

The influence of tutoring and learning motivation on mathematics achievement of junior high school students

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Abstract

Many factors influence student academic achievement, including tutoring and learning motivation. This research aimed to describe the influence of tutoring and learning motivation on Year 8 students' mathematics achievement in one of the junior high schools in Ruteng, Indonesia in the academic year of 2019/2020. This descriptive research with survey design involved 66 students. Data were collected by administering a student questionnaire consisting of 20 questions. The 5-point Likert scale questionnaire used in this research focused on two categories: tutoring and learning motivation. The final semester test scores were used as the data on students' achievement in learning mathematics. The results revealed that the two factors were positively related to students' mathematics achievement; both contributed to student achievement by 18.49%. These findings confirm that tutoring and students' motivation from teachers or parents are essential because both mediate student achievement. These results provide meaningful knowledge about the importance of teachers or parents providing structured tutoring to support the mathematics achievement of junior high school students.

Keywords: Junior High School, Learning Motivation, Mathematics Achievement, Tutoring

Introduction

Education is an essential need to support the nation progress in creating quality human resources (Allen et al., 2021; Arslan, 2021; Jehadus et al., 2020). To build quality human beings, students must have exemplary learning achievements to measure student success (Goldhaber & Özek, 2019). Learning achievement is expected in the educational research literature, where most studies refer to grades as a measure of success (Guterman, 2021). Thus, learning achievement becomes one of the focuses that teachers and students must achieve.

Various factors can influence the level of student achievement. Ramli et al. (2018) and Elastika et al. (2021) argued that internal and external factors influence student achievement. Tsai et al. (2017) reported that students' learning motivation could predict learning achievement in his research. In other words, learning motivation can mediate student achievement. In addition, learning achievement is also mediated by how much tutoring is carried out, especially by parents (Zhang et al., 2021). Thus, tutoring and student motivation are significantly related to student achievement.

To test the theoretical assumptions mentioned above, previous studies have reported that learning motivation is related to students' mathematics achievement (El-Adl & Alkharusi, 2020; Ning, 2020; Nugraha, Nugraha, & Widyastuti, 2021). It was also reported that tutoring is also related to student achievement. For example, Alegre et al. (2020) found that tutoring in mathematics has reported educational benefits at many levels, from Preschool to Higher Education. However, Šťastný et al. (2020) found different results that overall student achievement was not related to tutoring.

Another study by Zhang et al. (2021) also reported that the effectiveness of tutoring on student achievement was questionable. Hence, further studies are necessary to confirm these gaps. Furthermore, literature studies regarding the issue are rare. This research aimed to describe the relationship between tutoring and learning motivation on students' mathematics achievement by involving Year 8 students in one of the junior high schools in Ruteng, Indonesia, in the academic year of 2019/2020. The following are the research hypotheses.

1. There is a significant relationship between tutoring and mathematics achievement in Year 8 students.
2. There is a significant relationship between learning motivation and mathematics achievement in Year 8 students.
3. There is a significant relationship between tutoring and learning motivation on the mathematics achievement of Year 8 students.

Methods

This research is quantitative research with an Ex Post facto correlational approach method. It employed a multiple correlation design and a simple correlation technique to find the correlation between $(x_1)y$ and $(x_2)y$. In contrast, the double correlation was used to examine the correlation between $(x_1)(x_2)$ and simultaneously to y .

This research was conducted for 66 Year 8 students selected through the Simple Random Sampling technique. The population in this study were all Year 8 students in the 2019/2020 academic year (190 people from 6 classes). The research instrument used was a student questionnaire consisting of 20 questions and documentation. Questionnaires were used to obtain data on tutoring and student motivation, while the documentation technique was used to obtain data on students' achievement in mathematics. Previously, the instrument was tested using Product Moment analysis on 36 questions. If the correlation coefficient is less than 0.361, the item is invalid and should be omitted. While the items with the correlation > 0.361 are

declared valid (Lestari & Kustandi, 2019). A reliability test was then conducted using the Cronbach's Alpha. A variable is considered reliable or consistent if the Cronbach's Alpha is above 0.60 (Taber, 2018). Table 1 summarizes the validity test results using the SPSS 16.

Table 1. Summary of questionnaire validity test results

Questions Category	Questions Number	Total Questions
Valid	4, 8, 12, 13, 16, 17, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 32, 34, and 35	20
Invalid	1, 2, 3, 5, 6, 7, 9, 10, 11, 14, 15, 18, 24, 31, 33, and 36	16

The observation in Table 1 shows that of the 36 questions, 16 were declared invalid because of the $r_{count} \leq 0,361$. It means that the 16 items declared invalid were discarded or not used. Thus, there were 20 questions used to measure aspects of tutoring in this research. The 20 declared valid questions' reliability was determined using the Cronbach Alpha method. Table 2 presents a summary of the reliability test results.

