IS LEARNING MATHEMATICS STILL CREATIVE AND ENJOYABLE DURING THE COVID-19 PANDEMIC?

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ABSTRACT

Creativity in learning is an enjoyable experience for most students who are studying mathematics. However, when the COVID-19 pandemic brought unprecedented experiences to students, learning mathematics is questionably creative and enjoyable nowadays. This study intends to measure the level of creativity and how enjoyable learning mathematics is amidst the pandemic. The study develops statistical models to capture the different factors that significantly influence the students' creativity and enjoyable experience in learning mathematics. A selected secondary survey data from the existing study was utilized and analyzed through descriptive measures and regression analysis. Results revealed that the mean perception scores (scale of 1 to 10) for the level of creativity and enjoyment are 5.27 and 5.17, respectively. This implies that there is only moderate creativity and joy in learning mathematics amidst the pandemic. Findings showed that the predictors of students' level of creativity in learning mathematics are "synchronous learning modality," "learning environment," and "health aspect ."In addition, it is revealed that "age," "learning environment," and "health aspect" are significant predictors of students' level of enjoyment. Thus, teachers must maintain a lively and motivating learning environment for students by giving them exciting and enjoyable mathematics learning activities. Furthermore, teachers and students are advised to do physical exercise and maintain a good diet to become healthy amidst the pandemic.

1. INTRODUCTION

COVID-19 is an infectious disease that spread worldwide and brought a health crisis that adversely impacted the educational system. The new normal setup in education has shifted from face-to-face classes to online or distant learning (Salta et al., 2022). In particular, learning mathematics at a distance during the COVID-19 pandemic has a lot of barriers and challenges. According to Irfan et al. (2020), students face obstacles during online learning, like limitations in presenting mathematical symbols and limited capabilities in learning technology management. In that case, mathematics activities such as problem-solving, puzzles, and brain teasers, among others, are now less creative and enjoyable as opposed to face-to-face learning. Students are experiencing an adverse learning style due to a lack of interaction with their teachers as they follow health protocols (Mailizar et al., 2020). In addition, students feel bored in their home as a learning environment because of a lack of motivation and encouragement (Balkist & Agustiani, 2020). Moreover, learning mathematics online is less effective because of limited internet connections for students and less creativity and interaction between students and teachers (Putra et al., 2020; Wahyuningrum & Latifah, 2020; Maryanti, 2021). Stevanović et al. (2021) stated that distance learning is stressful, which increases the students' anxiety and results in less enjoyment and well-being in learning mathematics.

The impact of the pandemic is adversely affecting the teaching-learning process in many Universities, especially in mathematics education. Both teachers and students struggle to cope with technological advancement as a short-medium for the learning environment at a distance (Carius, 2020; Dubey & Pandey, 2020). In that case, students' mathematical abilities have diminished as they experience anxiousness during their learning tasks and activities (Maryanti, 2021). Additionally, creativity in mathematics activities for teachers and students is not exploited during online learning because of less interaction. Creativity in learning will motivate the student's cognitive behavior, which helps improve their academic achievement. In fact, without the proper guidance of the teacher, students' imagination in creating ideas cannot be used to its full potential in the classroom environment (Beghetto, 2017; Casinillo & Casinillo, 2021). According to Plucker and colleagues (2010), creativity is vital in mathematical reasoning, problem-solving, and other cognitive abilities. Aside from creativity, students' excitement is also affected by the pandemic; that is, the level of enjoyment is decreased. In the study of Tulis and Ainley (2011), enjoyment is one of the determinants of students' resilient behavior in the classroom. Students are bored and anxious without enjoyment in their learning tasks and activities, adversely affecting their cognitive behavior in class. Casinillo and Casinillo (2020) stated that happiness or enjoyment in the learning process is very crucial in the progress of their academic performance in mathematics. Hence, it is necessary to investigate students' level of creativity and enjoyment in learning mathematics online to attain helpful information in developing remote education during the pandemic and beyond.

