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Determinant Factors of Responsibilities and its Impact on Mathematics Learning Outcome of Junior High School Students

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Abstract. The purpose of this article is twofold: 1) Testing the communication support and organizational culture for learning outcomes in Mathematics indirectly through learning responsibilities, 2) Testing communication support, and organizational culture for learning responsibilities. The research type is correlational quantitative. The study population was 267 students of SMP Negeri 2 Kartasura, Sukoharjo, in 2019/2020. A sample of 160 students was determined by the Slovin formula. Sampling was done by proportional random sampling by lottery. Data collection techniques were carried out with documentation and a closed questionnaire. Data analysis techniques employed path analysis. The results of the study revealed that 1) there was no communication support, school organizational culture, and learning responsibility jointly for mathematics learning outcomes with $\alpha = 0.05$. Partially, communication, organizational culture, and responsibility significantly supported direct learning outcomes in mathematics. 2) Communication and organizational culture simultaneously supported learning responsibilities with $\alpha = 0.05$. The amount of communication support and organizational culture simultaneously towards learning responsibilities was 4.9%. Communication support for learning responsibilities was 2.0164%. Besides, organizational culture support for learning responsibilities was 2.56%.

1. Introduction

The result of learning mathematics is an outcome of the implementation of learning activities. Mathematical learning outcomes can be improved through conscious efforts made systematically leading to positive change. The conscious effort carried out is a good idea to prepare students to solve the problems they will face in everyday life and be able to apply them in any condition [1]. A conscious effort is learning to bring about change (in the sense of behavioral changes, actual, or potential). These changes basically get new skills and occur because of optimal effort [2].

Mathematical learning outcomes are essential because they can function both psychologically, didactically, and administratively. However, the reality in the field of mathematics learning outcomes, especially junior high school students, is not as expected. The quality of mathematics learning outcomes

in Indonesia is still unsatisfactory compared to neighboring countries, such as Malaysia or Singapore. The quality of education seen from mathematics learning outcomes as a benchmark for students to what extent they have understood teaching material still needs to be improved [3].

In general, the results of learning mathematics in Indonesia have not been as expected. The gap in mathematics learning outcomes in Indonesia can be shown from the PISA and TIMSS results in 2015. The PISA results revealed that Indonesia got an average mathematical score of 386 from the highest average score of 490 and Singapore got the highest score of 564 [4], [5]. Based on the TIMSSs results Indonesia got 397 math scores from the highest score achieved by Singapore, which was 618 [6]. Based on the mathematical values from the PISA and TIMSS data, there needs to be an effort to cultivate meaningful learning early on in mathematics learning.

The results of a preliminary study conducted by the researchers at SMP Negeri 2 Kartasura, Sukoharjo, showed that students who had completed mathematics learning were 46% with a Minimum Completion Criteria of more than or equal to 76 (analysis of documents, list of 8th-grade students' mathematics scores, 19 March 2020). Concerning the observation results of mathematics learning in SMP Negeri 2 Kartasura, Sukoharjo, teachers tended to use conventional lecture methods. It could be interpreted that the learning outcomes to be obtained were difficult to achieve optimal learning completeness.

The interview results showed that students in the study area tended to have difficulty in interpreting quantitative information contained in everyday life. It is supported by research results [7], which showed that in learning mathematics, students had difficulty understanding the questions; lack of student understanding of prerequisite material; difficulty building a resolution strategy; and difficulty in drawing conclusions. Therefore, the culture and responsibility of learning mathematics in the research area need to be improved. Except for the teacher factor, as outlined earlier, there were still many other factors causing the mathematics learning outcomes to have not been optimal, such as external and internal factors. External factors, such as communication and organizational culture, were thought to be very influential in mathematics learning outcomes. Likewise, internal factors, such as learning responsibility, were assumed to be very influential in mathematics learning outcomes.

Communication between teachers and students is a crucial factor in learning mathematics. Communication is the process of delivering a message from the message giver (communicator) to the recipient of the message (communicant). The Government of Indonesia, through the Indonesian Minister of National Education Regulation No. 23/2006 in Competency Standards Graduates, stipulates that in learning mathematics, students must have the communication skills to communicate ideas with symbols, tables, graphs, or diagrams to clarify the problem. If a student can master communication well, it will impact learning outcomes.

