

## LEVELS OF STUDENTS' MATHEMATICS ANXIETIES AND THE IMPACTS ON ONLINE MATHEMATICS LEARNING

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**Abstract:** It is widely assumed that anxieties tend to lead to low mathematics performance. The purpose of this study was to describe the levels of students' mathematics anxieties and the impacts on mathematics learning achievement in online mathematics learning. The study was a quantitative survey. The research instrument was questionnaire consisting of four elements of physiological, cognitive, affective, and behavioral aspects. The subjects were 109 mathematics education students who were willing to be the research participants. The data were collected using mathematics anxiety questionnaires and documentation of students' mathematics learning achievement. The data analyses used descriptive statistics and confirmatory factor analysis with Structural Equation Modeling of the Lisrel program. The findings show that the levels of all aspects of students' mathematics anxieties in online mathematics learning were at the moderate level. The anxiety aspects that affect students' mathematics learning achievement in online mathematics learning were of the affective and cognitive categories, while the physiological and behavioral aspects do not affect mathematics learning achievement. A research implication is for the teacher to pay attention to the cognitive and affective aspects of the students' mathematics anxieties.

**Keywords:** *mathematics anxiety, mathematics anxiety level, mathematics learning achievement, online mathematics learning.*

### LEVEL KECEMASAN MATEMATIKA MAHASISWA DAN DAMPAKNYA PADA PEMBELAJARAN MATEMATIKA *ONLINE*

**Abstrak:** Secara luas diasumsikan bahwa kecemasan cenderung menyebabkan kinerja matematika yang rendah. Tujuan penelitian ini adalah mendeskripsikan tingkat kecemasan matematika mahasiswa dan adakah dampak kecemasan matematika terhadap prestasi belajar dalam pembelajaran matematika *online*. Jenis penelitian ini adalah penelitian kuantitatif survei. Instrumen penelitian berupa angket kecemasan matematika yang terdiri atas empat aspek, yaitu aspek fisiologi, afektif, kognitif, dan perilaku. Subjek penelitian adalah 109 mahasiswa pendidikan matematika yang dengan sukarela bersedia menjadi sampel penelitian. Pengumpulan data menggunakan kuisioner angket kecemasan matematika dan dokumentasi prestasi belajar matematika mahasiswa. Analisis data menggunakan statistik deskriptif dan *confirmatory factor analysis* dengan *Structural Equation Model* dengan bantuan program Lisrel. Hasil penelitian menunjukkan bahwa level semua aspek kecemasan matematika mahasiswa dalam pembelajaran matematika *online* berada di level sedang. Aspek-aspek kecemasan yang memengaruhi prestasi belajar matematika mahasiswa dalam pembelajaran matematika *online*, yaitu aspek afektif dan kognitif, sedangkan aspek fisiologi dan perilaku tidak memengaruhi prestasi belajar matematika. Hal ini menyiratkan perlu adanya perhatian dosen terhadap aspek kecemasan afektif dan aspek kognitif.

**Kata Kunci:** *kecemasan matematika, level kecemasan matematika, hasil belajar matematika, pembelajaran matematika online.*

#### INTRODUCTION

In 2020, the world was attacked by the Covid-19 pandemic that caused anxieties among its inhabitants especially school and university students with their learning activities (Ayyala, Taylor, & Callahan, 2020). These anxieties were

initiated by the changes in the instructional systems from the face-to-face to the on-line modes (Almaiah, Al-Khasawneh, & Althunibat, 2020; Bloom, Reid, & Cassady, 2020; Kim, 2020).