Studying the level of creativity and enjoyment in learning mathematics at a distance is limited in the literature. Hence, the novelty of this research study is developing a statistical model that predicts the causal factors of creativity and enjoyment of students during the pandemic. Deciphering the determinants of creativity and enjoyment in learning mathematics in the new normal has never been executed in rural areas in the Philippines. Hence, the researchers have decided to conduct this study. On the face of it, the study aimed to seek and evaluate the different influencing determinants of creativity and enjoyment of college students during the pandemic as they are learning mathematics online. Specifically, to accomplish the aim of this study, researchers are motivated to answer the three objectives as follows: (1) to summarize the students' profile; (2) to measure the level of creativity and enjoyment in learning mathematics online; (3) to develop statistical models that determine the influencing factors of creativity and enjoyment in learning mathematics online. The findings of this study

may help college students understand the nature of online learning in mathematics. In addition, mathematics teachers may benefit from the extracted information that might give them some insights into the cognitive behavior of students during the new normal. Furthermore, this current study's results may help improve the existing policies in education and impart new knowledge that may be useful in mathematics education research in the Philippines and beyond.

1.1. The Framework of the Study

In problem-solving, creativity is required to obtain students' full potential in determining the solution by their imagination (Mann, 2006). Classroom talent development requires creative ideas as students explore and solve mathematical problems (Leikin & Pitta-Pantazi, 2013; Waluya, 2020). On the other hand, enjoyment in mathematics creates a motivated cognitive behavior for both teachers and students (Russo et al., 2020). In the study of Huang et al. (2020) and Awofala et al. (2020), interest and enjoyment in learning can boost their problem-solving skills and positive cognitive behavior in mathematics activities despite the COVID-19 pandemic setup.

Meanwhile, Casinillo and colleagues (2022) stated that students are experiencing anxiety and challenges as they learn mathematics online because of limitations and barriers. In that case, creativity and enjoyment in learning have diminished due to the adverse impact of the world crisis. According to Fruehwirth et al. (2021), it is vital to examine the demographic profile of students as a factor in their well-being during the pandemic. Salta et al. (2022) and Balkist & Agustiani (2020) have captured that students' involvement in the teaching-learning process during the pandemic is relatively lower as opposed to traditional (face-to-face) due to the unprecedented learning environment. In the study by Savitsky et al. (2020), it is found that students have high anxiety levels during the pandemic, which is dealt with coping strategies.

Knopik and Oszwa (2021) declared that during the COVID-19 pandemic, social connections are vital for group studies as cooperative education in mathematics. Likewise, the study by Ofori-Kusi and Tachie (2022) stated that learning mathematics through social media groups involves interactive learning that develops students' creativity and cultivates their interests. Moreover, online leisure activities during a pandemic can minimize the anxiety level of students because of the interactive platform where creativity and enjoyment are present (Kayumova et al., 2021). To be creative and enjoyable in learning mathematics amidst the pandemic, students must be healthy in their physical, emotional, and mental aspects. Palmer and colleagues (2021) stated that health and education must simultaneously occur during the pandemic to obtain the good well-being of students and the institution. Additionally, teachers and students must obey the health protocols to achieve a healthy and satisfying learning environment (Hebebci et al., 2020; Fruehwirth et al., 2021). The transition of instructional methods that have been through face-to-face directly in schools forces the school to follow the flow so that learning can take place with complex limitations.

2. METHODS

A complex correlational research design was used in this study. Firstly, descriptive measures were employed to summarize the gathered data and describe its nature and characteristics. Secondly, statistical modeling was developed to capture and predict some significant determinants influencing creativity and enjoyment in learning mathematics during the COVID-19 pandemic.

In this study, the desired participants are currently enrolled in Mathematics in the Modern World (MMW) at Visayas State University, Visca, Baybay City, Leyte, Philippines.

