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*by Tomat Sehat*

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## Mathematics Teachers' Perceptions of Using the Internet for Online Learning

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**Abstract.** This study aims to determine the mapping and teacher reasons regarding the use of the Internet in online mathematics learning. Retrieval of research data through a questionnaire Google Form. Interviews with mathematics teachers in Yogyakarta as many as 34 respondents. The results of the study were mapped based on gender, high school / junior high school units, and equivalent, 0-10 years of teaching and 21-30 years. Shows the same result, namely the use of the Internet for learning mathematics as an addition and a complement. Meanwhile, the results of teacher perceptions based on a junior high school level and teaching length of 11-20 years are only as an addition. The teacher's reason can be concluded that the source of learning can be from anywhere, and the Internet is one of the additional learning resources for students, but to use the Internet must be supervised. The Internet can also complement mathematics learning by utilizing existing applications, but online mathematics learning cannot be equated with direct learning. Mathematics learning cannot be done entirely using online learning because interaction and delivery of material to students is limited and not optimal. Still, because of this pandemic, online learning for learning mathematics is needed.

### 1. Introduction

The world of Information and Communication Technology (ICT) is currently overgrowing in various countries, such as Indonesia. One of the necessary forms in the development of information and communication technology in Indonesia is the Internet. The Internet is currently very developed and very easy to use to access all information. One area that has had a significant impact on technological developments in the form of the Internet is the field of education [1]. The Internet in this field is beneficial in the teaching and learning process at schools and at home. Students can access learning materials to complement their knowledge, while teachers can search for teaching materials that are following the material and are innovative on the Internet [2].

Online learning is learning that is implemented using the internet and extranet networks or computers that are directly connected and have global or complete coverage [3]. Online learning that utilizes the Internet in learning does not require the presence of teachers to interact face-to-face with their students [4]. Through online learning, students have the flexibility to study time and can study whenever and wherever students are. According to [5], [6], online learning has three functions, namely, additional (supplement), complement (complement), and substitute (substitution) of classroom learning. The application of this learning in Indonesia itself, according to [7] is still limited to additional and complementary learning.



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In early March 2020, Indonesia experienced a pandemic period of the outbreak Corona Virus Disease 2019 (Covid-19), and the government appealed to all levels of teaching and learning activities to be carried out in the homes of each student. So that requires teachers to carry out the teaching and learning process via the Internet. However, under normal conditions, the use of the Internet for online mathematics learning still depends on the willingness of each teacher and also the perception of the mathematics teacher [8]. In this case, the perception in question is the teacher's response to the use of the Internet for online mathematics learning [9], [10]. Is the use of the Internet for online mathematics learning approved only as an addition (supplement), complement (complement), and or substitute (substitution) of learning in class.

Based on the description above, this study aims to find out how to map teacher perceptions about the use of the Internet for online mathematics learning. Furthermore, to find out the teacher's reasons regarding the use of the Internet for mathematics learning in additional (supplement), complementary, or substitute (substitution) aspects [11][12][13].

## 2. Methodology

The subjects of this study were mathematics teachers at the junior and senior high school levels in Yogyakarta Special Region. Sampling was carried out by a simple random sampling technique [14], and the sample used in the study was 34 mathematics teachers. The research data was collected in two ways, namely by using a questionnaire and interview. The questionnaire used was a questionnaire arranged on a Likert scale and using Google Form. In addition to the quantitative data [15], the questionnaire was filled in as well as qualitative data, namely teacher perceptions in online learning. Interviews were conducted with selected respondents to strengthen the data obtained through questionnaires and conducted by telephone.

This research begins with the determination of the research variable indicators. Furthermore, it is compiled into a research instrument in the form of questionnaire statement items (qualitative and quantitative) and interview guidelines. After the instrument is compiled, it is given to the material expert for validation. If the questionnaire instrument has been approved and declared valid by the material expert, then the instrument is used in data collection. The instrument was tested to measure validity and empirical reliability. Valid and reliable statement items are used for data collection in research. The research process was carried out by sending a Google Form questionnaire link to the teacher. The results of the questionnaire were analyzed, then conducted interviews with several respondents. After the data collection process is complete, the data will be analyzed comprehensively and compiled into new research findings. This research step is presented in the form of Figure 1 as follows:

