Assessing Senior High Student's Learning Experiences in Mathematics

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http://ojs.unm.ac.id/index.php/Insani/index

Abstract. In this study, the learning experience and its cognitive factors of Mathematics among senior high school students of Visayas State University were investigated using a correlational research approach. A complete enumeration of 222 grade 11 and 12 senior high students in the second semester of school year 2018-2019 were used as the participants of the survey. Using a developed structured questionnaire, a primary data was employed. Results showed that the mathematics attitude of students influence their learning experience and academic performance. Mathematics anxiety has a negative effect on the students learning experience especially for females. However, mathematical resilience locates itself in a positive psychology which addresses mental wellness and makes the students positively perceived that mathematics is interesting even if it is challenging. Also, results revealed that senior high school students are mostly visual learners in mathematics, which implies that students practice visualizing or pictures numbers/equations and other concepts in their mind. Furthermore, it can be gleaned that an academic performance is not just derived from study habits but to their motivation and interest in mathematics

Keywords: Learning experience, mathematics, senior high student, cognitive factors

INDONESIAN JOURNAL OF EDUCATIONAL STUDIES (IJES)

E-ISSN: 2621-6744
P-ISSN: 2621-6736

Submitted: April, 8th 2020
Accepted: May, 2nd 2020

INTRODUCTION

Positive learning experience in mathematics leads to active engagement with the lesson and greater interaction in different activities in learning environment (Code et al., 2016). The study of Ruzek and Schenke (2019) suggests that cooperative and interactive learning strategies contribute to the promotion of higher order thinking for both students and the teacher. The use of a variety of teaching strategies and pedagogical approaches can address the diversity of learning styles and developmental stages of students, and enhanced the formation of sound and transferable of mathematical concepts (Casinillo & Guarte, 2018; Ma, 2003). Nowadays, learning experience in mathematics is a deep concern and key element of successful provision in higher education institutions especially in the area of sciences. Alabekee et al., (2015) stated that subjects such as mathematics in which students think were abstract, ought to be taught with effective strategies that will make students interact with the teachers. Apparently, some problems of students that they have encounter in learning mathematics has been attributed to the teaching strategies (Tularam & Machisella, 2018). According to the study of House (2006), perceptions and beliefs about mathematics originate from past experiences; comprising both cognitive and affective dimensions.

Visayas State University (VSU) offers a senior high school program with different strands namely: Technical-Vocational and Livelihood Tracks (TVL), Accountancy, Business and Management (ABM), Humanities and Social Sciences (HUMSS) and Science, Technology, Engineering, and Mathematics (STEM). All students taking these different strands will have to take General Mathematics as one of their required subject. Senior high school (SHS) students face numerous barriers that impact their overall academic performance in mathematics. The curriculum of this senior high program has a lot of subjects to take every semester and students' time is so difficult to manage. Since the said program is offered in VSU, there subjects are handled by instructors and professors in the university. Hence, mathematics subjects are presented in a rigorous approach or in college level which requires high demand of focus. In other words, these senior high students have different learning experiences in mathematics compare to the other schools. These students are expected to have different perceptions and belief in learning considering the pressure and stress levels. According to the research of Schiffrin and Nelson (2010), students who have high stress levels are less likely to report perceived enjoyment in learning experiences. And this negative learning experience leads to a low academic performance in mathematics subjects and even resulted to failure (Casinillo, 2019).

The reflections of instructors/professors are more aligned with teaching for understanding the concepts in mathematics when they thought about their learning experiences in the role of the learners before considering implications for their teaching methods (Chamberlin, 2009). In fact, positive learning experience played a vital part in teaching and learning process as it lays the foundation for developing students' knowledge and understanding of the subject as well as building up their confidence and employability skills which is influence by some cultural factors (Code et al., 2016; Casinillo et al., 2020). This study assume that learning experiences of these students are greatly influence by cultural and cognitive factors. In literature, there are limited work done about establishing a relationship between learning experiences and cognitive factors in learning mathematics in senior high

level in a university, hence this study is conducted to contribute new results to the body literature of students' learning experiences in mathematics.