Secondary data were utilized from the study of Casinillo et al. (2022) titled "How Challenging It Is to Learn Mathematics Online." One of the highlights of the said study is that the students' amount spent on the internet is an influencing factor in the level of challenge in learning mathematics during the COVID-19 pandemic. In that case, students with less family income struggle and experience a challenge as they learn mathematics (Casinillo et al., 2022). Students have difficulty acquiring technology resources and internet load for online learning. This study focuses on the students with at most Php 50 000 family income and excludes participants with family income above Php 50 000. Hence, this study considers 124 MMW students as participants.

Another thing is that the study only focuses on the determinants of the level of challenge in learning mathematics and does not evaluate the different factors influencing how creative and enjoyable learning mathematics is. Henceforth, this study utilized the level of creativity (scale of 1 to 10) and enjoyment (scale of 1 to 10) in learning mathematics as a dependent variable. The reliability test for these dependent variables has an average inter-item covariance of 3.56 and a Cronbach's alpha coefficient of 0.82, which implies that the two-item question is reliable. Table 1 shows the mean interval for students' perception score for creativity and enjoyment and its corresponding interpretation.

Table 1 Mean interval perception score and its corresponding meaning

Mean Perception Score	Level of Creativity	Level of Enjoyment
1.00 - 2.80	Not Creative	Not Enjoyable
2.81 - 4.60	Slightly Creative	Slightly Enjoyable
4.61 - 6.40	Moderately Creative	Moderately Enjoyable
6.41 - 8.20	Creative	Enjoyable
8.21 - 10.00	Very Creative	Very Enjoyable

As for the predictors of creativity and enjoyment, this study has chosen the following independent variables: age (in years), gender (0=female, 1=male), availability of laptop(s) (0=No, 1=Yes), number of hours studying mathematics (per week), monthly family income (Philippine peso (Php)), learning modality (0=asynchronous, 1-synchronous), coping with math anxieties (Scale of 1 to 10), learning environment (Scale of 1 to 10), leisure time (Scale of 1 to 10), level of social relationship (Scale of 1 to 10), and health aspect (Scale of 1 to 10). For more details about the research instrument, readers may refer to the study of Casinillo et al. (2022). Table 2 presents the perception scores (Scale of 1 to 10) and their corresponding interpretation.

Table 2 Mean perception scores and their corresponding interpretation.

Mean perception scores	Interpretation
1.00 – 2.80	Very Unsatisfied
2.81 – 4.60	Unsatisfied
4.61 – 6.40	Neutral
6.41 – 8.20	Satisfied
8.21 – 10.00	Very satisfied

As for the data management and analysis, some descriptive measures were computed to summarize the variables used in this study, such as mean (M), standard deviation (SD), minimum (min), and maximum (max) values. Moreover, in determining the significant

predictors of creativity and enjoyment of students in learning mathematics, ordinary least squares (OLS) regression models were constructed. The models are as follows:

$$LCreativity_i = \partial_0 + \partial_1 Age_i + \partial_2 Male_i + \partial_3 Laptop_i + \partial_4 HStudy_i$$
$$+ \partial_5 \log(Income + 1)_i + \partial_6 LModality_i + \partial_7 CAnxiety_i$$
$$+ \partial_8 LEnvironment_i + \partial_9 Leisure_i + \partial_{10} SocialR_i + \partial_{11} Health_i + \varepsilon_i$$

and

$$LEnjoyment_i = \pi_0 + \pi_1 Age_i + \pi_2 Male_{i2} + \pi_3 Laptop_{i3} + \pi_4 HStudy_{i4}$$
$$+ \pi_5 \log(Income + 1)_i + \pi_6 Lsynchronous_i + \pi_7 CAnxiety_i$$
$$+ \pi_8 LEnvironment_i + \pi_9 Leisure_i + \pi_{10} SocialR_i + \pi_{11} Health_i + \delta_i$$

