

MATHEMATICAL DISPOSITION OF STUDENTS THROUGH THE APPLICATION OF THE CTL TO BASIC STATISTICS LECTURES

KOLOKIUUM

Jurnal Pendidikan Luar Sekolah

<http://kolokium.ppj.unp.ac.id/>

Jurusan Pendidikan Luar Sekolah

Fakultas Ilmu Pendidikan

Universitas Negeri Padang

Sumatera Barat, Indonesia

Volume 11, Nomor 2, Tahun 2023

DOI: 10.24036/kolokium.v11i2.644

Received 23 September 2023

Approved 15 Oktober 2023

Published 31 Oktober 2023

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ABSTRACT

Mathematical disposition is one aspect that influences a person's success in learning, because mathematical disposition is a person's attitude towards appreciating mathematics. This research aims to describe the mathematical disposition of students in the Mathematics Education Study Program at PGRI University of West Sumatra in the Basic Statistics course. The research subjects were 28 students from the class of 2021. The instruments used were a mathematics disposition questionnaire and interview sheets. Mathematical disposition is seen using 6 indicators, namely: 1) self-confidence, 2) curiosity, 3) feeling capable, 4) happy, diligent and diligent, 5) flexible, 6) reflective. The data analysis technique uses quantitative descriptive analysis techniques in the form of percentages. The results of this research show that learning outcomes have increased from the average pretest score (62) to posttest score (87). Based on the results of the Shapiro-Wilk statistical test, it was obtained that 0.03 was smaller than 0.05 and had a normal distribution, so the results of this research were acceptable and had a significant effect on students' mathematical disposition through the CTL approach

Keywords: Mathematical disposition, Basic Student Statistics

INTRODUCTION

Every human being has problems in his life. This problem is a learning process and being able to find solutions and have a positive view of mathematics. One of the courses that can motivate students to have a positive view of mathematics is the basic statistics course. This course not only improves understanding of the material, but also improves other abilities. One of them is the ability to have a positive view. According to the National Council of Teachers of Mathematics, standards for mathematical abilities include (1) conceptual understanding related to operations and relationships; (2) procedural skills that are flexible, accurate and efficient; (3) methodological skills (ability to formulate mathematical disposition indicators, represent, and have a positive view of mathematics); (4) adaptive reasoning (ability to logically, reflexively, explain and justify); and (5) productive disposition (a habitual tendency to assess mathematics which can be assessed and increased

through self-persistence) (Delyana, Rismen, and Handayani 2018). Based on point 3 in the mathematics ability standards in increasing the ability to have a positive view of mathematics. This ability can develop students' mathematical knowledge. One of the abilities that students have in learning mathematics, especially statistics, is that it can increase the ability to have a positive view of mathematics. Basic Statistics is a mandatory subject in the Mathematics Education Study Program. This Basic Statistics course is widely used in everyday life, for example to calculate land area or construct buildings. One of the goals of studying Basic Statistics is how students can have a positive view of mathematics in solving Basic Statistics problems (A. Asmar & Delyana, 2020; Nurmi et al., 2020)

In having a positive view of mathematics, students are expected to be able to understand Basic Statistics well. To have a positive view of mathematics, there are many things that must be considered, such as persistence in learning, interest in the subject matter, cultivating curiosity within oneself, and so on. Learning success is influenced by toughness, tenacity, study habits, independence and responsibility in learning (Sunendar, 2017; Yusri et al., 2019). Apart from the ability to have a positive view of mathematics which is categorized in the cognitive aspect, there are affective and psychological aspects that need to be given attention in the learning process, one of which is mathematical disposition. This mathematical disposition is an interest in mathematics which is demonstrated by a pattern of thinking and actions that have positive elements, self-confidence, knowledge, persistence in solving problems, enthusiasm in learning, reflectiveness in carrying out mathematical activities (Ali Asmar & Delyana, 2020; Qohar & Sumarmo, 2013). In learning mathematics, it is not only the cognitive aspect that needs to be developed, but the affective aspect also needs to be given attention in order to build student character in education. Likewise with learning mathematics, if students try to solve a mathematical problem, they need confidence, tenacity, curiosity and a mindset. One of the affective aspects that needs to be developed is a mathematical disposition as stated by Syofyan Machmud, 2022. A positive mathematical disposition will encourage positive thinking and action (Akbar et al., 2017; Machmud et al., 2022). Mathematical disposition is a tendency to think positively about mathematics (Fatimah & Sundayana, 2022; Priatna Martadiputra, 2012). This is in line with other opinions which state that mathematical disposition is one of the supporting factors in achieving success in students' mathematics learning. Students need a mathematical disposition to solve problems responsibly and get used to working mathematically. Student attitudes towards mathematics cannot be separated from students' mathematical abilities. Students have weak skills and have a negative attitude towards mathematics. On the other hand, students who have a positive attitude towards mathematics will also have good abilities (Andani et al., 2016; Charles-Toussaint & Crowson, 2010) This is proven based on data on average student learning outcomes for the even semester of the 2020/2021 academic year and 2021/2022, only 43% passed. This means that students do not understand the teaching material or their mastery of basic statistics material is relatively low. The results of observations made so far show that students do not want to ask questions if they are having difficulty, if they are asked for an opinion, not many can give an opinion, students quickly give up if there is a difficult task so they don't do it. Therefore, it is important for us to review students' mathematical dispositions. A positive mathematical disposition has a positive role or impact on students in solving mathematical problems (Logawe et al., 2021; Sugiyanti et al., 2017) The results of interviews conducted with several students showed that students were less confident in expressing their opinions. Then from that, students find it difficult to understand the teaching material themselves and they mostly wait for explanations from the lecturer. So it

