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Online tutoring in pandemic: An investigation on students' mathematics anxiety and learning motivation

Syafika Ulfah [1*], Khoirunnisa [1], Collins Bekoe [2]
[1] Mathematics Education Study Program, Universitas Muhammadiyah Prof. DR. HAMKA, DKI Jakarta, Indonesia
[2] Memorial University of Newfoundland, Canada
* Corresponding Author. E-mail: syafika.ulfah@uhamka.ac.id

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ABSTRACT

Learning activities should be shifted from offline to online mode as a consequence of the COVID-19 pandemic. Several previous studies have stated that this situation affects the psychology of students. This study aimed to examine mathematics anxiety and learning motivation of junior high school students based on the availability of online tutoring support during the COVID-19 pandemic. We employed a survey method by distributing a Google Form link containing a questionnaire to a public junior high school in East Jakarta, Indonesia. The questionnaire consisted of 22 items of mathematics anxiety and 23 items of learning motivation with a 5-point Likert scale. A total of 365 eighth-grade students were involved in this study. Data analysis used descriptive analysis, Mann-Whitney test, and correlation analysis. Our study revealed a significant difference between students who took and did not take online tutoring. Furthermore, the study also found a negative relationship between mathematics anxiety and learning motivation. The students who took online tutoring had a low level of mathematics anxiety and a very high level of learning motivation.

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INTRODUCTION

Various public events have been shifted to homes due to the COVID-19 pandemic (Suhendro, 2020). To limit their chances of contracting the virus, Hong Kong residents tend to spend more time at home (Choi et al., 2020). A similar situation occurred in Indonesia, where the government established a policy belonging to government regulation (PP) No 21/2020 stated that temporarily halted activities that produce crowds to prevent infection with the COVID-19 (Presiden Republik Indonesia, 2020). As a result, teaching and learning activities moved from classrooms to the home as a circular letter issued by the minister of education and culture. This started March 14, 2020, until an unspecified time, face-to-face learning activities at all educational levels units are replaced by distance learning using online learning media (Kemdikbud, 2020).

Distance learning has been possible for students throughout the pandemic by using online learning from the comfort of their own homes (Sadikin & Hamidah, 2020). However, most students reported feeling anxious when participating in an online learning platform (Oktawirawan, 2020). When compared to face-to-face studying in class, online learning causes anxiety among students (Unger & Meiran, 2020). Anxiety during online learning is caused by an unpleasant home atmosphere, which inhibits focus. Online learning is also regarded as unfavorable because there are no tutors who can directly help students, making it harder for them to comprehend the lesson (Unger &

Meiran, 2020). Being anxious is a psychiatric disorder that is frequently observed in learning activities, particularly in mathematics, where it is referred to as mathematics anxiety (Saputra, 2014).

Mathematics anxiety is an unpleasant emotion experienced when confronted with mathematical problems that induce fear and concern when dealing with specific mathematical scenarios (Syafri, 2017). Math anxiety is a negative reaction to math that can be triggered by solving mathematics problems (Suren & Kandemir, 2020). When a person's thinking is filled with anxiety, it has negative consequences, such as lowering mathematics skills (Maloney & Beilock, 2012; Shi & Liu, 2016). Anxiety is a type of bad feeling that causes children to avoid particular situations linked to a school, lose interest in studying, and eventually drop out (Vivin et al., 2019). Anxiety in students causes students hard to have focus, remember and solve problems (Ekawati, 2015). It is anticipated that if anxiety persists without a remedy, students would lose their ability to control themselves (Suardana & Simarmata, 2013). Low learning motivation causes students to lose interest in learning and become more interested in non-learning activities (Vivin et al., 2019). There is a negative relationship between anxiety and learning motivation, which means that the higher the level of anxiety, the lower the level of learning motivation (Vivin et al., 2019).

Learning motivation is a trait in a student who is learning to make purposeful and focused behavioral changes to reach the desired outcomes (Eriany et al., 2014; Suardana & Simarmata, 2013). The transition from face-to-face learning at school to online learning at home without the presence of teachers and friends would lower motivation and enthusiasm for studying, making it difficult to maintain motivation during the pandemic (Fadlilah, 2020). Individuals with high motivation exhibit a greater interest in learning by devoting more time to it and are more excited about achieving their goals than pupils with low motivation (Febriany & Yusri, 2013). Students with poor motivation tend to be preoccupied with their activities rather than paying attention in class, according to interviews with teachers and students as well as the findings of observations of learning activities (Pratama et al., 2019).

Parents have a critical role in enhancing their children's drive and excitement for learning (Raharjayanti, 2019). According to the recent study, parental encouragement is a factor that encourages students to participate in tutoring (Eriany et al., 2014). Tutoring is commonly defined as extracurricular learning activities that take place outside of the classroom (Dharmapatni & Supriyadi, 2015). Parents and students both choose non-formal education, in this case tutoring, to improve learning outcomes (Hayati, 2020).

