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Students' Mathematical Disposition with Blended Learning in Post Covid-19

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Abstrak

Penelitian ini bertujuan untuk menganalisis disposisi matematis mahasiswa dalam *Blended Learning* pasca covid-19. Jenis penelitian ini merupakan deskriptif kuantitatif dengan subjek penelitian mahasiswa program studi manajemen pendidikan islam berjumlah 64 mahasiswa semester genap tahun ajaran 2020/2021. Instrumen penelitian berupa skala disposisi matematis terdiri dari 12 item yang telah divalidasi oleh expert judgment dan lembar pedoman wawancara. Skala disposisi matematis disusun menggunakan skala *semantic differential*. Teknik pengumpulan data dengan pengisian skala disposisi matematis dan wawancara. Berdasarkan hasil penelitian, disposisi matematis mahasiswa dalam *Blended Learning* pasca covid-19 termasuk dalam kategori tinggi. Dari enam aspek disposisi yang diukur empat aspek tergolong pada klasifikasi tinggi, aspek percaya diri dalam menggunakan matematika dalam memecahkan maslah tergolong sedang, sedangkan aspek menghargai kegunaan matematika dalam keseharian dan bidang ilmu lain tergolong sangat rendah. Penelitian ini merupakan penelitian awal untuk melihat disposisi matematis mahasiswa selama pembelajaran daring. Aspek menghargai kegunaan matematika perlu mendapat perhatian khusus untuk penelitian selanjutnya dimana mahasiswa belum sepenuhnya mengakui dan menyadari keberadaan matematika dalam aktifitas keseharian mereka dan pada bidang ilmu lain.
Kata kunci: Blended Learning, Covid-19, Disposisi Matematis

Abstract

This study aims to analyze the students' mathematical disposition with blended learning in post Covid-19. The study is descriptive quantitative, the subject are 64 students in the even semester of the 2020/2021 academic year islamic education management study program. The research instrument is a mathematical disposition scale consisting of 12 items that have been validated by expert judgment and an interview guide. The mathematical disposition scale is prepared using a semantic differential scale. Data collection techniques by filling out a mathematical disposition scale and interviews. Based on the research results, students' mathematical dispositions in post-covid-19 Blended learning are included in the high category. Based on six aspects of disposition measured, four aspects are classified as high, the aspect of confidence in using mathematics in solving problems is classified as moderate, while the aspect of appreciating the usefulness of mathematics in everyday life and other fields of science is very low. This study is a preliminary study to see the mathematical disposition of students during blended learning. The aspect of appreciating the usefulness of mathematics needs special attention for further study where students have not fully recognized and realized the existence of mathematics in their daily activities and in other fields of science.
Keywords: Blended Learning, Covid-19, Mathematical Disposition

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INTRODUCTION

The World Health Organization (WHO) has declared the Corona Virus Disease (Covid-19) outbreak as a world public health emergency, which poses a high risk of threatening state health at the end of January 2020 (Sohrabi et al., 2020). In Indonesia the COVID-19 outbreak affects the implementation of education, face-to-face learning activities must be shifted to online learning in order to prevent the spread of the virus. This is based on the Indonesian government circular letter No. 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of Covid-19. Based on this policy, almost all education providers shift the learning process online with media that can be accessed online without having to be in class to take face-to-face learning (Kemdikbud, 2020). This forces all educational institutions to carry out learning with Information Communication and Technology (ICT).

Learning that is carried out with computer media, or learning that combines face-to-face and computer use is called blended learning (Williams, 2008). Blended learning is a combination of face-to-face learning and e-learning that can be accessed by anyone, anywhere and anytime. Blended learning has the meaning of combining several elements of face-to-face learning with online in harmony (Heinze et al., 2007). Blended learning is one of several lessons that facilitate educational institutions in carrying out learning activities while still following government regulations regarding the spread of COVID-19

Blended learning requires computer-based media such as the Learning Management System (LMS) to assist lecturers in preparing learning materials that can be accessed by students so that communication between students and lecturers runs easily during learning. With LMS students can access learning anytime and anywhere, students can discuss learning and create a virtual learning environment. Blended learning can affect cognitive aspects as well as affective aspects, one of which is mathematical disposition.

Mathematical disposition includes a strong awareness, desire, tendency, and dedication in a person to think and act mathematically in a positive way (Sumarmo, 2010). Students with a higher mathematical disposition will be more persistent, diligent, and interested in exploring something new so that they have more knowledge than students who do not show this behavior (Mahmudi, 2010).