Table 2. Summary of questionnaire reliability test results

	Variable	Cronbach's Alpha	Total Questions
1	Tutoring	0.709	20

Table 2 shows that the Cronbach's Alpha was 0.709 (or > 0.60), so it can be concluded that the instrument used in this study is reliable. The prerequisite tests were carried out before testing the hypothesis (normality, linearity, and multicollinearity test). The normality of the data in this research was examined using the Chi-squared formula, with a significant level of 0.05. Using the F-test formula, a linearity test was conducted to examine a linear relationship between the independent variable and the dependent variable (Riduwan, 2012). At the same time, the multicollinearity test, using the Product-Moment Correlation technique, was done to determine that there was no linear relationship between independent variables. It is multicollinear if $r_{x_1x_2} \leq 0.90$. In other words, if the multiple correlation coefficient between independent variables is less than 0.90, there is no multicollinearity (Shrestha, 2020). Thus, the two variables are eligible as independent variables. Once the data satisfied the normality linearity and multicollinearity tests, the hypothesis testing was carried out using the Pearson Product Moment Correlation test and multiple correlations.

Results and Discussion

The normality test was conducted using the Chi-square formula (Riduwan, 2012). A summary of the normality test results of research data is presented in Table 3.

Table 3. Normality test results of research normative data

Research Variable	N	Data	X^2_{count}	X^2_{table}	Results
Tutoring	66	Normative	10.47	12.592	Normal
Learning Motivation	66	Normative	6.18	12.592	Normal
Mathematics Achievement	66	Normative	9.76	12.592	Normal

Table 3 shows that the normality test for tutoring, learning motivation and students' mathematics achievement were $X^2_{count} = 10.47$ and $X^2_{table} = 12.592$; $X^2_{count} = 6.18$ and $X^2_{table} = 12.592$; and $X^2_{count} = 9.76$ and $X^2_{table} = 12.592$, respectively. Because the results X^2_{count} tutoring, learning motivation, and mathematics achievement data were smaller than X^2_{table} , it can be concluded that H_0 is accepted, indicating that the normative data research was normally distributed. The linearity test was done by the F test formula, and the summary of the results is presented in Table 4.

Table 4. Linearity test results of research normative data

Research Variable	N	F_{count}	F_{table}	Results
Tutoring on mathematics achievement	66	0.53	1.79	Linear
Learning motivation on mathematics achievement	66	0.92	1.78	Linear

Table 4 shows that the linearity test results of tutoring on students' mathematics achievement were $F_{count} = 0.53$ and $F_{table} = 1.79$. The test of learning motivation data on mathematics achievement showed that the results of the linearity test of the normative data were $F_{count} = 0.92$ and $F_{table} = 1.78$. As the results of F_{count} both tutoring and learning motivation data were less than the value F_{table} , it can be concluded that H_0 is accepted, indicating that the normative research data has a linear pattern. Furthermore, the multicollinearity test was carried out to see whether the two variables are feasible as independent variables. The results showed that the multiple correlation coefficient between independent variables was $r_{x_1x_2} = 0.716$. The results showed $r_{x_1x_2} < 0.90$, indicating no multicollinearity problem. The research hypothesis test was done by Pearson Product-Moment Correlation and multiple correlations, and the results can be seen in Table 5.

Table 5. Testing results of hypothesis I and hypothesis II

Hypothesis testing	t_{count}	t_{table}	Results
Hypothesis I	3.692	1.669	H_1 accepted
Hypothesis II	2.647	1.669	H_1 accepted

Based on Table 5, the t-test results of the hypothesis I showed $t_{count} = 3.692$ and $t_{table} = 1.669$; thus, H_0 is rejected and H_1 is accepted. It means that student tutoring significantly affected student achievement in mathematics. Furthermore, for hypothesis II, the t-test results showed $t_{count} = 2.647$ and $t_{table} = 1.669$; thus, H_0 is rejected and H_1 is accepted. It can be assumed that students' learning motivation significantly affected students' mathematics achievement.

For hypothesis III, multiple correlation analysis was conducted. The significance level was determined using the F_{count} and the significant level used in the F_{count} test in this research was 5%. The test criteria are as follows.

1. If the value $F_{count} \geq F_{table}$, then H_0 is rejected and H_1 is accepted, there is a significant relationship.
2. If the value $F_{count} \leq F_{table}$, then H_0 is accepted and H_1 is rejected, there is no significant relationship.

The results of hypothesis testing for Hypothesis III are shown in [Table 6](#).