$Where\ creativity$ and $LEnjoyment_i$ refer to the student's level of creativity and enjoyment in learning mathematics, respectively. Additionally, $i = 1, \ldots, n$ and n is the number of participants in the survey, ∂_t, π_t ($\forall t \in \{0, 1, \ldots, 11\}$) refers to the parameters to be estimated, Age_i refers to the age of students in years, $Male_i$ refers to a dummy variable that captures a male student, $Laptop_{i3}$ refers to a dummy variable that captures a student with laptop, $HStudy_i$ refers to the number of hours studying mathematics per week, $\log(Income + 1)_i$ refers to the logarithm of monthly family income + 1 (Php), $Lsynchronous_i$ refers to a dummy that captures students who prefer synchronous set up as learning modality, $CAnxiety_i$ refers to the perception of students on how they cope with anxiety, $LEnvironment_i$ refers to the perception of students regarding their learning environment, $Leisure_i$ refers to the perception of students in regards to their leisure time, $SocialR_i$ refers to the perception of students in terms of their social relationship, $Health_i$ refers to the perception of students in relation to their over-all health condition, and ε_i and δ_i refers to the random errors in the two models. As for interpreting the numerical coefficients ∂_t (π_t) ($\forall t \in \{0, 1, \ldots, 11\}$), this refers to the estimated change in the student's level of creativity (enjoyment) in every 1 unit change in a predictor variable, while holding other predictors constant (ceteris paribus). The validity of the inference from the two models and diagnostic tests (Allison, 2012; Mátyás & Sevestre, 2013) were employed and subject to testing at a 5% α level.

3. RESULTS AND DISCUSSION

3.1. Students' Profile

Table 3 presents the students' demographic and economic profiles summarize by some descriptive measures. The mean age of students was close to 20 (M=19.88, SD=1.81) years old (Table 3). The minimum age was 18 years old, and the maximum age was 33 years old. This age gap can explain why some older students decided to enroll during the start of online learning (education during the pandemic) because of a lack of confidence in face-to-face learning. Another reason is that older students have a job during day time, which implies that they can choose the asynchronous learning modality instead. About 29% of these students were male, and the dominant (71%) were female. More than half (55%) of these students were using laptops, while others (45%) used cell phones as their learning instruments. The mean monthly family income is close to Php 13,972.30 (SD=13,549.61). This implies that most of them fall to low-income families in the Philippines (Domingo, 2020).

On average, more than half (51%) of the students preferred an asynchronous learning modality, and about 49% preferred a synchronous type of learning. As for the students coping with math, anxiety is rated as "neutrally satisfied" (M=5.11, SD=1.87) based on Tables 2 and 3. This implies that students have difficulty coping with their anxiety amidst the pandemic. Likewise, their learning environment is also rated as "neutrally satisfied" (M=5.11, SD=1.87) (Tables 2 and 3). This implies that their environment is not that conducive to learning due to the distractions and boredom at home.

Additionally, students' leisure time means perception score was close to 5.79 (M=5.79, SD=2.5), which can be interpreted as "neutrally satisfied" (Tables 2 and 3). This is due to restrictions and barriers implemented in their respective places to combat the spread of COVID-19 (Fisher et al., 2020). The student's social relationship is "satisfied" (Tables 2 and 3). This means that close friends, relatives, and family members, among others, can be reached through social media and other communication platforms during the pandemic (Goel & Gupta, 2020). Furthermore, the health aspects of students are rated as "neutrally satisfied" (Tables 2 and 3). It is worth noting that physical and mental health during the pandemic is adversely impacted by the restrictions and anxiety brought by COVID-19. Physical activities and other fitness programs are strictly stopped during the pandemic. Hence, most people's health declines (Flanagan et al., 2021).