Technological advancements promote the presence of innovation, namely online tutoring, which is more flexible in terms of time and location (Hayati, 2020). Learning from home activities as a form of COVID-19 infection prevention provides an opportunity for online tutoring companies to promote their services (Fattah & Sujono, 2020). Companies that provide online learning are currently innovating by providing a platform to build the educational sector, such as providing learning materials on websites or social media accounts that can be easily accessed and also free of charge by all students (Retnawati, 2019). This platform provides consulting services with tutors who are competent for students that subscribe to online learning applications (Retnawati, 2019). Artists and influencers well-known among students were chosen as brand ambassadors for Ruangguru's online tutoring to introduce the Ruangguru application and increase student interest in using Ruangguru's services (Hayati, 2020). Pahamify, Cisco Webex, Zenius, Quipper School, Ruang Guru, MejaKita, ICANDO, Ganeca Digital, and Kelas Pintar are some online applications that are in collaboration with the Ministry of Education and Culture. This it to assist teachers and students in the implementation of online learning (Mailizar et al., 2020).

Based on the explanation provided above, this research will go into detail about students' anxiety and motivation to learn mathematics. The following are the objectives of the research: determine the level of anxiety and learning motivation of junior high school students towards mathematics during the COVID-19 pandemic based on participation in an online tutoring and examine the relationship between mathematics anxiety and learning motivation towards mathematics.

There have been several previous studies on students' anxiety and motivation to learn mathematics. Similarly, it is not a novel instance in Indonesia to use online learning. However, since the outbreak of the epidemic, Indonesia fully integrated online learning in schools. Several earlier research on student anxiety and motivation to learn mathematics have been conducted. The global COVID-19 pandemic, on the other hand, has provided an opportunity to perform a similar study using a novel teaching and learning activity scenario, namely online learning, that is applied comprehensively in most areas in Indonesia that already covered by the internet network. The distinction between this study and other prior research is the emergence of the pandemic. Hopefully, the findings of this study will contribute to further research in the field of mathematics education and provide more information about the state of students during the COVID-19 pandemic.

METHODS

The data for this study was collected through a survey method. The survey was carried out using a questionnaire that has previously been used by Suren and Kandemir (2020). The questionnaire is divided into two sections that use a 5-point Likert scale to assess mathematics anxiety and motivation to learn mathematics. The mathematics anxiety questionnaire developed by Şentürk (2010) contains 22 items divided into five indicators. The indicators are attitude anxiety (4 items), self-confidence anxiety (5 items), content knowledge anxiety (4 items), learning anxiety (4 items), and test anxiety (5 items). Respondents can choose one of five available answers: (1) Never Worried; (2) A Little Worried; (3) Sometimes Worried; (4) Frequently Worried; and (5) Always Worried. The mathematics learning motivation questionnaire was adapted by Aktan and Tezci (2013) from Pintrich et al. (1991) and it consisted of 23 items which is divided into five indicators. These five indicators are intrinsic goal orientation (3 items), extrinsic goal orientation (4 items), task value (5 items), control of learning beliefs (5 items), learning self-efficacy (6 items). Respondents can choose one of five available answers: (1) Strongly Disagree; (2) Disagree; (3) Undecided; (4) Agree; and (5) Strongly Agree.

These instruments were chosen based on the statements contained in the questionnaire, and they can be modified and adapted to the online learning situation. Furthermore, the questionnaires were translated into Indonesian language and were then submitted to experts for validation. One linguist and one mathematical expert validated the instruments. Several items of questionnaires were needed to be improved, so we made adjustments based on the validators' suggestions. Validated instruments were then compiled in a Google Forms and distributed to research subjects. As a result of reliability analysis, the Cronbach's alpha is 0.916 for score collected from mathematics anxiety questionnaire and 0.92 for score collected from motivation to learn mathematics questionnaire.

This study's population consisted of eighth-grade students from a public junior high school in East Jakarta, Indonesia, during the academic year of 2020/2021. The following formula proposed by Estok et al. (2002) was used to calculate a representative sample size, where n is sample size, Z is standard value based on significance level (Z table), P is proportion of population, N is population size, and E is bound of error.

$$n = \frac{{Z\alpha_{/2}}^2[P(1-P)]N}{{Z\alpha_{/2}}^2[P(1-P)] + (N-1)E^2}$$

The total population (N) is estimated to be 24,533 students, the standard value of the normal distribution at the 0.05 significant level is $Z = 1.96$, and the proportion of the population (P) is 0.3333 with a bound of error (E) is ± 0.05. According to the Estok et al.'s (2002) formula, a minimum of 337 students is required to obtain a representtative sample. Sampling was done using a simple random sampling technique in which each member of a population had an equal chance of becoming the research sample (Taherdoost, 2018). From February 2021 to March 2021, 405 students completed online questionnaires via links distributed to schools. The collected data were then sorted. Some data had to be excluded because one student completed the questionnaire more than once and a few respondents did not complete the identity as required. Data sorting results showed that 365 students completed the questionnaire. These 365 students consisted of 45 (12.33%) students who took online tutoring and 320 (87.67%) who did not take online tutoring.