The National Council of Teachers of Mathematics [8] stated that students must have five basic abilities, and one of them is mathematical communication. In learning activities, communication can occur between teacher and student, students with teaching materials, and among students. It was further conveyed that the indicators of students' ability in mathematical communication in the mathematics learning include 1) the ability to express mathematical ideas through oral, written, and demonstrate and describe them visually, 2) the ability to understand, interpret, and evaluate mathematical ideas both verbally and in other visual forms, and 3) the ability to use terms, mathematical notations, and structures to present ideas, describe relationships, and models of situations. Based on the opinions of the experts described briefly, in this study, mathematical communication was assessed from four indicators: 1) stating mathematical ideas by speaking; 2) describing ideas into mathematical models; 3) writing down mathematical ideas in visual form; and 4) explaining the concept of mathematics both verbally and in other visual forms.

However, organizational culture can be seen as a system. Organizational culture is a shared perception shared by members of that organization [9]. Further, it was said that the functions of organizational culture are that 1) culture creates a clear distinction between one organization and another; 2) culture brings a sense of identity for members of the organization; 3) culture makes it easy for commitment to something broader than one's self-interest; 4) culture is the social glue that helps

unite the organization by providing appropriate standards for employees; and 5) culture as a mechanism for making meaning and control that guides and shapes employee attitudes and behavior. Based on this description, if the school is seen as an organization, then the school culture is a collective agreement shared by all school members. According to McShane and Von Glinow [10], school culture refers to a system of values, beliefs, and norms that are collectively accepted and implemented with full awareness as natural behavior, formed by the environment that creates the same understanding among all elements and personnel of the school. They further asserted that a strong school organizational culture has the potential to increase positive work, and vice versa, a weak organizational culture results in decreased performance.

Based on the opinions of the experts described briefly, the culture of school organizations in this study was assessed from seven indicators. 1) innovation and risk-taking are the extents to which school members are encouraged to be innovative and dare to take risks. 2) attention to detail is the extent to which school members are expected to show precision (accuracy), analysis, and attention to detail. 3) results orientation is the extent to which management focuses on results rather than on the techniques and processes used to achieve these results. 4) people orientation is the extent to which management decisions take into account the impact of outcomes on the school's residents. 5) team orientation is the extent to which work activities are organized based on the team. 6) aggressiveness is the extent to which the school community is aggressive and competitive. 7) stability is the extent to which school activities emphasize maintaining status.

Responsibility characterizes civilized or cultured people. Humans will feel responsible because they realize the good or bad consequences of his actions and realize that the other party requires dedication or sacrifice. Responsibility is the courage to determine that an action is in accordance with the demands of human nature and that only because of that action was carried out, any sanctions demanded (by conscience, by society, by religious norms) are received with full awareness and willingness. Responsibility is a state in which everything must be borne, so it is obliged to give responsibility and bear the consequences [11]. Based on the opinion of these experts, the responsibility of learning can be interpreted that students are obliged to bear all that is done, whether that has positive or negative consequences. Students will understand the importance of responsibility through daily interactions with parents, teachers, and peers. Several ways can be taken to increase the sense of responsibility, including devotion to God Almighty, education, and exemplary.

Learning responsibility in this study was measured by indicators of obedience to the rules of the school/class/teacher, doing all assignments as students, and not working/avoiding all restrictions as students. It is supported by the research results of [12], which explains the form of responsibility as a student, including compliance with school rules and work on assignments given by the teacher. Students work on assignments to finish and complete. The purpose of this article is twofold: 1) testing the communication support and organizational culture for learning outcomes in mathematics indirectly through responsibility; and 2) testing the communication support and organizational culture of responsibilities.

2. Research Methods

This type of research based on its approach is quantitative research. Quantitative research is deductive in nature, in which theory is used to answer the problem formulation so that hypotheses can be formulated, and the truth of the hypothesis will be tested with empirical data [13]. The design of this study is correlational to draw causal conclusions using the path analysis design [13]. This causal relationship included independent variables X_1 and X_2 to dependent variables Y and Z. Independent variables in this study were Communication (X_1) and Organizational Culture (X_2). Dependent variables in this study were Responsibility (Y) and Mathematics Learning Outcomes (Z).

The research setting was at SMP Negeri 2 Kartasura, Sukoharjo, in 2019/2020. This research was carried out for six months. Research preparation was in the 2nd week of December 2019 until the 4th week of January 2020. The research implementation was in the 1st week of February 2020 to the 4th

week of April 2020. Besides, the reporting research was in the 1st week of May 2020 to the 2nd week of July 2020.