CONCEPTUAL FRAMEWORK

A negative learning attitudes in mathematics is a growing barrier for many students in a university (Popham, 2008). Even now, mathematics in classrooms are based on a traditional "skills based" model and often, this means memorization and rote recitation rather than active concept based learning (Tularam & Machisella, 2018). In a worse case, it is often taught as if all the students are not just similar, but identical in terms of ability, preferred learning style, and pace of learning (Ulug et al., 2011). Attitudes towards learning mathematics are influenced by prior experiences (Şen, 2013). In the study of Cates and Rhymer (2003) it is found out that teacher's behavior was a prime determinant of math anxiety and not teaching strategies. And according to Casinillo and Guarte (2018), teaching strategies of the teacher might not be positively perceived by the students but still performing well and have a positive learning experience. In the study of Danili and Reid (2006), and Sadiku and Sylaj (2019), learning is equated to a change in behavior in positive direction and influenced by demographic backgrounds, learning environment, cultural and cognitive factors. If the classroom environment is conducive for learning, it is expected that students are performing well and achieve good academic performance in mathematics. Students from low socio-economic backgrounds often have parents with low level of income and less educational background, are often have negative attitudes toward mathematics (Titu et al., 2008). Females are also often overlooked or socialized to dislike mathematics (Geist and King 2008). Riley et al., 2017 stated that in some cases, the gap in achieving good academic performance is not brought about by differing levels of potential and ability, but the chances of developing math anxiety or a negative attitude towards learning mathematics. The conceptual framework of this study assumes that learning experiences of the SHS students are influenced by several intermediate variables in the classroom setting and cognitive factors. The framework of this study is based on the idea of Casinillo et al., (2020) and Kooken et al., (2013). The framework is expected to answer the following objectives: to evaluate the cognitive factors of students in relation to their demographic profile; to develop correlation matrix between cognitive factors, academic performance and learning experience; and to provide recommendations for changes or modifying existing practices by the policy makers in mathematics education.

RESEARCH METHOD

The Research Design

The design of this research study is inferential in nature that investigated the significant factors that influenced the learning experiences in mathematics of a Senior High School (SHS) students in VSU. The research design of this study is based on the current study of Casinillo and colleagues (2020) that deals with correlation analysis in determining the said determinants. Apparently, the study utilized the concepts of explaining some influencing factors in learning mathematics. These determinants are cognitive factors which is used to correlate with the learning experience in Mathematics. Cognitive factors refer to characteristics of the student that affect performance and learning. The correlation

coefficients was subjected to validation procedure and tested its significance. In describing and evaluating the survey data, descriptive measures were used and in determining the significant factors that influence the learning experience of students, correlation analysis was employed such as Spearman rho correlation and Pearson product moment correlation.

The Participants and Ethics

This study considers all senior high school students (Grade 11 and 12) of VSU enrolled in the second semester of academic year 2018-2019. In attaining the primary goal of this study, a complete enumeration was used in order to maximize the gathering of information and to lessen possible errors from implementation of the research design. Thus, all Grade 11 and 12 senior high students was considered in the survey with average age of 17 and 18 years old, respectively. Students who were absent during data collection and students with several blanks in the questionnaire was automatically excluded in the survey. Table 1 shows the frequency distribution of participants and its corresponding percentages.

Table 1. Distribution of participants

Grade level	Number of Students (N)	Participants (n)	Percentage (%)	Sex	
				Male	Female
Grade 11	121	119	98.35	48	71
Grade 12	110	103	93.64	32	71
Total	**231**	**222**	**96.10**	**80**	**142**

This study was strictly following an ethical procedure, hence, participation in the study was voluntary. The participants were assured that their responses will be treated with utmost confidentiality and the information provided shall be solely used for the research and carried out in accordance with Republic Act. 10173 or otherwise known as Data Privacy Act in the Philippines.

The Research Instrument and Data Collection

The study used a developed questionnaire to collect all relevant information to all Grade 11 and 12 students. First part of the questionnaire is the demographic profile of students. Then, followed by the Likert scale questionnaire for cognitive factors in learning General Mathematics. Research instruments used in this study were adapted from previous researches with proven reliability and validity shown below:

Analysis on the Mathematics Attitude Scale

The scoring system as adopted from the study of Code and colleagues (2016) is determined by the agreement between the expert's consensus and the student's perspective on his/her attitude towards mathematics. A student receives 1 point if his/her answer is the same direction as the expert consensus. If the student responds in the opposite direction of the expert consensus, or a neutral response is given, they receive 0 for that question. The expert consensus is as follows:

Table 2. Scoring Guidelines for Mathematics Attitude Scale

Question No.	Expert Consensus	Question No.	Expert Consensus	Question No.	Expert Consensus	Question No.	Expert Consensus
1	Disagree	9	Disagree	17	Disagree	25	Agree
2	Disagree	10	Disagree	18	Disagree	26	Disagree
3	Disagree	11	Agree	19	Filter Statement	27	Disagree
4	Disagree	12	Agree	20	Agree	28	Disagree
5	Disagree	13	Agree	21	Disagree	29	Disagree
6	Agree	14	Disagree	22	Disagree	30	Disagree
7	Disagree	15	Agree	23	Disagree	31	Disagree
8	Disagree	16	Disagree	24	Disagree	32	Disagree

Mathematics Attitude Scale is the average score for all items except questions 19, 22 and 31. Its value is from 0 to 1, ranging from negative attitude (0) to positive attitude (1). The mean mathematics attitude scale was used to represent the attitude towards studying math in each group (i.e, Male, Female, Grade 11, Grade 12, STEM, ABM, TVL, HUMMS).

Analysis on the Mathematics Anxiety Scale

The Math Anxiety Scale (MAS) by Betz (1978) is used in this study to measure the mathematics anxiety of Senior High School students as adopted by Johnston-Wilder and colleagues (2014) in their final report for The Gatsby Charitable Foundation. Questions 1 to 5 are positively worded and items 6 to 10 are negatively worded. The scoring used are as follows:

Table 3. Scoring Guidelines for Mathematics Anxiety Scale

Questions 1 to 5		**Questions 6 to 10**	
Response	**Score**	**Response**	**Score**
Strongly agree	1	Strongly agree	5
Agree	2	Agree	4
Undecided	3	Undecided	3
Disagree	4	Disagree	2
Strongly disagree	5	Strongly disagree	1

The Math Anxiety Scale is from 10 (minimum total score) to 50 (maximum total score). This scale indicates the least anxious (10) to the most anxious (50) student in terms of Mathematics. The mean mathematics anxiety scale was used to represent the attitude towards studying math in each group (i.e, Male, Female, Grade 11, Grade 12, STEM, ABM, TVL, HUMMS).

Analysis on the Mathematical Resilience Scale

The Mathematics Resilience Scale (MRS) by Kooken, J. et al (2013) is used to measure the mathematics resilience of Senior High School students in this study. There are 17 positively worded questions and 6 negatively worded questions. The scoring used are as follows:

Table 4. Scoring Guidelines for Mathematical Resilience Scale

Positively Worded Questions (Questions 1-2, 4-6, 8-9, 11-13, 15-17, 19-21, and 23)		**Negatively Worded Questions (Questions 3, 7, 10, 14, 18, and 22)**	
Response	**Score**	**Response**	**Score**
Strongly agree	5	Strongly agree	1
Agree	4	Agree	2
Undecided	3	Undecided	3
Disagree	2	Disagree	4
Strongly disagree	1	Strongly disagree	5

The MRS was designed to measure the attitude and beliefs in studying mathematics which constitutes three subscales: Value, Struggle and Growth. Value scores range from 8 to 40 (8 questions: 1, 6, 12, 16, 17, 19, 21, and 23). Struggle scores also range from 8 to 40 (8 questions: 2, 5, 8, 9, 11, 13, 15, and 20). Growth score ranges from 7 to 35 (7 questions: 3, 4, 7, 10, 14, 18, and 22). Thus the lowest Mathematical resilience score is 23 and the highest is 115 which ranges from the least resilient to the most resilient in studying mathematics. The mean mathematical resilience scale was used to represent the attitude towards studying math in each group (i.e, Male, Female, Grade 11, Grade 12, STEM, ABM, TVL, HUMMS).

Analysis on the Learning Styles

The learning style of senior high school students is determined by using the scoring guidelines by Moussa (2018). Student's answers are given the following points: "Often" is 5 points, "Sometimes" is 3 points, and "Seldom" is 1 point. There are three types of learners: Visual, Auditory, and Tactile. Each type is assigned 8 questions. Visual learners are determined by questions 2, 3, 7, 10, 14, 16, 19, and 22. Auditory learners are determined by questions 1, 5, 8, 11, 13, 18, 21, and 24. Tactile learners are determined by questions 4, 6, 9, 12, 15, 17, 20, and 23. The scores are added up for each group of questions and the category with the highest total score will determine which dominant type of learning style the student belongs. The mean total score was used to represent the dominant learning style in each group (i.e, Male, Female, Grade 11, Grade 12, STEM, ABM, TVL, HUMMS).