Table 1 shows the interpretation of the mathematics anxiety and mathematics learning motivation because the questionnaire is 5-point Likert scale (Suren & Kandemir, 2020). The score interval is derived from Sugiyono (Nilasari, 2020). The score interval is the division between the difference of maximum score and minimum score and the number of available choice (i.e., 0.8). The data collected from mathematics anxiety and motivation to learn mathematics questionnaires were analyzed using Microsoft Excel 2019 software for descriptive analysis, Mann-Whitney test, and correlation analysis.

Table 1. Score intervals used in the interpretation of data from questionnaire

Mean	Interpretation
1.00 – 1.79	Very low
1.80 – 2.59	Low
2.60 – 3.39	Moderate
3.40 – 4.19	High
4.20 – 5.00	Very high

RESULTS

Descriptive Analysis

Descriptive analysis was used to determine the level of students' mathematics anxiety and motivation to learn mathematics based on the availability of online tutoring support. Table 2 presents the results of the descriptive analysis obtained in the mathematics anxiety questionnaire on each statement item for the case of students who took online tutoring, while for the case of students who did not take online tutoring is presented in Table 3.

Table 2. Mathematics anxiety of students who took online tutoring

No.	Statement	Mean	Skewness	Kurtosis
1	When a mathematics teacher shares a link to join an online math class	1.69	0.99	−0.51
2	When I see the new mathematics book on the first day of school	1.40	1.41	0.82
3	When I picked up my mathematics notebook	1.24	3.16	9.54
4	When I do discussions related to mathematics	1.89	0.22	−1.71
5	When I talk to my friends about my performance in mathematics class	1.87	0.87	−0.34
6	When I heard to mathematics teacher's voice from the laptop/mobile phone speaker during online learning	1.71	1.25	0.56
7	When my teacher asks me a mathematics question	2.49	0.58	−0.89
8	When I was asked to explain a mathematics problem in online learning	2.82	0.28	−0.96
9	When someone asks me a mathematics question	2.02	0.92	−0.03
10	When I see a question with geometric shapes	2.13	0.73	−0.42
11	When I see graphics and charts in the mathematics book	1.78	1.19	0.74
12	When I see a page with rules about mathematics	1.76	0.90	−0.25
13	When I see a page with formulas about mathematics	1.93	0.46	−1.14
14	When I cannot solve a mathematics problem	3.69	−0.59	−0.88
15	When I do not know where to start solving a mathematics problem	3.04	0.12	−1.02
16	When I cannot remember what I learned in mathematics class later	3.31	−0.28	−0.82
17	When I cannot understand a subject taught in mathematics online class	3.31	−0.19	−1.10
18	When the date of the mathematics exam is determined	2.44	0.48	−0.97
19	When I see mathematics questions in a practice examination	2.27	0.53	−0.81
20	When I solve mathematics questions before the examination	1.82	1.25	0.28
21	When I hear that the mathematics examination result will be announced	3.20	−0.17	−1.23
22	When my parents heard the low grade that I got from the mathematics examination	3.64	−0.69	−0.56

From Table 2, we found that the highest mean belongs to the statement 14 "When I cannot solve a mathematics problem" and that mean is categorized as high, while the lowest mean belongs to the statement 3 "When I picked up my mathematics notebook" and that mean is categorized as very low. These results indicated that mathematics anxiety of students who took online tutoring was mostly triggered by inability to solve a mathematics problem. Meanwhile, of the 22 statements, the factor that was slightly to cause mathematics anxiety of students who took online tutoring was picking up mathematics notebook. As for the case of students who did not took online tutoring (see Table 3), the highest mean belongs to the statement 22 "When my parents heard the low grade, I got from the mathematics examination" and that mean is categorized as high, while the lowest mean belongs to the statement 3 and that mean is also categorized as very low. We could say that the most influential thing in causing mathematics anxiety in students who did not take online tutoring was the fear of making their parents disappointed or angry due to the unsatisfied mathematics score that student obtained in the examination. It is slightly different from what we have found from the data of students who took online tutoring, although they were both related to the fear of obtaining low score in mathematics. There was no difference between students who took online tutoring and those who did not take online tutoring in terms of the thing that slightly to cause mathematics anxiety.

In Table 4, we present the results of descriptive analysis on students' mathematics anxiety based on its indicators with respect to their participation in online tutoring. In the case of students who took online tutoring, the mean of learning anxiety was the highest among the mean of five indicators of mathematics anxiety and it is in the mode-

rate category. The similar condition was also found in the case of students who did not online tutoring, where the mean for learning anxiety was found in high category. In addition, the similar result was also found for the indicator with the lowest mean, in which the mean of attitude anxiety became the lowest among others, both for the case of students who took online learning and those who did not take online learning. The mean of attitude anxiety of students who took online tutoring and who did not take online tutoring was in very low and low category, respectively. Based on the results of descriptive analysis on the overall mathematics anxiety, students who did not take online tutoring had a slightly higher mean of mathematics anxiety than those who took online tutoring. The overall score shown that the group of students who took online tutoring had a low level of mathematics anxiety and those who did not take online tutoring had a very low level of mathematics anxiety.