The research population was 8th grade students, amounting to 267 students. The study sample size was 160 students, determined by the Slovin formula with an error rate of 0.05 [13]. The sampling technique employed proportional random sampling by lottery. Proportional was utilized to determine the sample portion of each class. Random sampling by drawing was done to select sample members from each class randomly by drawing from the population of each class.

Data collection techniques in this study used a questionnaire and documentation method. The questionnaire instrument was developed by the researchers based on theory and employed to collect data from communication, organizational culture, and learning responsibilities variables. Document analysis techniques were utilized for the data collection on mathematics learning outcomes. Data analysis techniques used path analysis. Path analysis technique was employed to test the contribution shown by the path coefficient on each path diagram of the causal relationship between independent variables X_1 and X_2 to dependent variables Y and Z. The following figure illustrates the procedure of this study (Figure 1).
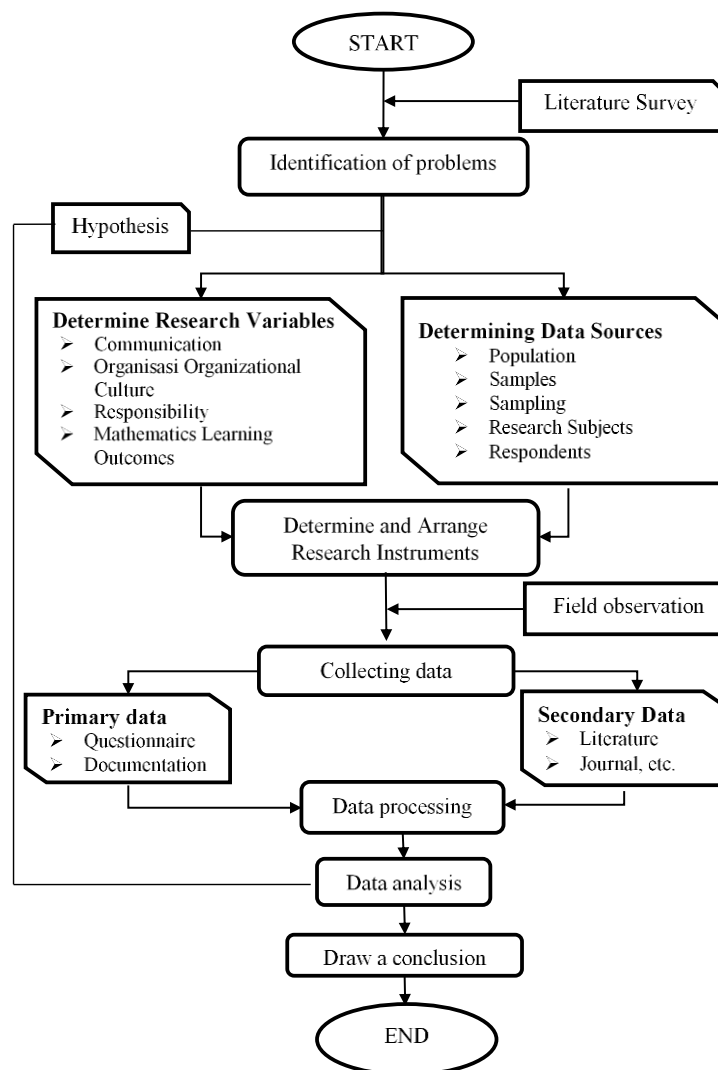

Figure 1. Research Procedure

3. Results and Discussion

Eighth-grade mathematics learning outcome data were taken from the mathematics scores document of the final examination in the even semester of 2019/2020. The highest score was 77, and the lowest was 55, with an average of 65.51 and a standard deviation of 4.31. Mathematics learning outcomes were in the low category with 32.5%, medium category of 38.1%, and high category of 29.4%. The results of learning mathematics in the research setting could be interpreted as not as expected. It was supported by the PISA and TIMSS studies results, showing that mathematics learning outcomes were at a level not yet as expected. Many factors caused it, but one of the factors was the teachers' ability to provide insight and design problems for critical thinking that was not optimal [14].