Analysis on Study Habits

The scoring guideline used in the analysis on the learning styles is adopted for identifying the study habits in math of senior high school students. The study habits responses are scored according to the following: "Yes" is 5 points, "Sometimes" is 2 points, and "No" is 1 point. The total scores range from 23 to 115 which represents very poor to very good study habit in math. The mean total score was used to represent the study habit in math for each group (i.e, Male, Female, Grade 11, Grade 12, STEM, ABM, TVL, HUMMS).

Another variables used in this study is the students' learning experiences in Mathematics. It can be classified as routinely, creative, challenging, enjoyable, logical, and rewarding. The students scale the following experiences by choosing 1-10 option as their perception score, that is, 1 is the lowest and 10 is the highest. Table 5 shows the interval of learning perception score and its corresponding description which is based on the study of Casinillo (2019).

Table 5. Students' learning experience perception score and its description

Range of median perception score	Description
1.0 – 2.8	Very Dissatisfied
2.9 – 4.6	Dissatisfied
4.7 – 6.4	Neutral
6.5 – 8.2	Satisfied
8.3 – 10.0	Very Satisfied

Data Analysis and Correlation Coefficient

In describing the data, it was analyzed using some descriptive measures namely: frequency distribution, percentages and mean average. In determining the relationship between two at least interval variables x_i and y_i, the Pearson correlation was computed as follows:

$$\widehat{r_p} = \frac{n\sum_{i=1}^{n} x_i y_i - (\sum_{i=1}^{n} x_i)\,(\sum_{i=1}^{n} y_i)}{\sqrt{[n\sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2][n\sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2]}} \qquad (1)$$

where $\widehat{r_p}$ is the estimated Pearson correlation coefficient and n is the number of paired data set. The Spearman rho correlation was used to determine the relationship between two variables when at least one of them are ordinal in nature. Then, the correlation coefficient was computed as follows:

$$\widehat{r_s} = 1 - \frac{6}{n(n^2-1)}\sum_{i=1}^{n} d_i^2 \qquad (2)$$

where $\widehat{r_s}$ is the estimated Spearman correlation coefficient and n is the number of paired ranks in the data set and d_i is the difference between the paired ranks. Furthermore, the computed correlation coefficient was tested under the following hypotheses:

$$H_o: r = 0$$
$$H_a: r \neq 0$$

The test statistic was computed as follows:

$$t_c = \frac{\hat{r}\sqrt{n-2}}{\sqrt{1-\hat{r}^2}} \quad (3)$$

The null hypothesis was rejected whenever $|t_c|$ is greater than or equal to $t_{\frac{\alpha}{2},df=n-2}$, or p-value is lesser than or equal to α, where α is the level of significance and df is the degrees of freedom. Seemingly, in order to have fast and accurate results, the calculation was done with the aid of Statistical Packages for Social Science (SPSS) version 22.

RESULTS AND DISCUSSION

In this section, the descriptive measures for cognitive factors and demographic profile of students were presented. Furthermore, to capture the relationships between the students' learning experience, academic performance and its influencing cognitive factors, the correlations analysis was presented and discussed.

Mathematics Attitudes of Senior High Students

In Table 6, it shows that the attitude of senior high school students are not significant in terms of sex and grade level but it is significantly different in terms of academic strand. This implies that their attitudes varies in regards to the different experiences in their senior high strand. In particular, HUMMS and TVL have significantly different attitude towards math where the former have more favorable attitude towards math compared to the latter. This suggest that students in HUMMS are more interested in learning mathematics. However, HUMMS, STEM and ABM are not significantly different, and STEM, ABM and TVL are also not significantly different in terms of their attitude towards studying mathematics since they were influenced by the same teacher in mathematics. In the study of Mazana et al. (2019) and Mensah et al. (2013), students' attitude towards learning mathematics is affected by factors such as teacher affective support and classroom instruction.