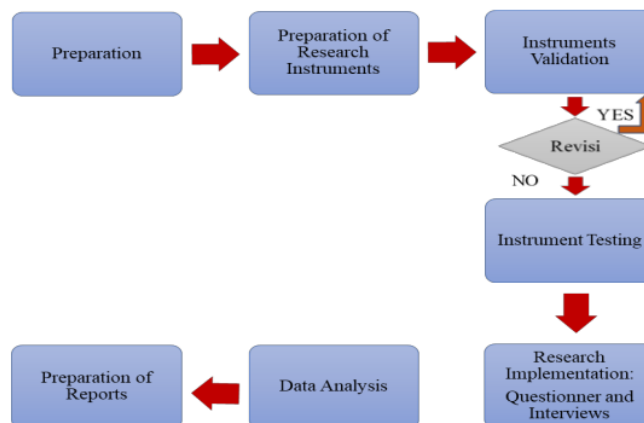


Figure 1. Research Steps

This study contained two data analyzes, namely quantitative data analysis and qualitative data analysis. Numbers represent quantitative data in the form of a Likert scale regarding the perceptions of mathematics teachers. Meanwhile, qualitative data is in the form of mathematics teacher perceptions in the form of descriptions of opinions during online learning. Quantitative and qualitative data are processed and presented to determine the mapping of mathematics teachers' perceptions of online learning. To complement the data, it is equipped with data analysis from the interview results so that the data is getting more potent because it is triangulated. In brief, the stages of data analysis are by presenting data, data reduction, verification, and drawing conclusions.

### 3. Results

This research was conducted for four weeks. The first two weeks were used to test the questionnaire instrument and to retrieve data using a questionnaire. The next two weeks were used for the data collection process through interviews, with the following research results.

#### 3.1. Validity test

The questionnaire instrument used by the researcher was validated by a material expert (validator). The conclusion of the questionnaire assessment, in general, carried out by the validator is a good questionnaire instrument with an average score of 4, and the questionnaire can be used without revision. Then the questionnaire instrument consisted of 16 statement items that have been validated by material experts (validators) and then tested on 15 respondents. To determine the validity of the questionnaire instrument being tested, it was calculated using software SPSS 16. The results of the calculations are as follows:

**Table 1:** Results of the Validity of the Questionnaire

Indicator	Statement	Correlation Coefficient	Information	Correlation
Internet Use as Supplement (Supplement)	Item 1	0,519	Valid	Medium
Utilization of the Internet as a Complement (Complement)	Item 3	0,563	Valid	Medium
	Item 8	0,671	Valid	Medium
	Item 9	0,808	Valid	High
	Item 12	0,722	Valid	High
Internet Utilization As a substitute (substitute)	Item 14	0,646	Valid	Medium
	Item 16	0,579	Valid	Medium

Based on table 1, because 9 statement items are not used for further analysis, and only seven statements are used, carried out renumbering is or renumbering on the questionnaire statement items.

#### 3.2. Reliability Test

This reliability test was conducted to determine the consistency of the items in the questionnaire instrument. The number of statements tested was seven items that had previously been tested for their validity. This test was conducted using the formula Cronbach's Alpha assisted by software SPSS 16 with the following results:

**Table 2:** Reliability Test Results of the questionnaire

Cronbach's alpha coefficient	Correlation	Interpretation of Reliability
0,785	High	Good

Based on table 2, the reliability interpretation of the seven valid questionnaire items is said to be acceptable or acceptable because it is included in the right/good category.

The results of this study will be divided into three categories, namely based on gender, level of education, and length of teaching. Apart from these three categories, it will also be discussed in general. Based on research data conducted through a questionnaire with a total of 34 respondents and research data analyzed using Microsoft Excel, the results of the study will be discussed as follows:

Persepsi teachers on the use of the Internet for learning mathematics in the network (online) by sex, the male teachers and female teachers get the following results:

**Table 3:** Tendency of Teacher Perception Based on Gender

Indicator	Category					amount
	Strongly Disagree	Disagree	Disagree less	Agree	Strongly agree	
<b>Male</b>						
Additional	0%	10%	0%	70%	20%	100%
Complementary	10%	0%	20%	60%	10%	100%
Substitute	10%	50%	30%	10%	0%	100%
<b>Female</b>						
Additional	0%	0%	4,2%	70,8%	25%	100%
Complementary	0%	0%	41,7%	45,8%	12,5%	100%
Substitute	4,2%	29,1%	41,7%	25%	0%	100%

Based on table 3, it can be concluded that the perceptions of male and female teachers regarding the use of the Internet for online mathematics learning get the same results, which tend to agree on additional and complementary aspects with a percentage of more than 50%.