Table 3. Mathematics anxiety of students who did not take online tutoring

No.	Statement	Mean	Skewness	Kurtosis
1	When a mathematics teacher shares a link to join an online math class	1.99	0.74	−0.16
2	When I see the new mathematics book on the first day of school	1.79	1.20	1.03
3	When I picked up my mathematics notebook	1.61	1.47	1.51
4	When I do discussions related to mathematics	2.25	0.54	−0.41
5	When I talk to my friends about my performance in mathematics class	2.43	0.48	−0.73
6	When I heard to mathematics teacher's voice from the laptop/mobile phone speaker during online learning	1.89	1.07	0.30
7	When my teacher asks me a mathematics question	3.08	0.13	−0.85
8	When I was asked to explain a mathematics problem in online learning	3.60	−0.38	−0.85
9	When someone asks me a mathematics question	2.52	0.33	−0.57
10	When I see a question with geometric shapes	2.63	0.44	−0.60
11	When I see graphics and charts in the mathematics book	2.35	0.51	−0.48
12	When I see a page with rules about mathematics	2.19	0.56	−0.55
13	When I see a page with formulas about mathematics	2.25	0.70	−0.18
14	When I cannot solve a mathematics problem	3.90	−0.76	−0.44
15	When I do not know where to start solving a mathematics problem	3.42	−0.19	−1.01
16	When I cannot remember what I learned in mathematics class later	3.72	−0.45	−0.80
17	When I cannot understand a subject taught in mathematics online class	3.78	−0.45	−0.76
18	When the date of the mathematics exam is determined	2.80	0.22	−1.09
19	When I see mathematics questions in a practice examination	2.75	0.28	−0.73
20	When I solve mathematics questions before the examination	2.07	0.67	−0.29
21	When I hear that the mathematics examination result will be announced	3.71	−0.48	−1.01
22	When my parents heard the low grade that I got from the mathematics examination	3.92	−0.88	−0.56

Table 4. Mathematics anxiety based on its indicators of students who took and did not take online tutoring

Indicators of mathematics anxiety	Did you take online tutoring? (Yes/No)	Mean	Skewness	Kurtosis
Attitude anxiety	Yes	1.56	1.22	0.16
	No	1.91	0.93	0.15
Self-confidence anxiety	Yes	2.18	0.81	−0.38
	No	2.71	0.28	−0.97
Content knowledge anxiety	Yes	1.90	0.85	−0.13
	No	2.35	0.55	−0.45
Learning anxiety	Yes	3.34	−0.21	−1.09
	No	3.70	−0.46	−0.81
Test anxiety	Yes	2.68	0.26	−1.30
	No	3.05	0.05	−1.27
Overall mathematics anxiety	Yes	2.34	0.63	−0.82
	No	2.76	0.27	−1.10

Table 5. Descriptive analysis of mathematics learning motivation of students who took online tutoring

No.	Statement	Mean	Skewness	Kurtosis
1	I would like to learn the topics that I like, albeit difficult, in mathematics class	4.02	−0.05	−1.85
2	Studying mathematics makes me very happy	3.84	−0,17	−1,08
3	I do my mathematics homework to gain knowledge not only for a good grade	4.40	−1.15	0.72
4	Getting a good grade from mathematics class makes me very happy	4.91	−4.38	20.69
5	I would like to get good grades from the examinations	4.91	−4.38	20.69
6	I would like to get higher grades than my friends did in mathematics class	4.73	−1.96	3.11
7	I would like to show my friends and family that I can be successful in mathematics class	4.60	−1.31	0.71
8	I can use what I learned in mathematics class in other classes	3.87	−0.46	−0.80
9	It is important for me to learn the subjects in mathematics class	4.42	−0.89	−0.64
10	I am interested in the subjects of mathematics class	3.91	−0.18	−1.15
11	The subjects of mathematics class are useful to me	4.31	−0.90	−0.09
12	I like the subjects of mathematics class	3.87	−0.06	−1.29
13	Understanding the subjects in mathematics class is very important to me	4.27	−0.52	−1.16
14	If I study properly, I can learn the subjects in mathematics class	4.71	−1.79	2.44
15	If I cannot learn the subjects in mathematics class, that is my fault	4.24	−0.74	−0.39
16	If I study hard enough, I can learn the subjects of mathematics class	4.78	−2.35	4.88
17	If I do not understand the subjects in mathematics class, this is because I am not studying hard enough	4.09	−0.94	0.29
18	If I study mathematics, I think I will get a very good grade	4.31	−0.63	−1.11
19	I am sure I can understand the most difficult subjects in mathematics textbook	3.49	0.03	−0.83
20	I am sure I can learn the knowledge taught in mathematics class	3.93	0.13	−1.75
21	I am sure I can understand the most difficult subjects that the teacher teaches in mathematics class	3.31	0.10	−0.29
22	I am sure that I will get a high grade in homework and exams in mathematics class	4.16	−0.29	−1.35
23	I am sure I will be very successful in mathematics class	4.42	−0.89	−0.64