To support the education's quality (including the quality of mathematics learning outcomes), the government tries to provide a curriculum so that educators have optimal levels of literacy mastery and improve teacher quality. It is in line with the Muscat Agreement, an agreement agreed in 2014 by delegates of the Global Education for All Meeting held by UNESCO [15]. Mathematical learning outcomes require students to solve problems, reasoning, communication, and connections in learning, so mathematics teachers must not be negotiable to be professional.

Communication data were obtained from filling out a questionnaire by a sample, consisting of 15 statement items on a scale of 4, 3, 2, and 1. The highest score was 56, and the lowest score was 29, with an average of 45.38 and a standard deviation of 4.60. Data communication was in the low category of 33.8%, the medium category was 36.3%, and the high category was 30%. Communication data in the research setting could be interpreted as not optimal. According to [16], communication is an inseparable part of social life because human nature is a social creature that is supposed to help one another. Likewise, with learning mathematics, it requires good communication, so what is conveyed, in this case, mathematics teaching materials by the communicator (teacher) to the communicant (students) can be received easily and optimally so that the learning objectives to be achieved can be realized as expected [17].

Interpersonal communication can run effectively if the communicating parties master the ways to communicate well and respect each other. In addition to communicator and communicant factors, other factors influence communication effectiveness, namely the message delivered, the context (environment, situation, and conditions), and the delivery system (the method and media used). In the communication process, several attitudes can support communication effectiveness, namely verbal cues, such as words or brief comments, and nonverbal cues, such as facial expressions, eye gazes, or body movements.

Organizational culture data were obtained from questionnaires by a sample, consisting of 15 statement items with a scale of 4, 3, 2, and 1. The highest score was 57, and the lowest score was 32, with an average of 45.98 and a standard deviation of 5.05. The organizational culture data was in the low category with 80.50%, the medium category was 13.1%, and the high category was 36.9%. Organizational culture in the research setting indicated that it still needs to be improved. It is because school organizations' culture can improve the quality and development of schools and their members. It supports the research results conducted by [18] that implementing a good religious culture in school would get the behavior of polite school citizens, positive thinking, the growth of mutual respect, and the creation of a conducive learning atmosphere.

The culture of school organizations, both curricular and extracurricular culture, needs to be continuously improved so that the behavior and attitudes of its citizens are always in an excellent corridor. Curricular must have a culture of mutual respect, obey the rules, and be on time. Likewise, the curricular extracurricular at school has its own culture, which is a value that tells members what is important and valuable in the organization and what they need to pay attention to. This underlying belief plays the role of moving and controlling one's behavior to shape the culture of school organizations [19].

Learning responsibility data were obtained from filling out a questionnaire by a sample, consisting of 15 statement items with a scale of values 4, 3, 2, and 1. It was obtained the highest score of 58, the lowest score of 37, an average of 48.29, and a standard deviation of 4.23. Responsibility data were in the low category with 31.9%, the medium category was 37.5%, and the high category was 30.6%. Based

on the learning responsibility data in the research setting, it could be interpreted as still being moderate so that it still needs to be continuously improved. It is because responsible attitudes and behaviors are characteristics of civilized people and people who believe in God Almighty. Humans from an early age have been accustomed to developing a conscience; then, they will feel guilty when everything he does and behaves is harming others [20]. Responsibility in learning is the obligation to complete tasks that have been received entirely through maximum effort and dare to bear all the consequences [21], [22].

Overall, the research data categories, namely data on mathematics learning outcomes, communication, organizational culture, and learning responsibilities, can be presented in Figure 2.
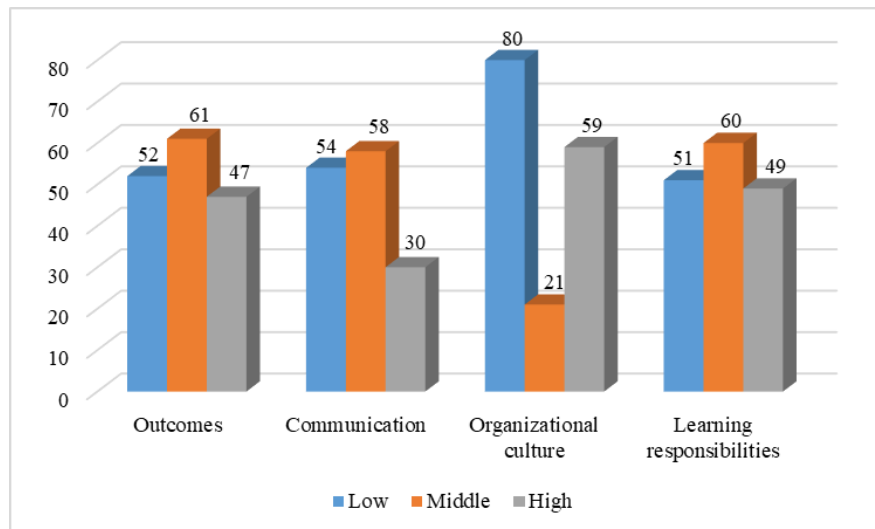