appears that student learning independence is still minimal. Learning Independence is one aspect of mathematical disposition. Students who have learning independence means being able to take the initiative with or without other parties, being able to determine their learning goals, being able to identify teaching materials, being able to choose and implement appropriate learning strategies and evaluating their learning outcomes (Engberg & Hurtado, 2011; Friantini & Winata, 2020; Khandaghi et al., 2011). Based on the problems above, this research aims to analyze students' mathematical disposition in learning Basic Statistics.

METHOD

This research uses descriptive quantitative methods with the object being students of the third semester of the PGRI University of West Sumatra in the Basic Statistics course. The research instrument was taken from the results of questionnaires and interviews. Questionnaires were given before and after implementing CTL learning. The test instrument is given to students in the form of a questionnaire. The questionnaire provided contains mathematical disposition indicators. The following is to determine the score for increasing statistical reasoning abilities using Hake's (1999) normalized gain formula, namely:

$$\text{Normalized gain} = \frac{\%(\text{skor postes}) - \%(\text{skor pretes})}{100 - \%(\text{skor pretes})}$$

The results of the normalized gain calculation are then interpreted using the classification from Hake (2002), namely:

Table 1. Gain Classification

Besarnya <i>Gain</i> (g)	Classification
$g \geq 0,70$	Tinggi
$0,30 \leq g < 0,70$	Sedang
$g < 0,30$	Rendah

Carry out a normality test to determine the normality of pre-test, post-test score data and normalized gain of mathematical communication skills using the Shapiro-Wilk statistical test with a significance level of $\alpha = 0.05$. Next, a t test was carried out to see the extent of the significance of the CTL model in improving students' mathematical disposition.

DISCUSSION

Results of normality and homogeneity testing of students' mathematical disposition scores using SPSS 25 with the Shapiro-Wilk test. Following are the results of the normality test for the two groups.

Table 2. Normality Pretest
Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.156	28	.081	.939	28	.127

a. Lilliefors Significance Correction

Based on table 2, it appears that the significance value (p) in the Shapiro-Wilk test is 0.127 ($p > 0.05$), so that based on the Shapiro-Wilk normality test the data is normally distributed. This is also visible in figure 1 below.