The following section reports the results of our descriptive analysis on the data about students' mathematics learning motivation or motivation to learn mathematics that were presented in Table 5 and Table 6. Table 5 reveals the results from the scores of each statement item contained in the mathematics learning motivation questionnaire of students who took online tutoring. Taking the results in Table 5 into account, the highest mean went to two statements "Getting a good grade from mathematics class makes me very happy" and "I would like to get good grades from the examinations". These results indicated that the most motivating thing that makes students who took online tutoring to learn mathematics was obtaining a good score. Meanwhile, the lowest mean went to the statement "I am sure I can understand the most difficult subjects that the teacher teaches in mathematics class", indicating that difficult mathematics contents or topics make students less motivated to learn mathematics. What we found in students who took online tutoring was similar to what we found in students who did not take online tutoring (see Table 6), where a good score and difficult topic of learning are the most and the least motivating tings for students to learn mathematics, respectively, regardless their participation in online tutoring service.

Based on Table 7, for the case of students who took online tutoring, the mean of intrinsic goal orientation, task value, and learning self-efficacy were found to be high. The mean for control of learning beliefs was found to be very high. The indicator with the highest mean was extrinsic goal orientation. As for the case of students who did not take online tutoring, the mean of intrinsic goal orientation, task value, and learning self-efficacy were found to be high. The mean of control of learning beliefs and extrinsic goal orientation were found to be very high. Based on the overall score, the group of students who took online tutoring had a very high level of motivation to learn mathematics. Meanwhile, students who did not take online tutoring were classified as having a high level of motivation to learn mathematics. Accordingly, it can be concluded that students who used online tutoring have a higher level of motivation to learn mathematics than students who did not use online tutoring.

Table 6. Descriptive analysis of mathematics learning motivation of students who did not take online tutoring

No.	Statement	Mean	Skewness	Kurtosis
1	I would like to learn the topics that I like, albeit difficult, in mathematics class	3.48	−0.12	−0.28
2	Studying mathematics makes me very happy	3.10	−0.15	0.36
3	I do my mathematics homework to gain knowledge not only for a good grade	4.11	−0.71	−0.16
4	Getting a good grade from mathematics class makes me very happy	4.69	−2.46	6.51
5	I would like to get good grades from the examinations	4.82	−3.66	16.05
6	I would like to get higher grades than my friends did in mathematics class	4.53	−1.57	2.03
7	I would like to show my friends and family that I can be successful in mathematics class	4.35	−1.38	1.31
8	I can use what I learned in mathematics class in other classes	3.48	−0.18	−0.15
9	It is important for me to learn the subjects in mathematics class	3.97	−0.57	−0.14
10	I am interested in the subjects of mathematics class	3.28	−0.08	−0.16
11	The subjects of mathematics class are useful to me	3.87	−0.35	−0.07
12	I like the subjects of mathematics class	3.18	−0.24	−0.10
13	Understanding the subjects in mathematics class is very important to me	3.83	−0.16	−0.58
14	If I study properly, I can learn the subjects in mathematics class	4.56	−1.30	1.24
15	If I cannot learn the subjects in mathematics class, that is my fault	4.12	−0.80	0.46
16	If I study hard enough, I can learn the subjects of mathematics class	4.56	−1.53	2.53
17	If I do not understand the subjects in mathematics class, this is because I am not studying hard enough	4.01	−0.96	0.88
18	If I study mathematics, I think I will get a very good grade	4.15	−0.83	0.11
19	I am sure I can understand the most difficult subjects in mathematics textbook	2.83	0.05	0.11
20	I am sure I can learn the knowledge taught in mathematics class	3.40	0.29	0.34
21	I am sure I can understand the most difficult subjects that the teacher teaches in mathematics class	2.72	0.10	0.11
22	I am sure that I will get a high grade in homework and exams in mathematics class	3.70	−0.19	−0.30
23	I am sure I will be very successful in mathematics class	3.90	−0.44	−0.23

Table 7. Mathematics learning motivation based on its indicators

Indicators of mathematics learning motivation	Did you take online tutoring? (Yes/No)	Mean	Skewness	Kurtosis
Intrinsic goal orientation	Yes	4.09	−0.42	−1.14
	No	3.56	-0.25	−0.36
Extrinsic goal orientation	Yes	4.79	−2.34	4.73
	No	4.60	−2.03	4.01
Task value	Yes	4.08	−0.50	−0.90
	No	3.55	−0.33	−0.17
Control of learning beliefs	Yes	4.42	−1.26	1.03
	No	4.22	−0.94	0.59
Learning self-efficacy	Yes	3.94	−0.35	−0.88
	No	3.45	−0.17	−0.42
Overall mathematics learning motivation	Yes	4.24	−0.81	−0.45
	No	3.85	−0.57	−0.36

Normality Test

The skewness and kurtosis values of each statement item in the questionnaire were used to perform the normality test. The normality of the data depends on the histogram and the absolute value of skewness and kurtosis. For a sample size greater than 300, the absolute value of skewness that is not greater than 2 or kurtosis value that

is not greater than 4 is sufficient to meet the requirement that the data is normally distributed (Mishra et al., 2019). The results of the calculation of skewness and kurtosis for each item of the statement in this study, however, showed that skewness and kurtosis values of several items are not in that range, indicating that the data is not normally distributed. As a result, the Mann-Whitney test was used to compare means of the two independent samples.