Table 3 Descriptive statistics for students' profile

Variables	M $\pm$ SD	min	max
Age of students *(in years)*	19.88$\pm$1.81	18	33
Dummy: Male	0.29$\pm$0.46	0	1
Dummy: Availability of laptops(s)	0.55$\pm$0.50	0	1
Number of hours studying mathematics *(per week)*	5.69$\pm$7.41	1	60
Monthly family income[a]	13,972.30$\pm$13,549.61	880	50000
Dummy: Asynchronous	0.51$\pm$0.50	0	1
Coping with Math Anxiety	5.11$\pm$1.87	1	10
Learning Environment[a]	4.19$\pm$1.64	1	10
Leisure time	5.79$\pm$2.25	1	10
Social Relationships	6.64$\pm$2.12	1	10
Health Aspects	5.15$\pm$2.20	1	10

Note: a - Philippine Peso (Php); b - Scale 1 to 10.

3.2. Level of Creativity and Enjoyment

Figure 1 shows that the dominant (40.32%) students said that the level of creativity in learning mathematics at a distance is moderate. On average, the students' mean perception score for the level of creativity is 5.27 (M=5.27, SD=2.26), which is interpreted as "Moderately creative" (See Table 1 for details). This can be gleaned during the COVID-19 pandemic; students' creativity is not used to its full potential due to restrictions and limitations. In Stevanović and colleagues (2021) study, students' opinion on the distance learning process is less valuable due to its limitations and barriers caused by the pandemic restrictions. Ida and Maksum (2021) stated that online learning is not fun and creative due to its monotonous methods applied in the learning process, which contributes to stressful experiences for students. Likewise, Wijaya et al. (2020) found that learning from home while teachers are at a distance is a bland environment for students as opposed to a face-to-face setup. Moreover,

due to less creativity and less encouragement in understanding the lessons, students are bored and have a hard time creating solutions to mathematics activities (Maryanti, 2021)
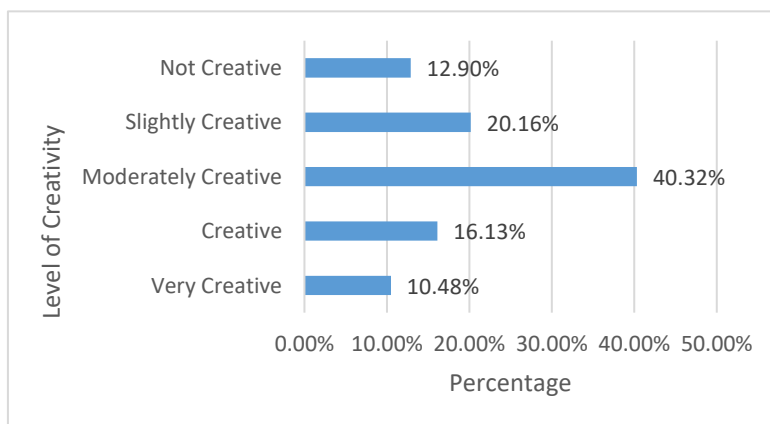

Figure 1 Level of creativity in learning mathematics online.