Figure 2. Research Data Categories

Before the four data from the research variables were tested by path analysis, the prerequisite tests, including normality, multicollinearity, heteroscedasticity, and autocorrelation tests, all of which were fulfilled. The results of the Product Moment correlation analysis obtained are presented in Table 1, as follows.

Table 1. A slightly more complex table with a narrow caption.

	X_1	X_2	Y	Z
X_1	1	0.075	0.154	-0.012
X_2		1	0.171	-0.186
Y			1	-0.066
Z				1

By entering the correlation (rij), values can be obtained as follows:

$0.154 = \rho yx_1 + \rho yx_2 .0.075$

$0.171 = \rho yx_2 + \rho yx_1 .0.075$

$-0.012 = \rho zx_1 + \rho zx_2 .0.075 + \rho zy . \rho x_1 y$

$-0,186 = \rho zx_2 + \rho zx_1 .0.075 + \rho zy . \rho x_2 y$

Based on the correlation values obtained by the path coefficient $\rho yx_1 = 0.142$, $\rho yx_2 = 0.160$, $\rho zx_1 = 0.007$, $\rho zx_2 = -0.180$, $\rho yz = -0.036$. Therefore, the equation was obtained $Z = 0.007X_1 - 0.180X_2 - 0.036Y + 0.964.\varepsilon_1$ (first model). This regression equation could be interpreted

starting from the constants and the coefficients of each variable. First, a constant of 0.964 with $.\varepsilon_1$ *still one unit*; means that if the values of X_1, X_2, and Y were 0, then the value of learning mathematics results (Z) was 0.964 units. Second, the coefficient of the communication variable (X_1) was 0.007. It indicated that if the other independent variable had a fixed value and communication has increased by one unit, the mathematical learning outcomes (Z) would experience an increase of 0.007 units. The positive coefficient means that there was a positive relationship between communication and mathematics learning outcomes, implying the more communication increases, the more mathematical learning outcomes increase.

Third, the coefficient of organizational culture variables (X_2) was -0.180. It signified that if the other independent variables had a fixed value, and the organization's culture increased by one unit, the mathematics learning outcomes (Z) would decrease by 0,180 units. The negative coefficient means that there was a negative relationship between the variables of organizational culture and mathematics learning outcomes, indicating that the more conducive the culture of school organizations was, the lower the learning outcomes of mathematics. Fourth, the coefficient of the responsibility variable (Y) was -0.036. It indicated that if the other independent variables had a fixed value and responsibility increased by one unit, the mathematics learning outcomes (Z) would decrease by 0,036 units. The negative coefficient means that there was a negative relationship between the variables of learning responsibility with learning outcomes in mathematics, implying that the more increasing the learning responsibilities, the lower the learning outcomes of mathematics.

The phenomenon of the two variables is in conflict with the theory and empirical reality. The results of this study also disagree with the results of the study by [23], which found a positive and significant relationship between discipline and responsibility together with civics learning outcomes. In this case, the researchers were aware that there were some limitations in their study. The limitations of research that were very dominant included in terms of instruments and the way the sample filed the instrument itself. The limitations of this research instrument were that the instrument was developed based on the theory chosen by the researchers with very limited ability and experience. The limitation of how the sample filled/answered the instrument was that the sample answered the research instrument in a free state without being controlled by the researcher. In filling this free instrument, the sample might have lacked concentration so that they only carelessly answered. With this limitation, the researchers remained consistent in believing the theory that has been believed to be true.

Based on the simultaneous testing of variables with the F-test on the first model, it was obtained F_{count} = 1.924 and $F_{(0.05;3;156)}$ = 2.66. It showed that the researchers' presumption or H_0 was accepted. It signified that there was no communication support, school organizational culture, and learning responsibility jointly for mathematics learning outcomes, with α = 0,05. The results of this study are different from the results of the study [24], which concluded that the motivation to solve problems and interpersonal communication together contributed to problem-solving strategies.