Mann-Whitney Test

The Mann-Whitney test is a non-parametric test that is commonly used as an alternative to the t-test when the data is not normally distributed (Perme & Manevski, 2019). The criteria for accepting the hypothesis are determined based on the z-score, that is if $-z_{table} \leq z_{count} \leq z_{table}$, then the null hypothesis (i.e., there is no significant difference) is accepted (Sundayana, 2014). The Mann-Whitney test was used to determine whether there is a difference in the indicator and overall mean of students' mathematics anxiety and learning motivation between those who took online tutoring and those who did not take it. By using two-tailed test and a significance level (α) of 0.05, we obtained that $z_{table} = z_{0.05(1-0.05)} = z_{0.0475} = 1.96$. The Mann-Whitney test results are shown in Table 8 and Table 9 using a two-tailed test and a significance level of 0.05.

Table 8. Mann-Whitney test of students' mathematics anxiety based on student participation in online tutoring

Aspect	Online tutoring	*n*	Mean	z	*p*-value
Attitude anxiety	Yes	45	1.556	−6.265	0.000
	No	320	1.911		
Self-confidence anxiety	Yes	45	2.182	−6.467	0.000
	No	320	2.705		
Content knowledge anxiety	Yes	45	1.900	−6.134	0.000
	No	320	2.352		
Learning anxiety	Yes	45	3.339	−5.606	0.000
	No	320	3.705		
Test anxiety	Yes	45	2.676	−5.852	0.000
	No	320	3.048		
Overall mathematics anxiety	Yes	45	2.339	−6.273	0.000
	No	320	2.756		

Table 9. Mann-Whitney test of students' mathematics learning motivation based on student participation in online tutoring

Aspect	Online tutoring	*n*	Mean	z	*p*-value
Intrinsic goal orientation	Yes	45	4.088	−6.425	0.000
	No	320	3.565		
Extrinsic goal orientation	Yes	45	4.789	−3.880	0.000
	No	320	4.596		
Task value	Yes	45	4.076	−2.675	0.007
	No	320	3.554		
Control of learning beliefs	Yes	45	4.418	−3.535	0.000
	No	320	4.216		
Learning self-efficacy	Yes	45	3.937	−2.530	0.011
	No	320	3.449		
Overall mathematics learning motivation	Yes	45	4.240	−2.473	0.013
	No	320	3.853		

The results of the analysis obtained from mathematics anxiety scores in terms of student participation in online tutoring differs significantly in all indicators (see Table 8) which is indicated by $-z_{table} > z_{count}$ (attitude anxiety, $z_{count} = -6.265$; self-confidence anxiety, $z_{count} = -6.467$; content knowledge anxiety, $z_{count} = -6.134$; learning anxiety, $z_{count} = -5.606$; and test anxiety, $z_{count} = -5.852$). It was concluded that the mean of mathematics anxiety of students who did not take online tutoring was found to be higher than those who took online tutoring. Table 9 showed that the results differ again in all indicators of mathematics learning motivation which is indicated by $-z_{table} > z_{count}$

(intrinsic goal orientation, $z_{count} = -6.425$; extrinsic goal orientation, $z_{count} = -3.880$; task value, $z_{count} = -2.675$; control of learning beliefs, $z_{count} = -3.535$; and learning self-efficacy, $z_{count} = -2.530$). It was also concluded that the mean of mathematics learning motivation of students who took online tutoring was found to be higher than those who did not take online tutoring.

Correlation Analysis

A Pearson product-moment correlation analysis was used to determine whether there is a correlation between mathematics anxiety and motivation to learn mathematics. Table 10 presents the results of the correlation analysis.

Table 10. Correlation analysis result between mathematics anxiety and motivation towards mathematics

Indicator	MA.ATT	MA.SCF	MA.CKN	MA.LRN	MA.TST	MA.ALL	MO.IGO	MO.EGO	MO.TVL	MO.CTL	MO.LSE
MA.SCF	0.710*										
MA.CKN	0.627*	0.705*									
MA.LRN	0.426*	0.566*	0.526*								
MA.TST	0.577*	0.677*	0.636*	0.652*							
MA.ALL	0.781*	0.885*	0.838*	0.769*	0.871*						
MO.IGO	−0.516*	−0.550*	−0.510*	−0.282*	−0.410*	−0.542*					
MO.EGO	−0.181*	−0.138*	−0.173*	0.074	−0.005	−0.094	0.391*				
MO.TVL	−0.437*	−0.490*	−0.443*	−0.298*	−0.385*	−0.493*	0.765*	0.381*			
MO.CTL	−0.242*	−0.260*	−0.281*	0.001	−0.208*	−0.238*	0.522*	0.523*	0.597*		
MO.LSE	−0.408*	−0.504*	−0.455*	−0.323*	−0.401*	−0.504*	0.663*	0.449*	0.719*	0.520*	
MO.ALL	−0.450*	0.500*	−0.474*	−0.234*	−0.373*	−0.486*	0.825*	0.635*	0.889*	0.774*	0.868*