One part of mathematical proficiency is productive disposition, which is a way of viewing mathematics as meaningful, worthwhile, and interesting (Kilpatrick et al., 2001). Disposition leads not only to an attitude but also to a tendency to always be positive in thinking and behaving. This is indicated by the confidence in learning mathematics and reflecting on the results of their thoughts. Disposition is a "habit of mind" or a person's characteristic in responding to various types of situations, such as curiosity, humor, creativity, and friendliness (Katz, 1993). Disposition refers to the frequent display of predispositions in action or behavior. In the context of learning mathematics, the meaning of disposition is a positive disposition where students have curiosity about mathematical problems, have creativity in finding various alternative solutions and respect each other.

Disposition components such as motivation, curiosity, and persistence can be seen when students persist to solve difficult problems, take risks and show an open mind (Maxwell, 2001). This disposition can be seen if students feel happy in learning mathematics. The learning atmosphere will certainly affect the way students view mathematics, the teacher has a role in regulating learning so that it can attract students' interest to bring up the disposition component.

Polking stated that mathematical disposition was seen by: (1) confidence in mathematics in solving problems, stating reasons and communicating an idea; (2) flexible when investigating a mathematical idea and trying to find other ways to solve problems; (3) diligent in solving mathematical problems; (4) interest, curiosity, and inventiveness in solving mathematical problems; (5) monitor, reflect on performance and reasoning; (6) using mathematics in various situations; (7) appreciate mathematics as a value, tool, and language (Sumarmo, 2010).

Based on these definitions, the mathematical disposition in this study is a student's positive attitude when studying and doing mathematical activities. The indicators of mathematical disposition in this study are: (1) confidence in using mathematics, solving problems, stating reasons and communicating ideas; (2) flexibility when investigating a mathematical idea and trying to find other ways to solve problems; (3) persevering in completing mathematical tasks; (4) interest, curiosity, and inventiveness in completing mathematical tasks; (5) monitor, reflect on performance and reasoning; (6) appreciate mathematics in everyday life in other fields. Based on this, the purpose of this study was to obtain a description of the students' mathematical disposition with blended learning in post Covid-19.

METHODS

This research is a quantitative descriptive study to determine students' mathematical disposition with blended learning in post Covid-19. The subjects of this study were 64 students of Islamic education management in the even semester of the 2020/2021 academic year. Mathematical disposition scale instruments and interview guidelines were compiled based on mathematical disposition indicators, the 12 items used were validated by expert judgment. The statement scale is generated from the distribution of agree or disagree responses by respondents who act as a test group that has characteristics similar to the sample (Azwar, 2015). The test of the mathematical disposition scale was carried out on 30 students who were not the research sample who had similar characteristics to the sample. The validity and reliability of the mathematical disposition scale were determined using the Ministep program version 9.3.1.0 using Rasch modeling. Data collection techniques by filling out a mathematical disposition scale and interviews. The data analysis technique used descriptive statistics by calculating the percentage of student answers.

RESULT

The mathematical disposition scale is prepared using a semantic differential scale which is depicted in a straight line consisting of two poles in opposite directions and assumed to be equidistant from the origin (Osgood et al., 1975). The mathematical disposition scale is carried out by (a) determining the indicators of mathematical disposition, (b) compiling a mathematical disposition scale instrument (c) testing the readability of the instrument to expert judgment (d) revising (e) testing the instrument (f) analyzing test data for determine instrument reliability. The validity and reliability of the mathematical disposition scale were calculated using the Ministep program version 9.3.1.0. Table 1 shows the criteria for the suitability of the scale items with Rasch modeling.

Table 1. Item Suitability Criteria for Mathematical Disposition Scale

Criteria	Acceptance Limits
Outfit Mean Square (MNSQ)	0,5 < MNSQ < 1,5
Outfit Z-standard (ZSTD)	-2,0 < ZSTD < +2,0
Point measure corelation (*Pt Measure Corr*)	0,4 < *Pt Measure Corr* < 0,85

(Sumintono & Widhiarso, 2015)

Boone stated that the criteria for outfit means-square, outfit z-standard, and point measure correlation were the criteria used to determine the level of item suitability (Sumintono & Widhiarso, 2015). An item can be revised, replaced or discarded if the item has not all three criteria but an item can be maintained if it has one or two criteria. The calculation results are presented in Table 2.