Teachers' perceptions of the use of the Internet for online mathematics learning based on gender, namely teachers of high school 3 and junior high school equivalents get the following results:

**Table 4:** Teacher Perception Tendency Based on Education Level

Indicator	Category					amount
	Disagree less	Disagree	Disagree less	Agree	Strongly agree	
<b>Senior High School equivalent</b>						
Additional	0%	5%	5%	70%	20%	100%
Complementary	5%	0%	20%	60%	15%	100%
Substitute	10%	20%	50%	20%	0%	100%
<b>Junior High School equivalent</b>						
Additional	0%	0%	0%	71,4%	28,6%	100%
Complementary	0%	0%	64,3%	28,6%	7,1%	100%
Substitute	7,1%	57,2%	21,4%	14,3%	0%	100%

Based on table 4, it can be concluded that the perceptions of high school and junior high school teachers regarding the use of the Internet for online mathematics learning get different results. In the perception of high school teachers and equivalent tend to agree on additional and complementary aspects with a percentage of more than 70%. In contrast, the perception of junior high school teachers and equivalent tends only to agree on additional aspects.

Teachers' perceptions about the use of the Internet for online mathematics learning based on gender, namely teachers aged 0-10 years, 11-20 years, and 21-30 years of age get the following results:

**Table 5:** Tendency of Teacher Perception Based on Length of Teaching

Indicator	Category					amount
	Strongly Disagree	Disagree	Disagree less	Agree	Strongly agree	
<b>0-10 years</b>						
Additional	0%	3,5%	3,5%	69%	24%	100%
Complementary	3,5%	0%	34,5%	51,7%	10,3%	100%
Substitute	7%	24%	45%	24%	0%	100%
<b>11-20 years</b>						
Additional	0%	0%	0%	100%	0%	100%
Complementary	0%	0%	67%	33%	0%	100%
Substitute	0%	100%	0%	0%	0%	100%
<b>21-30 years</b>						
Additional	0%	0%	0%	50%	50%	100%
Complementary	0%	0%	0%	50%	50%	100%
Substitute	0%	100%	0%	50%	0%	100%

Based on table 5, it can be concluded that teachers' perceptions regarding the use of the Internet for online mathematics learning get the same results based on the length of teaching 0-10 years and 21-30 years, which tend to agree on additional and complementary aspects with a percentage of more than 60%.

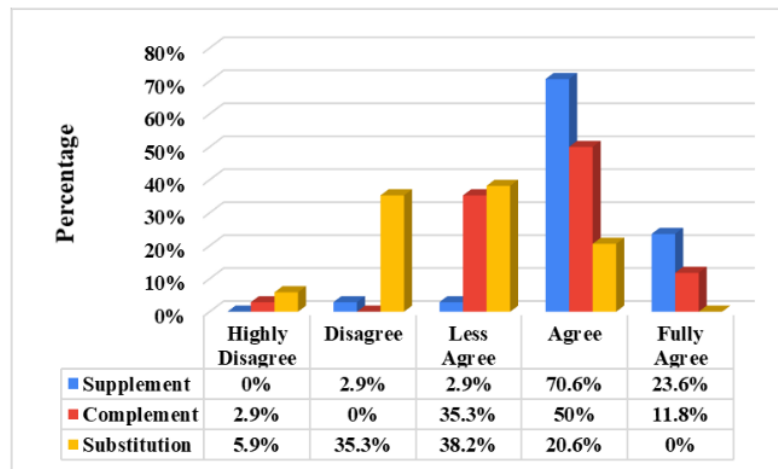
Meanwhile, teachers' perceptions based on the length of teaching 11-20 years get different results; that is, they tend to agree on additional aspects only with a percentage of 100%.