Various efforts were conducted by all

countries in order that instructional processes remained running during the Covid-19 pandemic, from altering the curriculum and setting up on-line evaluation (Daniel, 2020) to running virtual learning systems (Ehrlich, Mc Kenney, & Elkbuli, 2020). Various on-line platforms were used in the learning processes including e-learning, virtual labs (Ray & Srivastava, 2020), digital or technological connections (Nuere & de Miguel, 2020), and distance learning (Schneider & Council, 2020). Germany, Austria, and Switzerland used school barometres (Huber & Helm, 2020; Kerres, 2020), China used a system of open educational resources and open educational practices (Huang, Tlili, Chang, Zhang, Nascimbeni, & Burgos, 2020), New Jersey used community-based programs (Iyengar & Shin, 2020), and Africa used an instructional system for adult education (Lopes & McKay, 2020; Ramrathan, 2020; Spaul, 2020). The main challenges of the distance instructional systems during the Covid-19 pandemic were changes in the learning management, technical problems in the e-learning system, and financial supports (Almaiah *et al.*, 2020; d'Orville, 2020). On-line learning has its strengths and weaknesses. Students' perceptions on on-line learning are quite positive; on-line learning makes learning not monotonous only in the classroom, there is efficiency in time and materials that are easily accessible (Agarwal & Kaushik, 2020; Bal, Arslan, Budhrani, Mao, Novak, & Muljana, 2020). Besides, impacts of positive perceptions are felt by students of on-line learning that integrates ICT (Information, Communication, and Technology) (Lubis, 2018). However, there are weaknesses in on-line learning such as those experienced by Bangladesh and other low-income countries who do not have technological accesses and on-line school materials and have financial difficulties in the household (Mamun, Chandrima, & Griffiths, 2020). These weaknesses can create learning anxieties, especially in mathematics learning.

Mathematics anxieties often occur in students learning mathematics. One causing factor is the perception that learning mathematics or solving a mathematical problem is difficult (Gafoor & Kurukkan, 2015; Tambychik & Meerah, 2010). It is, therefore, true that mathematics anxieties become an important topic to study (Ayyala *et al.*, 2020). The

importance of studying mathematics anxieties arises from the fact that mathematics anxieties have a direct influence on mathematics learning; the higher the mathematics anxieties, the lower the mathematics achievements (Guita & Tan, 2018; Pourmoslemi, Erfani, & Firoozfar, 2013; Vásquez-Colina, Gonzalez-DeHass, & Furner, 2014). Besides, mathematics anxieties also have negative effects and relations with performance, achievement, learning motivation, decision-making abilities, and positive attitudes towards mathematics (Huang, Zhang, & Hudson, 2019; Lewis, 2020; Morsanyi, Busdraghi, & Primi, 2014).

Mathematics anxieties are caused by two factors; these are (1) personal factors when a person has unpleasant experiences in leaning mathematics or problems in mathematics earning in the past (Bekdemir, 2010); and (2) environmental factors such as the teachers or parents' attitudes towards the students' performances (Chaman, Beswick, & Callingham, 2014; Soni & Kumari, 2017). In on-line learning, mathematics anxieties are caused by, among others, the low level of the learning interactivities (Allen & Vallée-Tourangeau, 2016), on-line evaluation with no remedies (Lewis, 2020), and low learning habits (Chen, Hsu, & Chen, 2013).

In terms of the aspects of mathematics anxieties, according to Greenberger & Padesky (1995), there are physiological, affective, cognitive, and behavioral aspects of mathematics anxieties. The physiological aspect of mathematics anxieties is related to physical conditions such as over-sweating, hand and lip trembling, stomach ache, head ache, and increase in heart beats. The affective aspects are shown in the feelings of nervousness, fright, tense, and anxiety. The cognitive aspects occur in difficulties to concentrate, make decision, and sleep. Meanwhile, the behavioral aspects appear in purposeful attempts to avoid the on-line class, walking up and down, and clicking fingers.

The measurement of mathematics anxieties of Rayner, Pitsolantis, & Osana (2009) uses RMARS (Revised Mathematics Anxiety Rating Scale) in three levels: high, moderate, and low. In the meantime, there are five categories of mathematics anxieties: very high, high, moderate, low, very low (Nurhayati, Marhayani, Chang, & Naaranoja, 2019; Pourmoslemi *et al.*, 2013).