Table 2. Mathematical Disposition Scale Test Results

Item	MNSQ	ZSTD	Pt Measure Corr	Conclusion
1	0.84	-0.55	0.68	Used
2	0.80	-0.68	0.67	Used
3	0.70	-1.10	0.66	Used
4	0.52	-1.36	0.60	Used
5	1.45	1.00	**0.35**	Used
6	**1.80**	**2.01**	**0.39**	Revised
7	0.70	-1.05	0.65	Used
8	1.28	1.06	0.65	Used
9	0.80	-0.49	0.59	Used
10	0.64	-1.47	0.73	Used
11	**1.62**	**2.13**	0.62	Used
12	1.12	0.53	0.66	Used

Based on Table 2, item 5 does not meet the criteria for pt measure corr with a value of 0.35, but for MNSQ and ZSTD with a value of 1.45 and 1.00, it still meets the criteria, so item 5 is used. Item number 6 item criteria on pt measure corr, MNSQ and ZSTD did not meet, for that item 6 was revised. In item 11, the MNSQ and ZSTD values do not meet the criteria with a value of 1.62 and 2.13, but for the pt measure corr criteria they still meet the criteria with a value of 0.62, item 11 is used. Items that do not meet the criteria are revised by consulting expert judgment so that they can be used as an instrument to measure mathematical disposition.

An instrument must be reliable so that the measurement obtains consistent results (Sumintono & Widhiarso, 2015). Measurements with the same instrument on different students but have similar characteristics will give almost the same results. Table 3 presents the instrument reliability criteria.

Table 3. Instrument Reliability Criteria

Reliability Value	Interpretation
r < 0,5	Ugly
0,5 ≤ r < 0,6	Bad
0,6 ≤ r < 0,7	Moderate
0,7 ≤ r < 0,8	Good
r ≥ 0,8	Very good

(Sumintono & Widhiarso, 2015)

The reliability value of the mathematical disposition scale instrument is 0.88 with a very good interpretation category, so that the mathematical disposition scale meets the criteria for measuring mathematical disposition.

Data analysis was carried out by calculating the average percentage of student answers on each indicator of mathematical disposition using the formula:

$$\bar{P} = \frac{\sum \bar{P}_i}{k} \; x \; 100\%$$

Description:
$\bar{P}$ = the average percentage of answers for each indicator
$\bar{P}_i$ = average on item i
k = number of items per indicator

After calculating the percentage for each item and each indicator, the interpretation of the mathematical disposition is based on the criteria in Table 4.

Table 4. Mathematical Disposition Classification

Interval	Category
$\bar{P} \geq 90\%$	Very high
$80\% \leq \bar{P} < 90\%$	High
$70\% \leq \bar{P} < 80\%$	moderate
$60\% \leq \bar{P} < 70\%$	Low
$\bar{P} < 60\%$	Very low

The students' mathematical disposition data in this study displayed the percentage for each item based on the answers agree or disagree. Student disposition responses to post-covid-19 Blended Learning are shown in Table 5.

Table 5. Percentage of Student's Mathematical Disposition Response

Measured Aspect	No. Items	Items Percentage	Indicator Percentage
Confident	1	67,63	71,21
	2	74,78	
Flexibility	3	83,71	85,60

Measured Aspect	No. Items	Items Percentage	Indicator Percentage
	4	87,50	
Persevere in doing math	5	97,10	92,63
	6	88,17	
Interest, curiosity and inventiveness	7	84,82	81,03
	8	77,23	
Reflect on their own performance and reasoning	9	90,63	84,49
	10	78,35	
Appreciate mathematics in other fields	11	56,25	57,14
	12	58,04	

DISCUSSION

Based on Table 4, the aspect of self-confidence in using mathematics is 71.21% classified as moderate. During online learning, there are several students who actively respond to learning by asking for material that has not been understood or helping to explain to other students what they have understood. However, the comparison between active students and students who only pay attention to the lecturer's explanation is still relatively small. Students are more passive and only pay attention to the material explained by the lecturer. This can be seen from the percentage of the first item of 67.63% which is included in the low category. Students rarely ask the lecturers, they lack confidence to ask material that they do not understand. This can be seen when the lecturer asks whether they have understood or not, the students are just silent and do not respond to the lecturer's questions. This shows that they lack confidence in themselves in learning mathematics. For the second item, 74.78% belongs to the medium category. This item asks about the conditions when there are students who have difficulty understanding the learning material whether other students are willing to help students who have these difficulties. When in this condition, it appears that students are willing to help other students even though they also do not fully understand the material. This shows that they are more confident in discussing with their peers, as can be seen from the percentage comparison, compared to asking directly to the lecturer. In accordance with Vygotsky's learning theory, where learning can generate various mental processes that will operate when a person interacts with adults or friends (Desmayanasari & Hardianti, 2021).