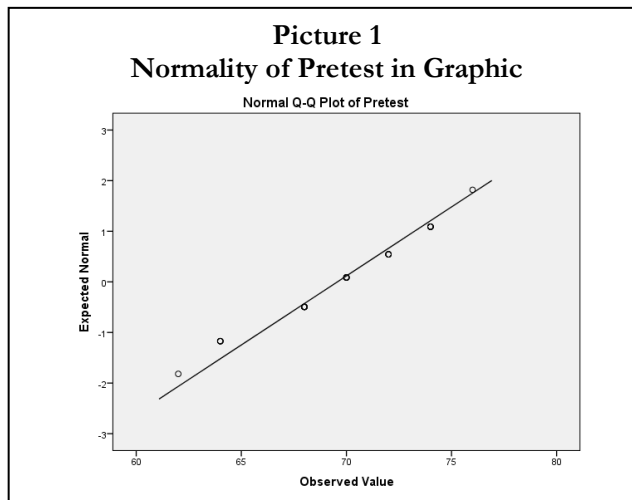


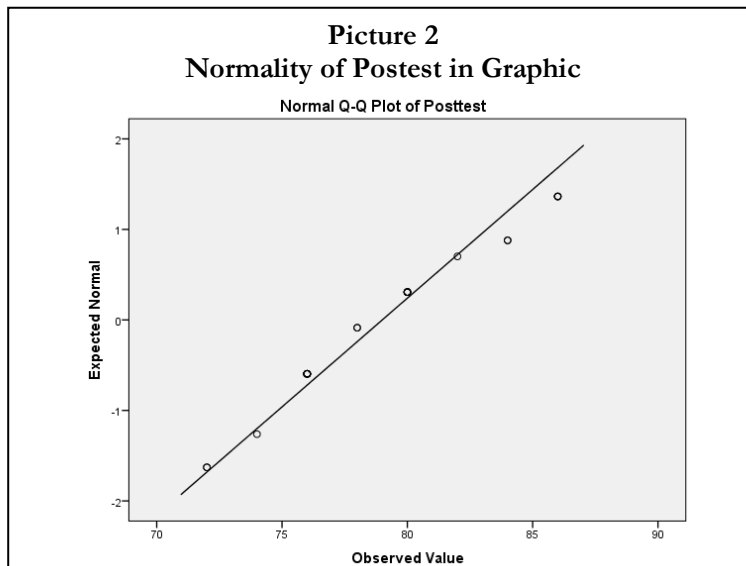
Figure 1 explains that in this image the diagonal gradients follow a normal distribution. On the graph, the points near the line are the appearance of the data when tested. If the points are predominantly near the line, it is concluded that the results of the data tested follow a normal distribution. The results of the pretest normality test and the results of the pretest normality test graph are supported by the results of the posttest normality test and the results of the posttest normality test graph along with the table below.

Table 3. Normality Posttest
Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Posttest	.193	28	.009	.914	28	.064

a. Lilliefors Significance Correction

Based on table 3, it appears that the significance value (p) in the normality test has a significance value of 0.064 so that based on this normality test the data can be said to be normal. This is also visible in figure 2 below.



Problem solving in basic statistics learning is very important in mathematics learning because this learning aims to solve problems related to daily life (Abidin et al., 2018; Yanti et al., 2017). Problem solving is finding a solution to a difficulty in order to achieve a goal that is obtained (Fajri, 2017). Problem solving in basic statistics learning where knowledge and skills are integrated to describe ideas or mathematical foundations that are created to be put together in the form of statements, stories in mathematical language (Pratama et al., 2020; Yuan et al., 2019). From the above problem solving, it can be concluded that mathematical problem solving abilities can be used to improve students' skills to apply them in everyday life. The elements in problem solving abilities are (1) goals that can find solutions; (2) material related to achieving a combined solution can be resolved well; (3) a set of operations in the form of actions that can reach a solution; (4) the set can violate problem solving. Indicator of problem solving ability. Indicators for solving mathematical problems mentioned by (Pratiwi & Widjajanti, 2020; Sutriyono et al., 2020) such as: (1) (1) Identifying adequate data for solving problems; (2) Making mathematical strategies based on daily life; (3) Application of strategies in solving problems in mathematics; (4) Identifying problem results in checking the correctness of the answer results; (5) Application of mathematics in a meaningful way.

The results of the opinion above can be concluded that the indicators of problem solving ability are explained as below (1) Identify elements that are known, asked, and elements that are adequate and needed; (2) Strategic planning in finding solutions; (3) Determine the method for solving problems; (4) Examination of the results obtained from the verification of the conclusions of students' answers Apart from that, this research requires indicators of problem solving ability, but requires a score rubric as a reference in providing mathematical problem solving ability test scores.

Mathematical disposition is an aspect categorized as affective that teachers need and pay attention to in learning. Mathematical disposition is a mathematical assessment and character that needs to be improved through four strategies, namely: (Andani et al., 2016; Qohar & Sumarmo, 2013; Sumarmo et al., 2012): (1) Gain a correct understanding of

mathematical disposition; (2) Make a habit with a mathematical disposition; (3) Provide examples of mathematical dispositions given by the teacher; (4) Learning mathematics, especially basic statistics in an integral, partial and separate manner Students' mathematical disposition can be developed if competency aspects are studied.