In the present study, the five-level category of mathematics anxieties is used, since the score interval is not so wide so that measurement of the anxiety levels is comparably accurate.

Reducing students' mathematics anxieties in learning can be done by, among others, the metacognitive technique of self-regulated learning (Kramarski, Weisse, & Kololshi-Minsker, 2010; Skaalvik, 2018), involvement of the parents (Demirtaş & Uygun-Eryurt, 2020), and creating conducive learning environment (McMinn & Aldridge, 2019; Taylor & Fraser, 2013). However, research shows that, in many countries, students' levels of mathematics anxieties are still high; such as in Serbia (Radišić, Videnović, & Baucal, 2015) and Norway (Skaalvik, 2018). Meanwhile, the levels of mathematics anxieties in students of the elementary school in Indonesia are at the low level (Nurhayati *et al.*, 2019).

There are a number of studies on mathematics anxieties, such as the ones by Radišić *et al.* (2015), in Serbia, concerning mathematics anxieties level of 15 year-old students; Nurhayati *et al.* (2019), in Indonesia, concerning mathematics anxieties level of elementary school children; and Skaalvik (2018) concerning the relation between mathematics anxieties level and mathematics performance of junior high school students. These studies have been conducted prior to the Covid-19 pandemic. However, research on mathematics anxieties has not been done during or after the pandemic. Studies on mathematics anxieties during the Covid-19 may give different results.

The need for research on mathematics anxieties during the Covid-19 pandemic is felt in order to find out students' readiness in mathematics learning during this new-normal time. Besides, by knowing students' mathematics anxieties, teachers will be able to better prepare instruction by way of various learning strategies and minimizing mathematics anxieties during the on-line learning. The objective of the present study is to describe the level of students' mathematics anxieties and to see the impacts on their mathematics achievement during the on-line learning.

## METHOD

The study uses a quantitative survey as the research design to measure the students' level

of mathematics anxieties and to see whether there is an impact of mathematics anxieties on students' learning achievement during their on-line mathematics learning. By way of random sampling, a total of 109 students of the Mathematics Study Program of UIN Sunan Ampel Surabaya participated in the voluntary completion of the mathematics anxieties questionnaires. The participants took the on-line mathematics learning in one semester during the even semester of 2020. Description of the participants can be seen in Tabel 1.

**Tabel 1. Research Subjects**

No.	Student	Gender		Total
		Female	Male	
1.	Semester 2	51	2	53
2.	Semester 4	33	5	38
3.	Semester 6	16	2	18
Total		100	9	109

The research instrument was the mathematics anxieties questionnaire. This is in line with Baloğlu & Zelhart (2007) and Soni & Kumari (2017) who stated that mathematics anxieties can be measured by a questionnaire. The data were responses to the mathematics anxieties questionnaire and scores of students' mathematics learning achievements. Results of the mathematics anxieties questionnaire were used to look at the levels of students' mathematics anxieties while the students' achievement scores were used to see the impacts of mathematics anxieties upon mathematics learning achievements.

The anxiety questionnaire was developed on the four observed aspects of affective, physiological, cognitive, and behavioral (see Table 2). The questionnaire was disseminated through the Google format. Each questionnaire item consisted of five options. The questionnaire had been validated by four faculty members of mathematics education. Validation was conducted on the basis of the pre-developed table of specifications. Using the Aiken formula, the validity co-efficient value (V) for each item was found to range between .562 and .813 with an average score of .696. It means that the questionnaire items were categorizable as valid. Meanwhile, results of the reliability test using Alpha Cronbach via SPSS showed a value of .771. This means that the questionnaire is reliable