Based on path coefficients (ρ_{ji}), it was obtained variable support directly and indirectly. The communication variable significantly supported direct learning outcomes in mathematics, with a path coefficient of 0.007. Direct communication support for mathematics learning outcomes was 0.49%. The results of this study are supported by the results of the study [25], which concluded that there was an influence of teacher communication on learning outcomes. Likewise, the results of the study [26], inferred that the use of effective communication had a significant effect on mastery of Entrepreneurship courses.

Organizational culture variables significantly supported direct learning outcomes in mathematics, with a path coefficient of -0.180. The amount of direct organizational culture support for mathematics learning outcomes was 3.24%. The results of this study are reinforced by the results of research conducted by [27], which proved the contribution of the organizational culture influence on student learning outcomes by 53.1%. Likewise, the results of the study [28] revealed results that there was a significant influence of learning culture on learning outcomes of KPPI students of SMK Muhammadiyah I Padang. On another occasion, the results of this study are also corroborated by research results from [29], which verified that organizational culture directly affected principals' job satisfaction by 20.97%,

with a path coefficient of 0.458. It suggested that if school organizations' culture were improved towards being more conducive, then the tendency of learning outcomes would increase better.

The learning responsibility variable directly and significantly supported mathematics learning outcomes, with a path coefficient of -0.036. The amount of support for learning responsibility for mathematics learning outcomes was 0.1296%. The results of this study are strengthened by the results of the study from [30], which found that the contribution of responsibility towards the learning outcomes of Natural Sciences was 8.58%, and the remaining 91.42% was determined by other variables.

The second model equation was $Y = 0.142X_1 + 0.160X_2 + 0.951.\varepsilon_2$. The second model regression equation could be interpreted starting from the constants and the coefficients of each variable. First, a constant of 0.951 with ε_1 still one unit; means that if X_1 and X_2 values were 0, the learning responsibility (Y) was 0.951 units. Second, the coefficient of the communication variable (X_1) was 0.142. It represented that if the other independent variable had a fixed value and communication has increased by one unit, the learning responsibility (Y) would experience an increase of 0.142 units. The positive coefficient means that there was a positive relationship between communication and learning responsibilities, indicating the more communication increases, the more learning responsibilities improve.

Third, the coefficient of organizational culture variables (X_2) was 0.160. It signified that if the other independent variables had a fixed value, and the organization's culture increased by one unit, the learning responsibility (Y) would increase by 0.160 units. The positive coefficient means that there was a positive relationship between the variables of organizational culture and learning responsibilities, meaning that the more conducive the culture of school organizations increases the learning responsibilities.

Using the F-test in the second model regression equation, it was obtained $F_{count} = 4.063$ and $F_{(0.05;2;156)} = 3.05$. It showed that the researchers' presumption or H_0 was rejected. It suggested that communication and organizational culture simultaneously supported the responsibility of learning with $\alpha = 0,05$. The amount of communication support and organizational culture simultaneously towards learning responsibilities was 4.9%, and the remaining 95.1% was influenced by other factors not yet examined.

Communication support for learning responsibilities was 2.0164%. Organizational culture support for learning responsibilities was 2.56%. The results of this study are in line with the results of their research [31], which denoted that the relationship of responsibility and mathematical communication was significant in the implementation of the Quick on The Draw cooperative learning model. The results of research conducted by [32] stated that there was a positive influence of the character of responsibility on mathematical communication skills.

4. Conclusion

There was no communication support, school organizational culture, and learning responsibilities jointly towards mathematics learning outcomes, with $\alpha = 0.05$. Communication significantly supported direct learning outcomes in mathematics, with a path coefficient of 0.007. Direct communication support for mathematics learning outcomes was 0.49%. Organizational culture significantly supported direct learning outcomes in mathematics, with a path coefficient of -0.180. The amount of direct organizational culture support for mathematics learning outcomes was 3.24%. Direct and significant learning responsibilities supported learning outcomes in mathematics, with a path coefficient of -0.036. The amount of support for learning responsibility for mathematics learning outcomes was 0.1296%.

Communication and organizational culture simultaneously supported learning responsibilities with $\alpha = 0.05$. The amount of communication support and organizational culture simultaneously towards learning responsibilities was 4.9%. Communication support for learning responsibilities was 2.0164%. Organizational culture support for learning responsibilities was 2.56%.

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