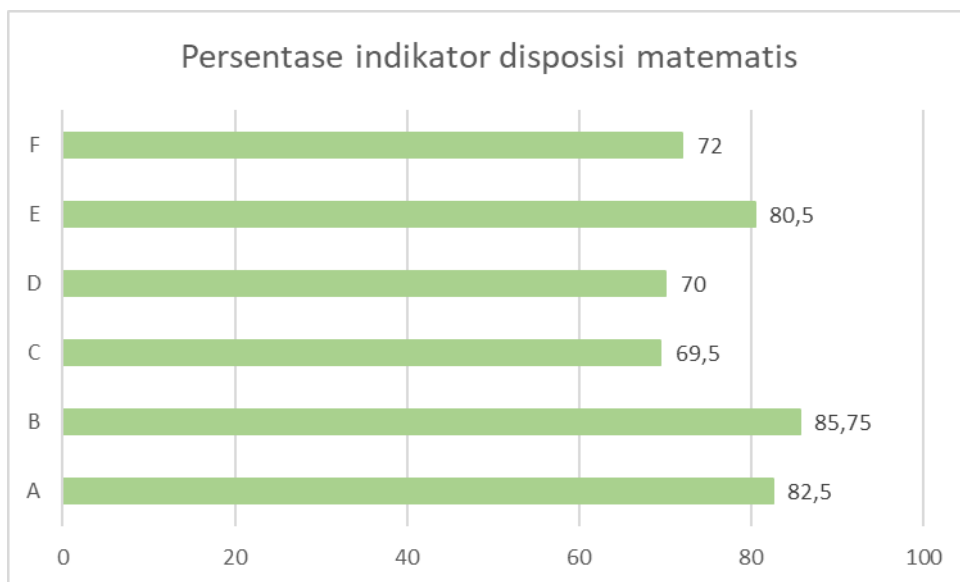
If students have an attitude in solving problems, this behavior is behavior that has confidence and is positive. A foundation that students can understand that basic statistics can be learned. On the other hand, if students do not have the ability to solve problems, it will be difficult to solve mathematical problems well. The mathematical disposition indicators are explained as follows: (1) Have confidence in using mathematics, solving problems, providing and communicating ideas; (2) Identify mathematical ideas for finding solutions; (3) Tenacity in completing mathematical tasks; (4) The tendency to supervise, reflect on students' abilities and logical thinking; (5) Assessing the application of mathematics in other situations and implementing it into situations that are realized in daily life; (6) Reflections carried out and seen are based on the mindset of situations that arise in other aspects of everyday life; (7) Flexibility in completing mathematics assignments through the realization of mathematical ideas applied in solving problems

The following is the student's mathematical disposition scale score based on mathematical disposition indicators, as explained below.

Aspect	Indicator
Confidence	Kepercayaan diri dalam penggunaan matematika
Flexibility	Use of mathematical ideas and seek various types of solutions to solve problems
Curiosity	Having a high level of knowledge in studying mathematics
Sense of self-ability	Having the ability to solve problems
Happy, diligent and persistent	Able to follow the lesson to completion and understand the material provided
reflective	Able to identify problems and understand solutions to problems that arise

Source: (Jamiah, 2018)

Based on the results of categorizing the mathematical disposition of students in the Mathematics Education study program, the research results showed that the average mathematical disposition of students was 77.5%, which was in the medium category. The percentage of self-confidence is 82.5% and curiosity is 85.75% in the high category, self-confidence is 69.5%, happy, diligent and persistent is 70%, flexibility is 80.5%, and reflective is 72%, all of which are within medium category. This illustrates that the mathematical disposition of students in basic statistics courses is mostly in the medium category and there is no low mathematical position.



Description of mathematical disposition indicators:

A = self-confidence

B = curiosity

C = feeling of being capable

D = happy, diligent and persistent

E = flexibility

F = reflective

The results of the analysis show that of the six indicators of mathematical disposition looked at, the indicators of self-confidence are in the high category, while the indicators of curiosity, sense of capability, happiness, diligent and perseverance, flexibility and reflectiveness are in the medium category. High self-confidence is shown by the attitude of students who have a positive view of basic statistics courses that they have no doubts about following, and the same goes for completing assignments, they believe that by doing a lot of assignments they will get good learning results. Students' mathematical disposition based on indicators can be seen;

Self-confidence

The average mathematical disposition of students for indicators of self-confidence is in the high category with a percentage of 82.5%. This shows that students have the confidence to be able to take basic statistics courses without any doubt, students are able to provide reasons for the statements made, students are confident that by doing a lot of assignments they will be able to master the material well. This is in line with what was found by (Machmud et al., 2022) that students who have high self-confidence believe they can do the assignment, try to answer the questions given and can put forward ideas or ideas. A similar thing was also found by (Akbar et al., 2017) that students who have self-confidence will try hard in carrying out learning activities and conversely students who lack self-confidence do not carry out activities with all their abilities.