**Tabel 2. Indicators of Mathematics Anxieties**

No.	Anxiety Aspect	Indicator	Questionnaire Item	Item Number	Code
1.	Physiology	1. Learner can explain problems of physical signs that are experienced during the learning process	Unfavourable	20	PHY1
				8	PHY2
				6	PHY3
2.	Cognitive	1. Ability to overcome problems	Favourable	13	COG1
				11	COG2
		2. Over-cautious over threats of bad experiences	Favourable	1	COG3
				5	COG4
				3	COG5
				14	COG6
3.	Affective	1. Learner shows responses of fright of mathematics	Unfavourable	2	AFF1
				16	AFF2
		2. Learner shows responses of nervousness of mathematics	Unfavourable	17	AFF3
				Favourable	19
		3. Learner shows responses of anxieties of mathematics	Unfavourable	18	AFF5
				4	AFF6
				12	AFF7
4.	Behavioral	1. Too many actions to avoid problems	-	-	-
				-	-
		2. Learner's behaviours when responding to instruction given by teacher during the on-line learning	Favourable	9	BEH1
				Unfavourable	15
				10	BEH3
				7	BEH4

or consistent. For the mathematics learning achievement, scores from one mathematics subject were used. The choice fell on the Geometry for semester 2, Numeric Method for semester 4, and Linear Program for semester 6.

Data collection was conducted in the following steps. Students were given the Google link for the mathematics anxieties questionnaire through the Whatsapp venue. Students filled out the questionnaire on-line at home, without supervision from the researcher, individually and autonomously.

Since the objective of the study was to find the level of the students' mathematics anxieties and the impacts on their on-line learning achievements, the data being analyzed were quantitative. Data analysis was done in the following steps: 1) identifying the students' responses; 2) calculating the average score for each of the mathematics anxieties aspects; 3) classifying the average score of the mathematics anxieties aspects into score intervals based on their means ( $\bar{X}$ ) dan standard deviations ( $SD$ ); and 4) computing the descriptive statistics on the

SPSS Version 22 and the Confirmatory Factor Analysis (CFA) using the Structural Equation Model (SEM) on the Lisrel Program.

## FINDINGS AND DISCUSSION

### Findings

#### *Mathematics Anxieties Levels*

Results of the data analyses of the mathematics anxieties aspects of the 109 student subjects are shown in Table 3. This is followed up by further analyses to plot the scores into each of the anxieties aspects based on the determined criteria. The next step is calculating the frequencies and percentages of the anxiety aspects that is shown in Table 4. As it can be seen in Table 4, the mathematics anxieties in the physiological aspect is seen as the highest (38.53%) in the highest category. In the cognitive aspect, the highest anxiety level is in the moderate category (52.29%). In the affective aspect, the highest anxiety level is also in the moderate category (42.20%). Similarly, the behavioral aspect also has its highest anxiety level in the moderate category (31.19%).

**Table 3. Descriptive Statistics of the Mathematics Anxieties Aspects**

No. Mathematics Anxieties Aspects	<i>N</i>	Mean	Standard Deviation
1. Physiological	109	2.96	.606
2. Cognitive	109	2.81	.490
3. Affective	109	3.05	.636
4. Behavioral	109	2.93	.687
<b>Mean</b>	109	2.94	.604885

**Table 4. Categorization of the Anxieties Aspects**

No.	Score Interval	Number of Students in the Anxieties Aspects								Category
		Physiological		Cognitive		Affective		Behavioral		
		<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	
1.	$x > 3.84$	5	4.59	1	.92	10	9.17	12	11.01	Very high
2.	$3.24 < x \leq 3.84$	42	38.53	17	15.60	33	30.28	26	23.85	High
3.	$2.63 < x \leq 3.24$	37	33.94	57	52.29	46	42.20	34	31.19	Moderate
4.	$2.03 < x \leq 2.63$	12	11.01	24	22.02	11	10.09	24	22.02	Low
5.	$x \leq 2.03$	13	11.93	10	9.17	9	8.26	13	11.93	Very low
<b>Total</b>		109	100	109	100	109	100	109	100	

