.7%	100%
6	0%	33.3%	33.3%	33.3%	0%	100%
7	0%	33.3%	0%	33.3%	33.3%	100%
8	0%	0%	33.3%	0%	66.7%	100%
9	0%	0%	33.3%	33.3%	33.3%	100%
10	33.3%	0%	33.3%	0%	33.3%	100%

Based on Table 2, it can be concluded that the teacher's perception based on the length of teaching regarding learning mathematics with an online system in terms of pedagogic competence got the results they experienced difficulties when applying core competencies 1. Furthermore, applying competencies 2, 5, 7, and 9 tended to be easy. In applying core competencies, 8 and 10 teachers with a teaching period of 11-20 years found it easy, but others found it challenging. Based on the length of teaching, both teachers who had taught for a long time or not tended to have difficulty when applying pedagogic competencies. Both still found it difficult when they did not accompany students directly during the learning process. Some teachers thought they tended to be easy to apply because these competencies have often been done before used online. This difference of opinion was due to applying

core competencies, not only being influenced by the length of time a teacher taught but also by supporting circumstances.

3.3. In general

Based on the results of the analysis of teacher perceptions in general, a mapping table of teacher perceptions of learning mathematics with an online system is obtained in terms of overall pedagogic competence as follows:

Table 3: Teachers' Perceptions of Using the Internet for Online Mathematics Learning

Core Competencies	Category					
	Very Difficult	Difficult	Quite Easy	Easy	Very Easy	Total
1	11.8%	52.9%	23.5%	11.8%	0%	100%
2	5.9%	5.9%	29.4%	47.1%	11.8%	100%
3	0%	0%	11.8%	76.5%	11.8%	100%
4	0%	64.7%	23.5%	11.8%	0%	100%
5	0%	0%	5.9%	64.7%	29.4%	100%
6	0%	76.5%	17.6%	5.9%	0%	100%
7	0%	5.9%	29.4%	58.8%	5.9%	100%
8	0%	11.8%	29.4%	41.2%	17.6%	100%
9	0%	0%	35.3%	64.7%	11.8%	100%
10	5.9%	5.9%	35.3%	41.2%	11.8%	100%

Based on Table 3, it can be concluded that the teacher's perception of online learning mathematics based on pedagogical competence's perspective obtained the results that they experienced difficulties when applying core competencies 1, 4, and 6. Then, it would be easier to apply core competencies 2, 3, 5, 7, 8, 9, and 10.

Teachers' perceptions of learning mathematics with an online system based on pedagogical competencies tended to experience difficulties applying core competencies 1, 4, and 6. The teachers could not monitor students directly. Implementing the three core competencies was still challenging when learning mathematics online. Furthermore, applying competencies 2, 3, 5, 7, 8, 9, and 10 tended to be easy. Although there were still some obstacles, some of these competencies could still be applied when learning mathematics was carried out online; for example, the unstable internet network and low students' learning motivation.

The research results supported Noni Agustina and Ratnawati Susanto's research (2017) [16], which stated that online training using Edmodo provides benefits in developing teacher professionalism because it could increase teacher competence, namely competence in using technology-based learning media. Another thing also supported the research of Sobron, Bayu, Rani, and Meidawati (2019) [17], which stated that education users/ teachers could more easily find the right learning rhythm for students with online learning. Learning could be accessed at any time with technological sophistication. These learning materials could also be downloaded and studied without being limited by time. In addition, this research was also in line with the results of Lambok Simamora's research (2014) [18]. The pedagogic competence of teachers was influenced by many factors, including whether the teacher's educational background was following the qualifications, whether the teacher was certified as a professional teacher, and the students they faced by the teacher himself. Based on this review, it can be concluded that the teacher's perception of learning mathematics with an online system in terms of pedagogic competencies in core competencies 1, 4, and 6 was difficult to apply. Meanwhile, core competencies 2, 3, 5, 7, 8, 9, and 10 were easy to implement.