Based on the results of the analysis of teacher perceptions in general, from the three aspects of internet use, a table of mapping teacher perceptions about the use of the Internet for online mathematics learning as a whole is as follows:

**Table 6:** Teachers' Perceptions of Using the Internet for Online Mathematics Learning

Indicator	Category					amount
	Strongly Disagree	Disagree	Disagree less	Agree	Strongly agree	
Additional	0	1	1	24	8	34
Complementary	1	0	12	17	4	34
Substitute	2	12	13	7	0	34
Percentage						
Additional	0%	2,9%	2,9%	70,6%	23,6%	100%
Complementary	2,9%	0%	35,3%	50%	11,8%	100%
Substitute	5,9%	35,3%	38,2%	20,6%	0%	100%

Based on table 6, a diagram of the teacher's perception of the use of the Internet for online mathematics learning is obtained as follows:



**Figure 2:** Teachers' Perceptions of Using the Internet for Online Mathematics Learning

Based on Figure 2, it can be concluded that teachers' perceptions of the use of the Internet for online mathematics learning generally tend to agree on additional and complementary aspects with a percentage of more than 60%.

#### 4. Discussion

The results of research on teacher perceptions regarding the use of the Internet for online mathematics learning, which are divided into gender, education level, length of teaching, and in general, are as follows. Based on gender, which is divided into the perceptions of male mathematics teachers and female mathematics teachers, it is concluded that the Internet can be used for learning mathematics like addition and complement. Learning mathematics online using the Internet cannot replace learning mathematics directly because there are still many obstacles faced by teachers and students, so that the use of the Internet for online mathematics learning, according to the responses of male and female math teachers, is only as addition and complement, for teachers' perceptions about the use of the Internet for online mathematics learning based on the school level teacher which is divided into two, namely high school level and junior high school equivalent.

In the perception of high school teachers and the equivalent, it is concluded that the Internet can be used for learning mathematics like addition and complement. But for the perception of junior high school teachers and equivalent, the conclusion is that the Internet can be used for mathematics learning only as an addition. The junior high school teacher argued why it was only an addition because some junior high school students still did not have their cellphones, and there were other obstacles. If learning using the Internet, the time is equal to direct learning, especially when online learning replaces direct learning, it will not be conducive to the condition of the students. So, in essence, for teachers' perceptions about the use of the Internet for online mathematics learning as a substitute for all categories, they disagree and disagree because there are still many obstacles that are experienced.



In the results of teachers' perceptions about the use of the Internet for online mathematics learning based on the length of the teacher's teaching, it is divided into three, namely 0-10 years of teaching, 11-20 years, and 21-30 years. Based on the length of teaching 0-10 years and 21-30 years, the results can be concluded that teachers tend to agree on additional and complementary aspects. But for a square of teachers with a teaching length of 11-20 years, the results tend to agree on additional aspects only. The teacher said that to provide material as a complement to learning can be done using power points not only via the Internet. Online learning equivalent to direct learning; it also disagrees because face-to-face learning will be more useful and easier to interact with students. Delivering material directly will also be maximized. Online learning cannot replace direct learning because students' different abilities will find it difficult to control students if direct learning is replaced by online learning.

Based on the results of research on teacher perceptions regarding the use of the Internet for online mathematics learning in general in terms of additional aspects, it is classified as high for the category agree with a percentage of 70.6%, strongly agree 23.6%, 2.9% disagree and 2, 9% strongly disagreed. The reason is that the learning source can be from anywhere, not only from books and teachers. The Internet is an additional source of learning mathematics that is easily accessible to students; with the internet, students can study anywhere and anytime. There is a lot of math material and various examples of questions that students can learn to add to their insight. Besides, utilizing the Internet for additional mathematics learning, it can also develop students' technological abilities to keep up with the developments of this advanced era. But on the Internet, it is also not necessarily all right and right, for mathematics material, it is not necessarily following the concept, so there must still be supervision from the teacher and from the parents of the students themselves to use the Internet properly and correctly. Because each student has a different level of understanding, students who may find it difficult to learn independently using the Internet also need assistance from the teacher to better understand the material being taught.