#### *Distribution of the Indicators of the Anxiety Aspects*

Results of the descriptive statistical analyses on the indicators of the anxiety aspects are displayed in Table 5. Calculation of these statistics was done by CFA and SEM tests. For all indicators of the aspects of mathematics anxieties, the mean score is found to be 2.939 with a standard deviation of 1.051. This means

that, on the average, all indicators tend to fall in the moderate category. However, two indicators in the affective aspects are found to be in the high category (AFF1 and AFF2). These two indicators are “students feel uneasy when the teacher explains materials in the on-learning” and “students feel frightened when learning mathematics on-line.”

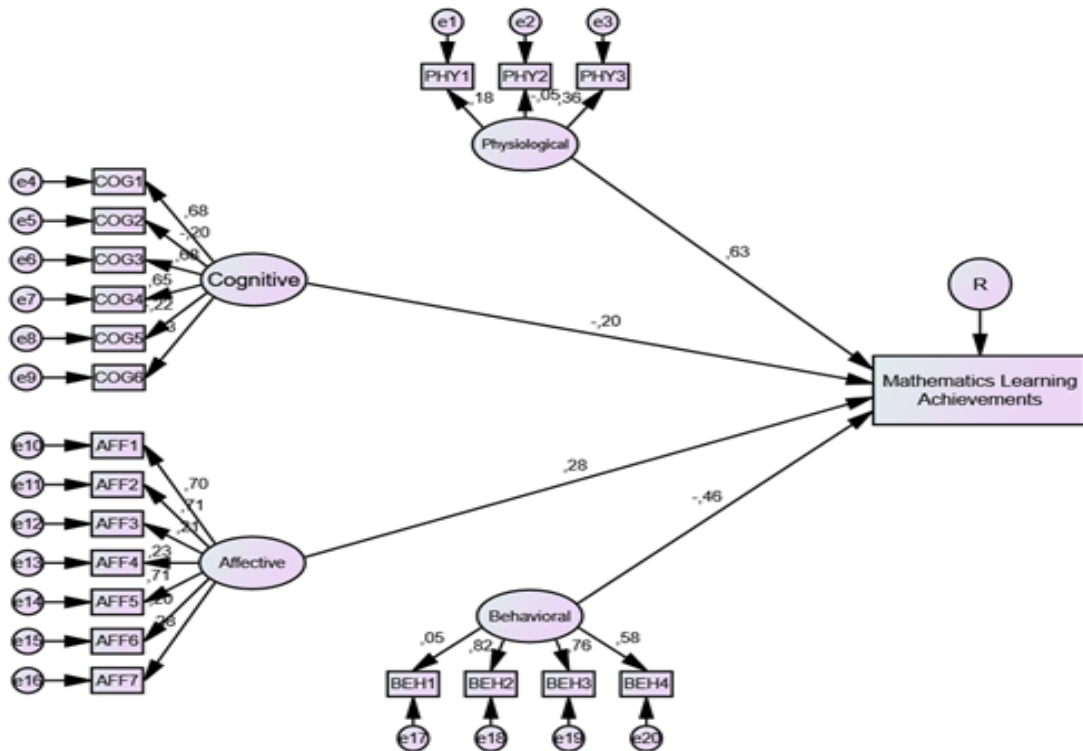
**Table 5. Descriptive Statistics of the Indicators of the Anxiety Aspects**