4. CONCLUSION

The results of research using a quantitative method as a secondary method were in the form of mapping the teacher's perception of mathematics learning with an online system based on pedagogic competence's perspective, i.e., when applying core competencies to mastering the students' characteristics, conducting educational learning, and facilitating the development of potential students, teachers experience difficulties. Meanwhile, the core competencies were mastering learning theories and principles, developing a curriculum, utilizing communication and information technology, communicating effectively and politely, conducting assessments and evaluations, utilizing the results of

assessments and evaluations, and taking reflective actions that teachers could easily apply. Furthermore, the research results using qualitative methods as the primary method were in the form of reasons put forward by the teacher regarding learning mathematics with an online system based on pedagogic competence's perspective. When mathematics learning was carried out online, the teacher did not directly monitor the learning process. Therefore, teacher and student interactions became limited, and they could not see how the actual state of students. The teacher did not know whether students' potential was developing or not. In its implementation, there were also obstacles, e.g., the internet network was not supportive, and students' learning motivation was low. Therefore, teachers experienced difficulties when implementing pedagogic competencies. Meanwhile, several core competencies were considered easy to apply because to be still able to communicate with students. Teachers could use online applications. Various learning resources could also be utilized. The learning methods and instruments used were adjusted to the needs. Learning outcomes could be seen from the tasks that students did so that teachers could evaluate them. In addition, the assessment process became more efficient. From the results of the reflective actions taken by the teacher, they knew students' difficulties when learning mathematics using online. Then the teacher could also improve the way of teaching for further learning.

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REFERENCES

[1]   Nurkholis, J. Kependidikan. **1**, 24–44 (2013).

[2]   M. Anwar, *r. (2015). Filsafat Pendidikan. Jakarta: Kencana* (Kencana, Jakarta, 2015).

[3]   I. G. A. Wiradnyana, I. N. Jampel, and A. A. G. Agung, **2** (2014).

[4]   Z. Zulyadaini, J. Ilm. Univ. Batanghari Jambi. **16**, 153–158 (2016).

[5]   K. Wardani, 8–10 (2010).

[6]   P. Setyosari, JINOTEP (Jurnal Inov. dan Teknol. Pembelajaran) Kaji. dan Ris. dalam Teknol. Pembelajaran. **1**, 20–30 (2017).

[7]   S. Anitah, Hernawan, A. Herry, Ruhiat, and Toto, *Strategi Pembelajaran di SD* (Universitas Terbuka, Banten, 2014).

[8]   D. Suhandani, and J. Kartawinata, Mimb. Sekol. Dasar. **1** (2014).

[9]   A. A. Nur, J. Adm. Pendidik. **2**, 65–72 (2014).

[10]   A. Susilo, C. M. Rumende, C. W. Pitoyo, W. D. Santoso, M. Yulianti, H. Herikurniawan, R. Sinto, G. Singh, L. Nainggolan, E. J. Nelwan, L. K. Chen, A. Widhani, E. Wijaya, B. Wicaksana, M. Maksum, F. Annisa, C. O. M. Jasirwan, and E. Yunihastuti, J. Penyakit Dalam Indones. **7**, 45 (2020).

[11]   S. K. Dhir, D. Verma, M. Batta, and D. Mishra, Indian Pediatr. **54**, 871–877 (2017).

[12]   S. Yodha, Z. Abidin, and E. Adi, J. Kaji. Teknol. Pendidik. **2**, 181–187 (2019).

[13]   Ika, *Univ. Gadjah Mada* (2020).

[14]   M. F. Annur, and Hermasyah, J. kajian, Pnelitian dan Pengemb. Kependidikan. **11**, 195–201 (2020).

[15]   E. Kuntarto, J. Indones. Lang. Educ. Lit. **3**, 53–65 (2017).

[16]   N. Agustina, and R. Susanto, Pros. Semin. Nas. Pendidik. Tek. Inform. **2**, 44–48 (2017).

[17]   A. . Sobron, Bayu, Rani, and M. S, Semin. Nas. Sains Entrep. **1**, 1–5 (2019).

[18]   Lambok Simamora, J. Form. 4(1) 21-30, 2014 ISSN 2088-351X. **4**, 21–30 (2014).