Table 6. Comparison of mean mathematics attitude scale and standard deviation among students' sex, grade level, and academic strand by Independent T-test/ANOVA F-test

Demographics		Mean	Standard deviation	Test Statistic[1,2]	p-value
Sex	**Male**	0.341[a]	0.189	1.699[ns]	0.091
	Female	0.383[a]	0.175		
Grade Level	**11**	0.363[a]	0.177	-0.435[ns]	0.664
	12	0.374[a]	0.185		
Academic Strand	**STEM**	0.390[ab]	0.189	3.076*	0.029
	ABM	0.332[ab]	0.180		
	TVL	0.318[b]	0.148		
	HUMMS	0.435[a]	0.159		
Overall		0.368	0.181		

Note: [1]-Test Statistics for T-test; [2]-Test Statistics for F-test in ANOVA; [ns]-Has no significant difference; *- Has significant difference at the 0.05 level. Multiple comparison test was done using LSD. Means with a common letter are not significantly different.

Mathematical Anxiety of Senior High Students

In terms of sex, females tend to be more anxious towards studying math than males (Table 7). In other words, male student is more likely to be interested in mathematics compared to female student. The result is parallel to the study of Geist and King (2008) that deals with the gender of students in mathematics. The anxiety of senior high school students towards math are not significantly different in terms of grade level. Furthermore, Table 7, reveals that STEM students have the lowest anxiety towards math and is not significantly different from HUMMS but are significantly different from ABM and TVL. This suggest that STEM and HUMMS students and are more motivated to learn mathematics compared to the other strands. This infers that the learning from mathematics provides satisfaction and fulfillment to STEM and HUMMS students which is helpful for good academic performance (Ruzek & Schenke, 2019).

Table 7. Comparison of mean mathematical anxiety scale and standard deviation among students' sex, grade level, and academic strand by Independent T-test/ANOVA F-test

Demographics		Mean	Standard deviation	Test Statistic[1,2]	p-value
Sex	**Male**	31.59^{b}	5.92	3.950^{**}	<0.001
	Female	34.66^{a}	5.28		
Grade Level	**11**	33.95^{a}	5.84	1.043^{ns}	0.298
	12	33.15^{a}	5.53		
Academic Strand	**STEM**	32.66^{b}	5.33	2.758^{*}	0.043
	ABM	34.96^{a}	5.93		
	TVL	34.85^{a}	5.62		
	HUMMS	32.81^{ab}	6.83		
Overall		33.57	5.70		

Note: [1]-Test Statistics for T-test; [2]-Test Statistics for F-test in ANOVA; [ns]-Has no significant difference; *- Has significant difference at the 0.05 level; **- Has high significant difference at the 0.01 level. Multiple comparison test was done using LSD. Means with a common letter are not significantly different.

Mathematical Resilience of Senior High Students

The mathematical resilience of senor high school students are not significantly different in terms of sex and grade level but significantly different among academic strands (Table 8). In particular, STEM is the most resilient and is not significantly different form HUMMS but significantly different from ABM and TVL. This implies that STEM and HUMMS students are adaptive bearing to mathematics which allows students to continue to pursue learning mathematics despite adversity. This result is consistent to the study of Johnston-Wilder and Lee (2010) that deals with mathematical resilience.

Table 8. Comparison of mean mathematical resilience scale and standard deviation among students' sex, grade level, and academic strand by Independent T-test/ANOVA F-test

Demographics		Mean	Standard deviation	Test Statistic[1,2]	p-value
Sex	**Male**	87.13[a]	11.69	1.851[ns]	0.066
	Female	89.97[a]	9.06		
Grade Level	**11**	90.07[a]	9.85	1.704[ns]	0.090
	12	87.74[a]	10.34		
Academic Strand	**STEM**	91.13[a]	10.51	4.489**	0.004
	ABM	86.64[b]	9.78		
	TVL	85.39[b]	8.25		
	HUMMS	89.56[ab]	9.49		
Overall		88.97	10.13		

Note: [1]-Test Statistics for T-test; [2]-Test Statistics for F-test in ANOVA; [ns]-Has no significant difference; **- Has high significant difference at the 0.01 level. Multiple comparison test was done using LSD. Means with a common letter are not significantly different.

Learning Styles of Senior High Students

In Table 9, Senior high school students, in general, tend to be visual learners and Moussa (2018) suggests that students should make use of study materials such as charts, maps, filmstrips, notes, and videos to address the needs of this type of learners. It is also suggested that students practice visualizing or pictures words and concepts in their mind. Adding meaningful symbols, colors, and graphics to notes also provide visual cues. Try to visualize how information appears on a page. In study groups or discussions, focus on how people look when they speak.