No.	Indicator Code of the Anxiety Aspects	<i>N</i>	Mean	Std. Deviation
1.	PHY1	109	3.028	1.004
2.	PHY2	109	2.917	1.115
3.	PHY3	109	2.936	1.021
4.	COG1	109	3.128	.934
5.	COG2	109	2.330	1.072
6.	COG3	109	2.899	.952
7.	COG4	109	2.835	1.014
8.	COG5	109	2.862	1.004
9.	COG6	109	2.780	1.189
10.	AFF1	109	3.798	1.145
11.	AFF2	109	3.257	1.101
12.	AFF3	109	2.872	1.131
13.	AFF4	109	3.018	.933
14.	AFF5	109	3.284	1.089
15.	AFF6	109	2.716	1.277
16.	AFF7	109	2.422	1.133
17.	BEH1	109	2.917	.783
18.	BEH2	109	2.844	1.029
19.	BEH3	109	3.055	1.044
20.	BEH4	109	2.890	1.066
<b>Mean</b>			2.939	1.052

**Impacts of Mathematics Anxieties Aspects on Mathematics Learning Achievements**

The impacts of mathematics anxieties on mathematics learning achievements can be seen from the results of CFA using SEM of the Lisrel program as shown in Figure 1. There are 20 indicators of the anxieties aspects; 4 physiological, 6 cognitive, 7 affective, and 4 behavioral.

In the Figure 1, scores are shown on the factor loading used to determine the impacts of the anxieties aspects on the on-line learning achievements. There are three criteria: high ( $x \geq .76$ ), moderate ( $.3 \leq x < .76$ ), and low ( $x < .3$ ) (Nurgiyantoro, Lestyarini, & Rahayu, 2020). Meanwhile, the contributions of the anxieties aspects on the learning achievements can be seen in Table 6.



**Figure 1. Impacts of Mathematics Anxieties Aspects on Mathematics Learning Achievements**

**Tabel 6. Contributions of the Mathematics Anxieties Aspects on the Mathematics Learning Achievements**

No.	Variable	Indicator	Loading Factor Score	Category	Note
1.	Physiological	PHY1	.184	Low	High = 5 (25%) Moderate = 6 (30%) Low = 6 (30%)
		PHY2	-.052	Not convergent	
		PHY3	.359	Moderate	
2.	Cognitive	COG1	.683	Moderate	Not convergent = 3 (15%)
		COG2	-.204	Not convergent	
		COG3	.683	Moderate	
		COG4	.650	Moderate	
		COG5	-.221	Not convergent	
		COG6	.430	Moderate	
3.	Affective	AFF1	.701	High	
		AFF2	.711	High	
		AFF3	.205	Low	
		AFF4	.232	Low	
		AFF5	.711	High	
		AFF6	.197	Low	
		AFF7	.282	Low	
4.	Behavioral	BEH1	.054	Low	
		BEH2	.819	High	
		BEH3	.761	High	
		BEH4	.576	Moderate	

As it can be seen in Table 6, some indicators have a factor loading score lower than .5; it can be said that these indicators are not good enough for measuring physiological, cognitive, affective, and behavioral anxieties. sehingga indikator-indikator tersebut kurang baik dalam mengukur variabel fisiologi, kognitif, afektif, dan perilaku. Factor loading scores can be categorized as high (25%), moderate (30%), and a combination of low and not convergent (45%). There are, then, 11 indicators that can be retained as contributors; that is, indicators of the high and moderate categories while the other indicators cannot be categorized as contributors; that is, they do not give significant contributions to the learning achievements of mathematics. This has a consequence on the re-evaluation of the determining factors, number of factors, and other contexts that have influence on learning achievements.

Figure 1 also shows the impacts of the physiological, cognitive, affective, and behavioral aspects of mathematics anxieties in relation to learning achievement. To point out which variables have influence on learning achievements, Table 7 can be used. It can be shown that physiological and behavioral aspects do not have significant impacts on learning strategies. This is seen from the values of the critical ratio which is less than 2 and  $p$ -value which is higher than .05. On the other hand, the cognitive and affective aspects of the anxieties have significant impacts from the facts that the critical ratio is larger than 2 and  $p$ -value is lower than .05.