On the other hand, Figure 2 shows that about 36.29% of the students have concluded that their enjoyment of learning mathematics online is also moderate. In addition, the mean perception score for the level of enjoyment in learning mathematics is 5.17 (M=5.17, SD=2.26), and based on Table 1; it is interpreted as "Moderately enjoyable." This implies that students are experiencing challenges during the pandemic, which affects their interest and motivation, resulting in low enjoyment. According to Casinillo and colleagues (2022), students are having difficulties learning their lessons due to less proper guidance from their teachers, affecting their well-being amidst the pandemic. This is supported by the study of Wahyuningrum and Latifah (2020), in which the authors found that remote learning in mathematics during the COVID-19 pandemic is rigid and less interactive, adversely affecting their understanding and academic achievement. On the face of it, this causes a low interest and enjoyment in learning mathematics.
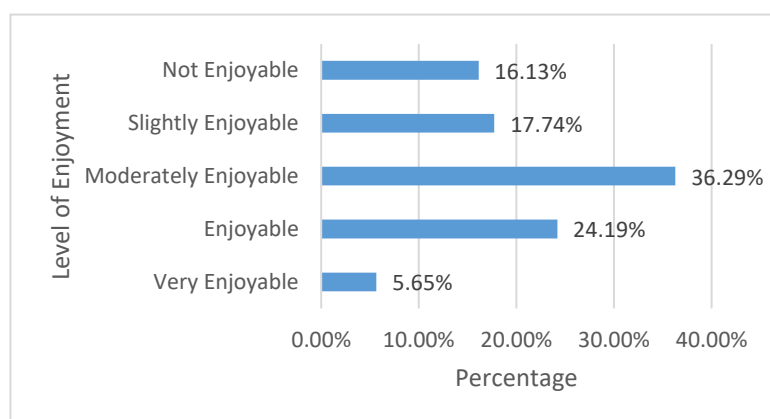

Figure 2 Level of enjoyment in learning mathematics online.

3.3. Statistical Models

Table 5 discloses the first regression model that determines the significant factors of the level of creativity in learning mathematics amidst the pandemic. The model is not considered heteroscedastic ($\chi^2_{computed}$=1.88, p-value=0.17) based on the diagnostic called the Breusch-Pagan test. The Ramsey RESET test shows that the model is considered to have no omitted-variable bias ($F_{computed}$=1.81, p-value=0.15). Additionally, with the aid of the Variance Inflation Factor (VIF), the model has no problem concerning multicollinearity between independent variables, i.e., VIF<10. Moreover, it is disclosed that the model's residuals are considered normal (W=0.99, p-value=0.81) based on the Shapiro-Wilk W test. Hence, the model will provide a valid inference from the extracted information. In fact, the model is highly significant ($F_{computed}$=6.37, p-value<0.001) at a 1% level. This implies that factors influence the students' level of creativity in learning mathematics in the new normal. It is also evident in the coefficient of determination (goodness-of-fit, R^2=0.39) that the model has predicted some significant independent variables about the level of creativity as the dependent variable. However, the model reveals that independent variables do not influence the level of creativity amidst the COVID-19 pandemic, including age, sex, availability of laptops, study hours, family income, and level of coping with math anxiety, leisure activities, and social relationships. These results can be attributed to the low level of creativity in the new normal.

The model revealed that a synchronous type of modality in learning could increase (p-value=0.063) the level of creativity (Table 4). This means that the guidance and presence of teachers in real-time classes help develop students' creativity in learning. This result is inconsonant with the study of Knopik and Oszwa (2021) that the social connection between a teacher and students is crucial in critical thinking as a cooperative teaching-learning process. If a teacher properly guides students, students are motivated to think of new ideas. Muslimin and Harintama (2020) declared that interactive learning via synchronous modality would increase students' motivation to participate and create innovative ideas in the learning environment. Likewise, the study of Sholikhah and Cahyono (2021) stated that online learning (synchronous) using new technologies could encourage students to formulate (create) an imaginative solution to mathematical problems.

Additionally, the learning environment is a highly significant (p-value=0.001) predictor of the student's level of creativity during the pandemic at a 1% level. This implies that a conducive and relaxing learning environment can improve the students' creative learning ability and develop their cognitive thinking skills. However, during the pandemic, the online learning environment has many problems for students and teachers, especially in delivering lessons (Alvarez, 2020). In that case, students' participation and motivation are relatively low as opposed to face-to-face learning, which causes minimal creativity in learning mathematics. The study of Bahian et al. (2020) indulged that students at a distance have encountered diverse challenges and obstacles in adapting to the online environment. In addition, students' home has several distractions that create a barrier to a creative and well-focus learning environment. Table 4 also shows that students' health aspect (p-value=0.088) significantly influences the level of creativity in learning mathematics at a 10% level. This implies that if a student is in good health, their creativity in learning is expected to be relatively high. However, mental health is declining amid the pandemic due to obstacles and anxieties; creativity and cognitive behavior are affected, which causes mental stress to students and educators (Zhai & Du, 2020). Moreover, according to Vetter and colleagues (2018), a physically active (healthy) student may boost the learning abilities to proper and effective cognitive function. On the face of it,

good health is critical in improving creativity, concentration, and academic performance amid distance education.