Table 6. Test results from hypothesis III

Hypothesis testing	F_{count}	F_{table}	Result
Hypothesis III	7.15	3.14	H_1 is accepted

F-test results for hypothesis III ([Table 6](#)) were $F_{count} = 7.15$ and $F_{table} = 3.14$; thus, H_0 is rejected and H_1 is accepted. It indicates that tutoring and learning motivation significantly correlate to students' mathematics achievement.

The research results revealed that tutoring is related to student achievement. These results are in line with the findings of previous studies. For example, Liu et al. (2021) reported that tutoring from teachers in learning positively impacts student achievement. Horan and Carr (2018) also supported this research and even explicitly reported that the amount of tutoring from teachers mediates the improvement of students' learning achievement. More extensive results were stated by Kim et al. (2017) that tutoring from teachers and parents reduces students' mathematical anxiety. Furthermore, those factors positively impact students' academic abilities in mathematics.

This current study also found that learning motivation is related to student achievement. This finding is in accordance with El-Adl and Alkharusi (2020) finding that student motivation in learning is positively related to mathematics achievement. These findings are also extended by association with other variables. For example, Sharp et al. (2019) reported that boredom in learning can be reduced by growing students' learning motivation, which contributes to student learning outcomes. This finding implied that students' learning motivation must be emphasized and increased with various interesting interventions from the teachers.

This study also explained that tutoring is related to students' motivation in learning mathematics. Students who are continuously tutored in learning by teachers and parents will be more motivated to learn. This result is supported by Kim (2015) finding that the role of parents in guiding student learning contributes to shaping students' learning motivation. Capuno et al. (2019) reported a similar finding that tutoring could motivate student learning. In addition, Jiménez-Fernández (2016) revealed that tutoring helps overcome students' difficulties in learning which are directly related to their learning achievement. Parental support in guiding children's learning supports students' academic achievement in mathematics. Abah et al. (2018), Hansson (2012), and Alegre et al. (2020) even emphasized the importance of teachers in helping

students through instruction and tutoring to facilitate their academic achievement in learning mathematics.

Conclusion

Tutoring correlates positively and significantly with mathematics achievement. On the other hand, there is also a positive and significant relationship between learning motivation and mathematics learning achievement. Finally, the two categories contributed 18.49% to the mathematics achievement of junior high school students, indicating that tutoring should be implemented and learning motivation must be fostered in students.

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Conflicts of Interest

The authors declare that no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely by the authors.

References

- Abah, J. A., Age, T. J., & Okoronkwo, M. O. (2018). Returning responsibility to the home: Outcomes of background checks on low and high achievers in middle basic mathematics in North Bank Suburb of Makurdi, Nigeria. *Journal on Efficiency and Responsibility in Education and Science*, 11(2), 29–37. <https://doi.org/10.7160/eriesj.2018.110202>
- Alegre, F., Moliner, L., Maroto, A., & Lorenzo-Valentin, G. (2020). Academic achievement and peer tutoring in mathematics: A comparison between primary and secondary education. *SAGE Open*, 10(2), 1-9. <https://doi.org/10.1177/2158244020929295>
- Allen, R. E., Kannangara, C., & Carson, J. (2021). True grit: How important is the concept of grit for education? a narrative literature review. *International Journal of Educational Psychology*, 10(1), 73–87. <https://doi.org/10.17583/IJEP.2021.4578>
- Arslan, A. (2021). Determining educational needs of families for a value oriented family education program. *African Educational Research Journal*, 9(1), 205–217. <https://doi.org/10.30918/aerj.91.21.013>
- Capuno, R., Revalde, H., Etcuban, J. O., Aventuna, M., Medio, G., & Demeterio, R. A. (2019). Facilitating learning mathematics through the use of instructional media. *International Electronic Journal of Mathematics Education*, 15(1), 677–688. <https://doi.org/10.29333/iejme/5785>