Curiosity

The average student mathematical disposition on the curiosity indicator is in the medium category with a percentage of 69.5%. From the results of the data description, the lowest average is the statement that students are not used to working on difficult questions, they only work on questions that they consider easy. Many students also do not study the material first. To find out more material in various learning sources, there was one student who did nothing at all. Then, not all students ask seniors for material they don't understand and if there are questions they don't understand, not all students look for answers. However, in general, students already have curiosity in learning because they have tried to learn better, this is in accordance with what was stated by (Ardiyanto, 2013) that curiosity in mathematics will result in someone continuing to learn so that they always try to dig up information. - information to enrich insight.

Feeling capable

The average mathematical disposition for indicators of feeling capable is also in the medium category with a percentage of 70%. This shows that not all students are confident in their abilities to be successful in taking basic statistics courses. There are still students who think that basic statistics material is difficult to learn, students are still not completely sure that they can do the assignments given by the lecturer, and are also not sure about getting good grades.

Happy, Diligent and Persevering

The average mathematical disposition of students for the indicators of being happy, diligent and diligent is in the medium category with a percentage of 76.86%. This means that students are not yet complete; enjoy basic statistics lessons, attend lectures until they are finished, study lecture material until they understand it, do assignments given to them until they are finished, look for learning resources to help understand the material. Students sometimes don't complete their assignments well, and there are still students who study when they are going to take an exam. However, in general, students are diligent in studying, this is in accordance with what was stated by Polking (1998) who stated that persistence is an indicator of mathematical disposition (Izzati & Widyastuti, 2021).

Flexibility

The average mathematical disposition in the student flexibility indicator in learning is also included in the medium category with a percentage of 80.5%. This means that students look for various alternatives in solving problems, find ideas in solving problems related to subject matter, respect different opinions of friends, help friends who have difficulties, are quite satisfied with working on questions in one way, still need to be improved, because there are still students very low ability of flexibility, especially in finding other ways to solve problems. Acting positively and being willing to share is one of the indicators of mathematical disposition (Qohar & Sumarmo, 2013). Silver also expressed the same thing that being attentive, sharing suggestions and respecting each other is a mathematical disposition. Apart from that, this is also in line with research (Lu & Straubhaar, 2014; Poondej et al., 2014) which states that students' mathematical disposition is very good if they have flexible indicators in solving high mathematics problems.

Reflective

The average mathematical disposition of students on reflective indicators is in the medium category with a percentage of 72%. This shows that students' ability to identify problems, communicate ideas in symbols and images, understand what is known and what is needed to solve problems, know that basic statistical material is very relevant in everyday life, are able to connect basic statistical concepts with everyday life. days need to be improved. For statements about what is known to solve problems, in general students have a low disposition. In terms of reflection, it is needed to solve problems, as stated by (Fuady, 2017). if you always reflect, you have a great opportunity to be able to make decisions in solving the problems you face.

CONCLUSION

The mathematical disposition of UPGRSIBA Mathematics Education Study Program students in basic statistics courses is on average in the medium category with a percentage of 77.5%. The level of students' mathematical disposition category in the high category was 36.5%, in the medium category 63.5%, and in the low category 0%. This illustrates that the mathematical disposition of students in basic statistics courses is mostly in the medium category. The mathematical disposition category based on the indicators obtained is the indicator of self-confidence (82.5%) and the indicator of curiosity (85.75%) is in the high category, feeling capable (69.5%), happy, diligent and persistent (70%) , flexibility (80.5%) and reflectiveness (72%) are all five in the medium category. Based on the findings above, it is recommended for students to improve their dispositional abilities towards basic statistics in order to understand the material well, especially on reflective indicators, namely the ability to solve problem. It is also hoped that lecturers who teach basic statistics courses will always develop students' mathematical disposition abilities so that they develop a positive attitude in learning

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