Teachers' perceptions about the use of the Internet for online mathematics learning in terms of complementary aspects with the percentage strongly agree 15.8%, agree 52.6%, and disagree 31.6%. The reason is that by completing direct learning with online learning, the teacher prepares the material to be studied using the Internet, the material from the Internet will be summarized by the teacher combined with the material in books and then will be sent to students also via the Internet. Teachers have also been able to use the Internet for enrichment activities because enrichment activities themselves do not have to be done in the classroom, especially in the current conditions that must be done at home. So teachers can take advantage of Google Forms and Google Classroom, and other applications for enrichment activities. But if online mathematics learning is equivalent to direct mathematics learning, the teacher disagrees because direct learning must be more than online learning because students understand more about direct learning. In essence, the Internet is only to complement mathematics learning. So that students do not only learn in class with books, and it is essential indeed to use the Internet to increase students' insight.

Teachers' perceptions about the use of the Internet for online mathematics learning in terms of the substitution aspect, with a percentage of 26.3% agree, 42.1% disagree, and 31.6% disagree. The reason is that if mathematics learning is fully implemented by online learning, there will be many students who do not understand because each student has a different level of understanding. To convey the material will not be optimal because the material is not conveyed properly from the teacher to the students. Online learning also has many obstacles, namely the main signal, and it makes the condition of students not conducive so that online learning is not carried out properly, even for interaction between teachers and students is also limited. However, in the current condition, online learning is a solution to replace direct learning recommended by the government, because at this time, it is not allowed to gather at school. So, online learning can only be used at certain times to replace hands-on mathematics learning.

Some teachers who argued that they disagreed with the use of the Internet as a substitute for direct learning and replaced with online learning, some said that their students still did not understand and understand technology because learning during this pandemic was demanded to be done online. What this means is that students are still clueless or technologically illiterate because the teacher teaches in a

boarding school, which means that students are not allowed to carry cellphones in the cottage and at school. Apart from that, from an economic point of view, there are different parents of students who do not have their cellphones own that can be used to access the Internet. The teacher said that his students would be very different from students who usually hold cellphones every day, even though in terms of internet technology, this is not only through cellphones but also through computers. One solution so that students are no longer clueless, especially students in Pondok schools, is that teachers can use computers and the Internet at school to be used as learning media, especially mathematics learning. Schools should also have computers and the Internet that is adequate to facilitate students to keep abreast of the times with this very advanced technology. If the school still does not have adequate facilities, then it should be able to apply for assistance to the government to overcome this.

Based on the description above, it can be concluded that the teacher's perception of the use of the Internet for mathematics learning is high in the additional (supplement) and complementary (complement) aspects only. This is the same as the opinion [7]; he said that the application of online learning using the Internet in Indonesia itself is still limited to additional and complementary learning.

### 5. Conclusions

The results of the research on teacher perceptions based on gender regarding the use of the Internet for learning mathematics, namely the dominance of agreeing on additional aspects with a percentage of more than 70% and complementary aspects of more than 50%. Teachers' perceptions based on the level of education show different results, namely that the SMA level is equivalent dominant in additional and complementary aspects with a percentage of more than 70%, while at the junior high school level, the equivalent is only dominant in additional aspects with a percentage of more than 70%. Teachers' perceptions based on the length of teaching showed different results; for the length of teaching 0-10 and 21-30 years, it was dominant in additional and complementary aspects with a percentage of more than 60%. In comparison, in the length of teaching 11-20 years, it was only dominant in additional aspects only with the percentage of more than 70%.

The teacher's reason can be concluded that learning resources can be from anywhere, not only from books and the Internet is one of the additional learning resources for students. But to use the Internet must be under the supervision of the teacher because on the Internet, not all mathematical concepts are correct. The Internet can also complement mathematics learning by utilizing existing applications such as Google Classroom, Google Form, YouTube, Blog, Edmodo, WhatsApp, Quiz, and others. However, online mathematics learning cannot be equated with direct learning to complement learning in school. Mathematics learning cannot be done entirely with online learning because the interaction and delivery of material to students is limited and not optimal. Still, because of this pandemic, online learning for learning mathematics is very much needed. So, the use of the Internet for learning mathematics is only a complementary addition, if as a substitute, it is only for a particular time.

### 6. Acknowledgments

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