- El-Adl, A., & Alkharusi, H. (2020). Relationships between self-regulated learning strategies, learning motivation and mathematics achievement. *Cypriot Journal of Educational Sciences*, 15(1), 104–111. <https://doi.org/10.18844/cjes.v15i1.4461>
- Elastika, R. W., Sukono, & Dewanto, S. P. (2021). Analysis of factors affecting students' mathematics learning difficulties using SEM as information for teaching improvement. *International Journal of Instruction*, 14(4), 281–300. <https://doi.org/10.29333/iji.2021.14417a>
- Goldhaber, D., & Özek, U. (2019). How much should we rely on student test achievement as a measure of success? *Educational Researcher*, 48(7), 479–483. <https://doi.org/10.3102/0013189X19874061>
- Guterman, O. (2021). Academic success from an individual perspective: A proposal for redefinition. *International Review of Education*, 67(3), 403–413. <https://doi.org/10.1007/s11159-020-09874-7>
- Hansson, Å. (2012). The meaning of mathematics instruction in multilingual classrooms: Analyzing the importance of responsibility for learning. *Educational Studies in Mathematics*, 81(1), 103–125. <https://doi.org/10.1007/s10649-012-9385-y>
- Horan, E., & Carr, M. (2018). How much guidance do students need? An intervention study on kindergarten mathematics with manipulatives. *International Journal of Educational Psychology*, 7(3), 286–316. <https://doi.org/10.17583/ijep.2018.3672>
- Jehadus, E., Tamur, M., Jelatu, S., Pantaleon, K. V, Nendi, F., & Defrino, S. S. (2020). The influence of Conceptual Understanding Procedures (CUPS) learning models concept of understanding of concept student math. *Journal of Educational Experts*, 3(2), 53–59. <https://doi.org/10.30740/jee.v3i2p53-59>
- Jiménez-Fernández, G. (2016). How can I help my students with learning disabilities in mathematics? *Journal of Research in Mathematics Education*, 5(1), 56-73. <https://doi.org/10.17583/redimat.2016.1469>
- Kim, J. I. (2015). American high school students from different ethnic backgrounds: The role of parents and the classroom in achievement motivation. *Social Psychology of Education*, 18(2), 411–430. <https://doi.org/10.1007/s11218-014-9285-3>
- Kim, Y., Thayne, J., & Wei, Q. (2017). An embodied agent helps anxious students in mathematics learning. *Educational Technology Research and Development*, 65(1), 219–235. <https://doi.org/10.1007/s11423-016-9476-z>
- Lestari, I., & Kustandi, C. (2019). Mobile learning design models for state university of Jakarta, Indonesia. *International Journal Interactive Mobile Technologies*, 13(9), 152–171. <https://doi.org/10.3991/ijim.v13i09.10987>
- Liu, H., Yao, M., Li, J., & Li, R. (2021). Multiple mediators in the relationship between perceived teacher autonomy support and student engagement in math and literacy learning. *Educational Psychology*, 41(2), 116–136. <https://doi.org/10.1080/01443410.2020.1837346>
- Ning, B. (2020). Discipline, motivation, and achievement in mathematics learning: An exploration in Shanghai. *School Psychology International*, 41(6), 595–611. <https://doi.org/10.1177/0143034320961465>
- Nugraha, D. Y., Nugraha, D., & Widyastuti. (2021). The correlation between learning motivation and learning outcomes on mathematics subjects in XII science class senior

- high school 4 Bone. *Anatolian Journal of Education*, 6(1), 157–166. <https://doi.org/10.29333/aje.2021.6113a>
- Ramli, N., Muljono, P., & Afendi, F. M. (2018). External factors, internal factors and self-directed learning readiness. *Journal of Education and E-Learning Research*, 5(1), 37–42. <https://doi.org/10.20448/journal.509.2018.51.37.42>
- Riduwan. (2012). *Belajar mudah penelitian untuk guru-karyawan dan peneliti pemula [Easy learning research for teachers-employees and junior researchers]*. Alfabeta.
- Sharp, J. G., Hemmings, B., Kay, R., & Sharp, J. C. (2019). Academic boredom and the perceived course experiences of final year Education Studies students at university. *Journal of Further and Higher Education*, 43(5), 601–627. <https://doi.org/10.1080/0309877X.2017.1386287>
- Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of Applied Mathematics and Statistics*, 8(2), 39–42. <https://doi.org/10.12691/ajams-8-2-1>
- Šťastný, V., Greger, D., & Soukup, P. (2021). Does the quality of school instruction relate to the use of additional tutoring in science? Comparative analysis of five post-socialist countries. *School Effectiveness and School Improvement*, 32(1), 24–46. <https://doi.org/10.1080/09243453.2020.1770809>
- Taber, K. S. (2018). The use of Cronbach's Alpha when developing and reporting research instruments in science education. *Research in Science Education*, 46(7), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Tsai, C. H., Cheng, C. H., Yeh, D. Y., & Lin, S. Y. (2017). Can learning motivation predict learning achievement? A case study of a mobile game-based English learning approach. *Education and Information Technologies*, 22(5), 2159–2173. <https://doi.org/10.1007/s10639-016-9542-5>
- Zhang, Y., Dang, Y., He, Y., Ma, X., & Wang, L. (2021). Is private supplementary tutoring effective? A longitudinally detailed analysis of private tutoring quality in China. *Asia Pacific Education Review*, 22, 239–259. <https://doi.org/10.1007/s12564-021-09671-3>