## Discussion

### *Levels of Mathematics Anxieties*

Many agree that studying mathematics is difficult even when instruction is done in a direct way (face-to-face); not to mention when it is done

on-line. Such feelings of difficulty may cause mathematics anxieties. Mathematics anxieties are shown when one is nervous when studying mathematics or when solving mathematical problems. Mathematics anxieties have been found to have an impact on mathematics achievement, psychology, and neuroscience (Buckley, Reid, Goos, Lipp, & Thomson, 2016). A special attention is therefore needed to be given as to the level of mathematics anxieties in on-learning, factors that cause mathematics anxieties, and ways to overcome or minimize mathematics anxieties.

The present study is attempting to find the levels of mathematics anxieties and the impacts of mathematics anxieties on mathematics learning achievements. Findings of this study show that three mathematics anxieties aspects (cognitive, affective, and behavioral) are dominated by the moderate category while the physiological aspect is dominated by the high category. These findings indicate that students of the mathematics study program experience anxieties in the proportional standard. Students have been able to handle their anxieties in their on-line learning in the cognitive, affective, and behavioral aspects. This is in agreement with the study of Pourmoslemi *et al.* (2013) who studied mathematics anxieties before the Covid-19 time, and found that students' mathematics anxieties level in mathematics learning was of the low level.

In the results of the data analyses of the students' questionnaires, it was found that, in every aspect, there were few students who scored very high (around 1% to 11%), and high (15% to 38%). This means that there are a considerable number of students who are not able yet to overcome their anxieties well. This fact can be taken to lead to the understanding that, for a number of students, on-line learning becomes

**Table 7. Standardized Co-efficient and Significance Level Model**

Relation	Standardized Co-efficient	Critical Ratio	$p$ -Value	Conclusion
Physiological → Learning achievement	.632	.711	.477	Not significant
Cognitive → Learning achievement	-.205	-2.140	.032	Significant
Affective → Learning achievement	.284	2.946	.003	Significant
Behavioral → Learning achievement	-.464	-.507	.612	Not significant

one of the causes of mathematics anxieties. This must be taken into account by teachers since mathematics anxieties of the very high or high level tend to cause students' mathematics anxieties in their students classes. In a different way, Buckley *et al.* (2016) stated that high mathematics anxieties will influence students' learning either in a short or longer range. The short-term influence appears in the form of students' low level of fluency/comprehension in the instructional contents while the long-term influence occurs in their teaching expertise (Cates & Rhymer, 2003).

Score distribution of anxieties aspects shows an average for the moderate category although 2 of the 20 indicators have a mean score of the high category. These two indicators that are of the affective aspects refer to how students feel uneasy when attending the teacher's explanation on the class material and how students feel frightened when studying mathematics through the on-line mode. This is in line with Rubinsten & Tannock (2010) who defined mathematics anxieties as negative affective responses and have negative effects on mathematics performances. In addition, mathematics anxieties have direct influences over students' emotions.

### ***Impacts of Mathematics Anxieties on Mathematics Learning Achievements***

The level of students' mathematics anxieties gives an impact on their on-line learning achievements. The impact takes the form of the various aspects of mathematics anxieties that have an influence on learning achievement. Results of the study, as presented above, show that the cognitive and affective aspects of the mathematics anxieties give significant influences on learning achievements. The cognitive aspects of mathematics anxieties take the forms such as difficulty to focus on class, make decision, and solve mathematics problems. The affective aspects appear in feelings of nervousness, fright, and anxiety when attending on-line mathematics classes. These phenomena are also explained by Erzen (2017) who stated that mathematics anxieties have a negative and significant influence on learning achievements.

Results of the SEM analyses indicate that the physiological and behavioral mathematics anxieties do not have significant impacts on learning achievements. However, these anxiety

aspects need to be given attention since data show that the levels of the anxieties are high enough for the first (38.53%) and the latter (23.85%). Lai, Zhu, Chen, & Li (2015) stated that any sign of mathematics anxieties must be taken into account as they will interfere with students' learning.