Note: * statistically significant, MA: Mathematics anxiety, MO: Mathematics learning motivation, MA.ATT: Attitude anxiety, MA.SCF: Self-confidence anxiety, MA.CKN: Content knowledge anxiety, MA.LRN: Learning anxiety, MA.TST: Test anxiety, MA.ALL: Overall mathematics anxiety, MO.IGO: Intrinsic goal orientation, MO.EGO: Extrinsic goal orientation, MO.TVL: Task value, MO.CTL: Control of learning beliefs, MO.LSE: Learning self-efficacy, and MO.ALL: Overall mathematics learning motivation

The value of r_{count} then compared with the value of r_{table} to determine whether there is a relationship between mathematics anxiety and mathematics learning motivation. Positive and negative signs indicate the direction of the relationship between two variables (Aroma & Suminar, 2012; Sugiyono, 2012). The two variables have a relationship if $r_{count} > r_{table}$. With a significance level of 0.05 and the sample size is 365, the value of r_{table} is 0.103. Table 11 shows criteria of relationship level to interpret the correlation coefficient (Sugiyono, 2012).

Table 11. Criteria of correlation level

Correlation coefficient	Level
0.00 – 0.199	Very low
0.20 – 0.399	Low
0.40 – 0.599	Moderate
0.60 – 0.799	High
0.80 – 1.000	Very high

As a result of the correlation analysis, attitude anxiety in mathematics anxiety indicators had a relationship with intrinsic goal orientation ($r_{count} = -0.516$) in mathematics learning motivation indicators. This was indicated by $|r_{count}| > r_{table}$, namely $|-0.516| > 0.103$ with a moderate level. Meanwhile, a very low-level relationship between attitude anxiety had a relationship with extrinsic goal orientation ($r_{count} = -0.181$). This result is consistent with previous study, which indicates that it is essential for students to have a competitive learning environment in order to encourage competition, which can increase interest in learning and reduce mathematics anxiety (Garba et al., 2019).

Self-confidence anxiety in mathematics anxiety has a relationship with self-efficacy ($r_{count} = -0.504$). These indicators have a moderate level of relationship. Another study conducted on ninth grade students showed that there was a relationship between self-confidence and self-efficacy (Usta, 2017). Self-confidence anxiety has a relationship with extrinsic goal orientation ($r_{count} = -0.138$), the value of r_{count} shows the relationship between these indicators is in the very low category. Content knowledge anxiety has a relationship with intrinsic goal orientation

($r_{count} = -0.510$) which is in the moderate category. Meanwhile, there is a very low-level relationship between content knowledge anxiety and extrinsic goal orientation ($r_{count} = -0.173$).

There is relationship between learning anxiety and learning self-efficacy ($r_{count} = -0.323$), the value of r_{count} shows the relationship between these indicators is in low category. Meanwhile, there is no relationship between learning anxiety in mathematics anxiety indicators and control of learning beliefs ($r_{count} = 0.001$) in mathematics learning motivation indicators which is indicated by $r_{count} < r_{table}$, i.e., $0.001 < 0.103$. Test anxiety has a moderate relationship with intrinsic goal orientation ($r_{count} = -0.410$) and there is no relationship between the test indicator and extrinsic goal orientation ($r_{count} = -0.005$) which is shown by $|r_{count}| < r_{table}$ is $|-0.005| < 0.103$.

Based on the value of r_{count} in Table 10, it can be seen that the results of the correlation analysis on the overall score show that there is a negative relationship ($r_{count} = -0.486$) between mathematics anxiety and mathematics learning motivation with a level of relationship in the moderate category. As a result, students who are more anxious about mathematics have lower levels of motivation to learn the subject. Otherwise, students with a higher level of mathematics learning motivation have lower levels of mathematics anxiety.

DISCUSSION

Student participation in online tutoring was used as a variable in this study to determine students' anxiety and motivation to learn mathematics during the COVID-19 pandemic. The results of this study showed that the mathematics anxiety of students who did not take online tutoring was higher than students who took online tutoring. Previous study found that students with mathematics anxiety disorder are concerned when dealing with mathematics, and as a result, they avoid doing mathematics-related activities (Syafri, 2017). When the findings of these studies are merged, it is reasonable to conclude that students do not use online tutoring because of mathematics anxiety, which causes them to avoid interactions with mathematics. Nevertheless, results from this study are contrary to previous research, which showed that students without tutoring showed average mathematical anxiety less than those with tutoring (Dharmapatni & Supriyadi, 2015). The difference between the results of this study and previous studies may be due to differences in grade levels. In the previous study, the sample in the study was students who would face the national examination. Therefore, it is possible that this reason makes students feel more anxious so they take tutoring so they are expected to be better prepared to face the national examination.