Table 4 Regression model for the level of creativity and its predictors

Predictors	OLS Model I		
	Coefficient	Std. Error	p-value
Constant	-2.103[ns]	2.776	0.450
Age of students (in years)	0.090[ns]	0.097	0.354
Dummy: Male	-0.378[ns]	0.395	0.341
Dummy: Availability of laptops(s)	-0.016[ns]	0.384	0.966
Number of hours studying mathematics (per week)	-0.007[ns]	0.023	0.766
log (Monthly family income[a]+1)	0.336[ns]	0.482	0.488
Dummy: Asynchronous	-0.660*	0.351	0.063
Coping with Math Anxiety[b]	0.093[ns]	0.095	0.331
Learning Environment[b]	0.459**	0.130	0.001
Leisure time[b]	0.023[ns]	0.113	0.835
Social Relationships[b]	0.181[ns]	0.132	0.170
Health Aspects[b]	0.194*	0.113	0.088
Number of Participants	124		
F-computed	6.37		
p-value	<0.001		
The goodness of fit (R^2)	0.385		

Note: a - Philippine Peso (Php); b - Scale 1 to 10.

ns- not significant.
* - significant at 10% α level.
** - highly significant at 1% α level.

Table 5 depicts the second regression model that captures the significant predictors of the level of enjoyment in learning mathematics in the new normal. In this model, the variances are considered homogeneous ($\chi^2_{computed}$=0.03, p-value=0.86) due to the Breusch-Pagan test. With the aid of the Ramsey RESET test, it is revealed that the model has no omitted variables ($F_{computed}$=0.14, p-value=0.93). Using the Variance Inflation Factor (VIF) concept, there is no multicollinearity problem between predictors, that is, VIF<10. Additionally, the Shapiro-Wilk W test revealed that the model's residuals are normal (W=0.99, p-value=0.81). In that case, the model will safely deliver a valid inference. The second model is also highly significant ($F_{computed}$=5.88, p-value<0.001) at a 1% level. This goes to infer that there are predictors that influence the students' level of enjoyment in learning mathematics at a distance. The coefficient of determination (goodness-of-fit, R^2=0.37) reveals that the model has determined some significant factor variables that correlate to the level of enjoyment.

Nevertheless, the model reveals that some variables do not correlate with the level of enjoyment in learning amidst the COVID-19 pandemic. Such as students' sex, availability of laptops, study hours, family income, learning modality, level of coping with math anxiety, leisure activities, and social relationships. Again, these results can be attributed to a low level of enjoyment in learning amidst the pandemic's challenges.

Table 5 shows that higher age is more likely enjoyable in learning mathematics during the pandemic. This implies that more mature students are resilient in facing the challenges and obstacles in implementing online learning. According to Rafique et al. (2021), the age of students is one of the significant predictors of online learning readiness. In that case, students of higher age are more capable of doing things online, which positively influences their

enjoyment and well-being in learning. The second model reveals learning environment (p-value=0.076) is a determinant in the enjoyment of learning mathematics at a 10% level (Table 5). It is worth noting that the online learning environment has limitations and barriers which negatively affect the enjoyment and excitement of learning mathematics.