The flexibility aspect shows a percentage of 85.60 in the high category. Flexibility in online learning is shown in solving mathematical problems with various alternative methods in solving problems. Using a variety of alternative solutions, students do in solving problems, they also accept other people's opinions with other methods of solving. This is in accordance

with the statement on the fourth item of 87.50% in the high category. In the third item of 83.71% which is also classified as high category, students stated that they were looking for various ways to solve mathematical problems. The aspect of flexibility is an important concern because this aspect is related to the ability of students to find alternative problem solving strategies. The aspect of flexibility is also one of several important aspects to be developed during learning in the problem solving process. Students solve problems not only from the information that is being discussed at that time, but also from the information they already have. With blended learning the learning process is not limited by space and time so as to maintain the learning process as in the classroom (Endah Wulantina, 2019). A person must be able to develop and use thinking skills based on the experience he already has and relate it to new knowledge that will be or is being studied (Desmayanasari et al., 2018).

The aspect of being diligent in doing mathematics shows 92.63% in the very high classification. Students always do the assignments given, although sometimes there are some students who are late in collecting assignments. They are just trying to do the task, either individually or in group discussions. Group discussions facilitate students to help their friends who have obstacles in understanding the problem. This can be seen in student responses of 97.10% of completing assignments given by the lecturer, and 88.17% if students have difficulty doing math problems, they will ask friends. Both items are classified as very high.

Aspects of interest, curiosity and inventiveness in performing mathematical tasks are classified as high classification 81.03%. Online learning requires students to be independent in learning with various learning resources. Printed books and learning resources are available online and can be used free of charge. During Covid-19, most activities are forced to use online media. Students can easily access online books according to their needs, it is effective and efficient to use. If students encounter difficult math problems, students are challenged to find solutions, this can be seen in student responses of 77.23% in the medium classification. Online learning gives students the flexibility to find information from various online sources in solving math problems.

During online learning, students recheck their answers, it can be seen in students' answers to each task. They monitor and reflect on their performance and reasoning. In the aspect of reflecting on performance, the student response is 84.49% in the high classification. When doing assignments, they sometimes discuss with their friends, study with their peers. Students are conditioned to convey the results of their thoughts on a given mathematical problem. By giving an explanation to his friends, students also reflect on their own answer, by negotiating with other students can improve their level of thinking (Desmayanasari et al., 2021).

The aspect of appreciating mathematics in other fields and in everyday life gets a response of 57.14% in the very low classification. On the statement that students use mathematics to solve everyday problems, the response is 56.25%. Meanwhile, the statement of the use of mathematics in solving problems in other fields received a response of 25.04%. Based on these results illustrate that students have not fully recognized and realized the existence of mathematics in their daily activities and in other fields of science. This is in line with (Intisari, 2017) about his research which discusses students' perceptions of mathematics, students state that mathematics has nothing to do with everyday life and other subjects. This perception of mathematics has existed for a long time and has not undergone significant changes until now. Gurganus stated that mathematics is considered a relatively difficult subject, perceptions and experiences that are formed negatively on mathematics will have a negative impact on motivation to learn mathematics (Khumairo & Lukito, 2019). Mathematics is a science that always supports the development of science and technology. The statement Mathematics is the queen and servant of science (S. & Gauss, 1964) means that mathematics is a source of other fields of science and in its development mathematics does not depend on other sciences. In Post-covid-19, the learning process that was planned face-to-face in class and online could not be carried out because at the time of research, cases of covid-19 increased. The implementation of education must follow government policies by fully implementing online learning.

CONCLUSION

Based on the results of the discussion, the disposition of students in online learning during post Covid-19 is in the high category. The six aspects of disposition measured by four aspects are classified as high, the aspect of confidence in using mathematics in solving problems is classified as moderate, while the aspect of appreciating the usefulness of mathematics in everyday life and other fields of science is very low. This research is a preliminary study to see the mathematical disposition of students during online learning. The aspect of appreciating the usefulness of mathematics needs special attention for further research where students have not fully recognized and realized the existence of mathematics in their daily activities and in other fields of science.

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