From the degree of contribution of the indicators of the anxieties aspects, it is found that 11 of the 20 indicators show contributions on learning achievements. These 11 indicators occur in all the four aspects of anxieties. In this case, it can be stated that all the four mathematics anxieties aspects have direct impacts on learning achievements by different degrees. Mathematics anxieties are related closely to cognitive reflections (Morsanyi *et al.*, 2014).

Mathematics anxieties influence mathematics performances in two ways (Buckley *et al.*, 2016). First, through physiological response interpretation, the emerging responses accelerate heart beats and breathing paces and disturb the work of the brain in solving mathematical problems. Second, through affective response interpretation, negative responses such as negative thoughts disturb cognitive functioning and interfere with memory performance processes. It is therefore important that all signs of mathematics anxieties be taken into account as they will interfere with the work of the physical organs that will negative impacts on learning achievements.

It goes without saying that a mathematics teacher needs to know characteristics of the students who experience mathematics anxieties whether of the physiological, cognitive, affective, or behavioral aspect. It is by knowing students' mathematics anxieties that the teacher will be able to help them solve or minimize their problems using various ways. Mathematics anxieties are instructional problems that need to be given attention and solution. In minimizing students' problems in mathematics anxieties, the teacher needs to pay attention on instructional interactivities of the high degree Allen & Vallée-Tourangeau (2016). A high degree of learning interactivities will help students so that their mathematics anxieties will no longer interfere with their mathematics performances.

It is no doubt that parents' roles can also help in preventing or minimizing students' mathematics anxieties (Demirtaş & Uygun-



Eryurt, 2020). In this case, the father and mother become influential figures in helping students cope with anxieties. Parents' support is greatly efficient in helping students when they experience problems in understanding mathematical concepts or solving mathematical problems. It is therefore true that there are many ways that can be done to help prevent the occurrence of mathematics anxieties.

### **Implication**

Students' mathematics anxieties must become a point of attention by the mathematics teacher especially during the time of the Covid-19 pandemic. It is found that students' mathematics anxieties are generally in the moderate level; however, some students have high or very high levels of anxieties in certain anxieties aspects. Therefore, the teacher can create positive learning habits such as facilitating students with cooperative and responsive learning, giving enough tolerance to students who have problems with the Internet speed, giving transparent score grading, providing students with fun learning, and others. In their study, Chen *et al.* (2013) stated that learning habits have a significant relation with mathematics anxieties; the lower of the learning habit is, the higher the mathematics anxieties are.

As for the holders of the educational management, it is necessary to look at the curriculum especially in relation to the Covid-19 pandemic on-line learning. There is a difference in the treatment of the instructional processes between the curriculum during the pandemic and the curriculum of the face-to-face instruction. This will help all instructional efforts so that students will not experience mathematics anxieties in their mathematics learning. In this case, Daniel (2020) stated that the institution and teachers need to determine the points of the contents of the curriculum that need to be given special attention to achieve the learning outcomes.

### **CONCLUSION**

This study is envisaged to yield the following points of conclusion: (1) students' levels of mathematics anxieties are bound to be in the moderate category in the cognitive, affective, and behavioral aspects and high in the physiological aspect. This shows that

students of the mathematics study program have mathematics anxieties of the standard proportion. Students are able to cope with their mathematics anxieties in the cognitive, affective, and behavioral aspects during their on-line mathematics learning; (2) the mathematics anxieties aspects that have significant impacts on students' learning achievements are those of the cognitive and affective. The cognitive aspects refers to anxieties that are related to their thought processes while the affective aspects to their feelings. These two mathematics anxieties influence negatively and significantly on their academic achievements.

A suggestion for future researchers is to conduct research on mathematics anxieties not only using a questionnaire as the research instrument, but also an observation to more in-depth data. Indicators of mathematics anxieties can be well identified using direct observation.

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