Additionally, learning from home has many distractions, resulting in a lack of attention that can reduce the motivation and quality of learning (Yekefallah et al., 2021). On the face of it, teachers must make the learning environment lively and exciting to increase students' determination and cognitive thinking. Moreover, the online environment should be a focus by teachers to modify the effectiveness of the learning process and increase students' interest. In the study of Casinillo and Aure (2018), it is vital to cultivate students' interest and enjoyment to increase students' academic achievement.

Furthermore, Table 5 reveals that the health aspect (p-value=0.076) is a significant predictor of enjoyment in mathematics online. This implies that good health can positively influence the students' enjoyable moments in learning mathematics. It is stated in the study of Che Ahmad and Amirul (2017) that there is a significant correlation between students' health and enjoyment of learning. This goes to infer that when the student is healthy, it can boost their motivation to penetrate the learning activities, which increases their enjoyment of learning. Likewise, Casinillo and Casinillo (2020) found that health is a significant predictor of students' motivation in learning mathematics. Hence, good health must be maintained by students to be enjoyable learning despite the challenges brought by the COVID-19 pandemic.

Table 5 Regression model for the level of enjoyment and its predictors

Predictors (Independent variables)	OLS Model II		
	Coefficient	Std. Error	p-value
Constant	-3.816[ns]	2.825	0.180
Age of students (in years)	0.180*	0.098	0.072
Dummy: Male	-0.238[ns]	0.402	0.554
Dummy: Availability of laptops(s)	0.456[ns]	0.391	0.247
Number of hours studying mathematics (per week)	-0.019[ns]	0.024	0.430
log (Monthly family income[a]+1)	0.150[ns]	0.491	0.760
Dummy: Asynchronous	0.233[ns]	0.357	0.516
Coping with Math Anxiety[b]	0.147[ns]	0.097	0.133
Learning Environment[b]	0.237*	0.132	0.076
Leisure time[b]	0.143[ns]	0.115	0.219
Social Relationships[b]	0.153[ns]	0.134	0.255
Health Aspects[b]	0.202*	0.114	0.081
Number of Participants	124		
F-computed	5.88		
p-value	<0.001		
The goodness of fit (R^2)	0.366		

Note: *a - Philippine Peso (Php); b - Scale 1 to 10.*

ns- not significant.
* - significant at 10% α level

4. CONCLUSION

Based on the results, it is revealed that learning mathematics online during the COVID-19 pandemic is moderately creative and enjoyable. This is due to the challenges and obstacles that both mathematics teachers and students experience as they do the teaching-learning

process online. Online learning has less interaction and no proper guidance from the teacher, resulting in a low level of creative ideas and interest in problem-solving activities. Conclusively, the first regression model has revealed that the predictors of students' creativity are the following: synchronous learning modality, learning environment, and health aspect. On the other hand, the second regression model has shown that age, learning environment, and health aspects are significant factors in students' level of enjoyment in learning mathematics. This goes to infer that creativity in learning mathematics exists in real-time classes with the proper guidance of the teacher. In that case, teachers must encourage their students despite the challenges and cultivate their interest in thinking of creative ideas amid their mathematical activities.

Results showed that older students are more likely to enjoy learning mathematics despite the limitations and barriers of remote learning. This indicates that older students are more mature and resilient to adopt the new normal situation. Additionally, it is concluded that the new learning environment during the pandemic was an unprecedented experience for students that affected their creativity and enjoyment of learning. Hence, teachers must keep the learning environment lively and motivating to students by giving them realistic and enjoyable examples. Teachers also must let their students think of creative cognitive content that creates new solutions to mathematics activities.

Moreover, teachers and students must be advised to rest and not to stress themselves to maintain good mental health. It is also recommended that during the pandemic, teachers and students must do physical exercise and maintain a good diet to become healthy amid the health crisis. A physically healthy individual is more likely healthy in the mental aspect, which increases the level of creativity and enjoyment in learning. As for future research, one may consider the level of resiliency and self-efficacy of students in learning mathematics to supplement the findings of the current paper.

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