High category mathematics anxiety was derived from statements related to parents, which results in parents playing a role in shaping views of children on mathematics. This result is supported by previous study which indicates that parents have played an essential role in the development of childhood attitudes and anxiety and parents should be able to communicate good mathematics so that their children do not feel pressure to learn mathematics (Yaratan & Kasapoğlu, 2012). Students who have a high level of mathematics anxiety have a lower learning performance because they do not have confidence and a small understanding of mathematics (Zakaria et al., 2012). Parents and teachers need to grasp the characteristics of children anxiety because children with high anxiety require counseling for additional consultation (Yavuz, 2018).

Learning anxiety in mathematics anxiety indicators obtains an average score that is included in the high category. Indicators of learning anxiety include statements related to learning situations in online classes when students have difficulty solving problems in mathematics and cannot understand the teacher's explanation. These results are supported by research which states that students with high mathematics anxiety make several mistakes in doing mathematics problems: errors in writing symbols, interpreting mathematical models, and being inconsistent in using mathematical symbols so that these errors can obstruct mathematical problem solving (Irfan, 2017). Another study found online learning causes of mathematics anxiety, teachers need to understand the characteristics of students who have a mathematics anxiety disorder because by understanding the character of students, teachers can help provide solutions to student problems (Lailiyah et al., 2021).

The results of this study also showed that the group of students who took online tutoring had a higher level of mathematics learning motivation than the group of students who did not take online tutoring. Another finding in this study is that students who take online tutoring are more motivated to get good grades. This result has already been confirmed in a study that shows that most students want to get good score, although in online learning students still want to compete with friends to get good qualifications (Alifia & Pradipta, 2021). Students who assume mathematics is fun will grow their motivation to learn mathematics and looking at problems in mathematics are a challenge (Lestari, 2017). Furthermore, the results of study conducted by Lestari (2017) showed that there was a positive relationship between learning motivation and mathematics learning outcomes. Based on this statement,

it means that when students have high learning motivation, they will get good learning outcomes. Indicator in mathematics learning motivation with the highest average is extrinsic goal orientation which is included in the very high category. Extrinsic motivation comes from outside the individual including parents, parents supporting factors for children to participate in tutoring (Eriany et al., 2014). Other studies have found that in real-life, most students are more extrinsically motivated which means that learning motivation is strongly influenced by the environment (Suprihatin, 2015).

Mathematics anxiety and mathematics learning motivation were examined in terms of student participation in online tutoring showed that there are significant differences between students who take and do not take online tutoring on all indicators in mathematics anxiety: attitude anxiety, self-confidence anxiety, content knowledge anxiety, learning anxiety, and test anxiety. The same results were also found in the mathematics learning motivation, there were significant differences between students who take and do not take online tutoring on all indicators in the mathematics learning motivation: intrinsic goal orientation; extrinsic goal orientation; task value; control of learning beliefs; and learning self-efficacy. Several previous studies have shown that many students are satisfied with online tutoring because there is an increase in learning outcomes, online tutoring is considered more flexible because students can arrange the place, study time so that it is easier to access subject matter (Syamsurijal, 2019). A study recommends that online tutoring can provide asynchronous and synchronous services. Asynchronous makes it easier for students who have problems with internet connections, while synchronous allows tutors and students to interact directly via video conference so that if a problem is found the tutor can immediately provide a solution (Johns & Mills, 2021).

The results of the correlation analysis showed that there was a negative relationship between mathematics anxiety and mathematics learning motivation with the level of the relationship in the moderate category, this finding means that the relationship between mathematics anxiety and mathematics learning motivation is inversely proportional. Previous research found that there was a negative relationship between anxiety and student motivation (Suardana & Simarmata, 2013). This result means that students with higher mathematics anxiety have a low level of motivation to learn mathematics. On the other hand, students with higher mathematics learning motivation have lower math anxiety levels.

CONCLUSION

Descriptive analysis shows that the average mathematics anxiety of students who did not take online tutoring is higher than those who took online tutoring and the group of students who take online tutoring has a higher mathematics learning motivation than the opposite group. Findings in this study were students felt anxious when their parents found out that they had low mathematics scores. Meanwhile, learning anxiety are indicators with the highest average meaning that students' mathematics anxiety is high. Indicators of learning activities include statements related to students' obstacles in solving mathematical problems, this shows that students' barriers to learning mathematics are one of the factors that can lead to the emergence of mathematics anxiety. In addition, students feel happy when they get good mathematics scores. This result indicates that extrinsic motivation is a factor that affect students' motivation in learning mathematics. The Mann-Whitney test showed that there were significant differences between students who took and did not take online tutoring in each indicator of mathematics anxiety and mathematics learning motivation. The results of the correlation analysis between mathematics anxiety and mathematics learning motivation show that there is a negative relationship, meaning that students with low mathematics anxiety have high mathematics learning motivation and vice versa. The results of this study are expected to contribute and enrich information in educational research related to the condition of students in participating in online learning so that teachers or parents can understand existing conditions and find solutions to problems faced by students. For further research, it can focus on solutions to the factors of mathematics anxiety and motivation to learn mathematics found in this study.

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