Table 9. Mean learning style preference score and proportion of students per learning style by sex, grade level, and academic strand

Demographics		Learning Styles		
		Visual	Auditory	Tactile
Sex	**Male**	26.75 (52.0%)	25.79 (48.0%)	24.75 (37.3%)
	Female	28.45 (62.0%)	26.11 (33.8%)	25.00 (26.8%)
Grade Level	**11**	27.40 (54.7%)	25.78 (36.8%)	25.26 (34.2%)
	12	28.40 (63.0%)	26.26 (41.0%)	24.60 (26.0%)
Academic Strand	**STEM**	28.18 (64.9%)	25.79 (37.7%)	24.82 (30.7%)
	ABM	26.43 (46.8%)	25.36 (40.4%)	24.85 (38.3%)
	TVL	27.40 (55.0%)	26.10 (37.5%)	25.00 (30.0%)
	HUMMS	31.00 (56.3%)	29.13 (43.8%)	25.50 (6.3%)
Overall		27.86 (58.5%)	26.00 (38.7%)	24.91 (30.4%)

Note: Proportions are enclosed in parenthesis.

Study Habits of Senior High Students

Table 10 reveals that senior high school students tend to have high significant difference in their study habits in terms of sex, grade level, and academic strand. Female senior high school students tend to have more favorable study habits compared to males. Most of the male students nowadays are influence by online games which is a hindrance to their study habits. Also, grade 12 students tend to have more favorable study habits compared to grade 11 students. It implies that grade 12 students are more mature in terms of their responsibilities as a students. Furthermore, HUMMS and TVL students tend to have more favorable study habits compared to STEM and ABM.

Table 10. Comparison of mean study habits score and standard deviation among students' sex, grade level, and academic strand by Independent T-test/ANOVA F-test

Demographics		Mean	Standard deviation	Test Statistic[1,2]	p-value
Sex	**Male**	77.89^{b}	13.81	3.145^{**}	0.002
	Female	83.77^{a}	13.00		
Grade Level	**11**	78.88^{b}	14.28	-3.307^{**}	0.001
	12	84.82^{a}	12.00		
Academic Strand	**STEM**	80.55^{b}	14.28	7.449^{**}	<0.001
	ABM	76.53^{b}	11.85		
	TVL	87.54^{a}	11.76		
	HUMMS	89.50^{a}	8.56		
Overall		81.65	13.57		

[1]-Test Statistics for T-test; [2]-Test Statistics for F-test in ANOVA; **- Has high significant difference at the 0.01 level

Note: Multiple comparison test was done using LSD. Means with a common letter are not significantly different.

Correlation Analysis

Table 11 shows that students' attitudes towards learning mathematics contribute to students' learning experiences in mathematics. Meanwhile, some researchers have concluded that students' attitudes play a vital role in the learning of mathematics (Ayob & Yasin, 2017; Kele & Sharma, 2014). Attitude is defined as a mental set or disposition, readiness to respond and the psychological basis of attitudes, their permanence, learned nature and evaluative character (Graf et al., 2010). In the context of mathematics, attitude should be viewed as a predisposition to respond in a favourable or unfavourable way to mathematics and academic performance (Sadiku & Sylaj, 2019). Perhaps, attitudes can therefore be linked directly to motivation and provide key information to a better understanding of attitudinal and motivational processes in learning mathematics. Mathematics anxiety level has negatively impacted the students' learning experience (Table 11). According to Mahmood and Khatoon

(2011), math anxiety often leads to avoidance of mathematics class and laziness of doing math activities. If a student has high anxiety level, then the student is anxious, bored, and fearful towards math or who do not want to grasp the importance of math in real life and professional life (Ashcraft, 2002). In Table 11, it displays that mathematical resilience is dependent on the students learning experience. In psychology, resilience is a multidimensional construct which regulates the optimal human functioning and locates itself in a positive psychology which addresses mental wellness (Karairmak, 2010). Henceforth, it shows that even if learning mathematics is quite challenging but students shows interest and satisfaction. This goes to infer that students are having fun and happy to learn mathematical concepts when they are challenge. This result is somehow consistent to the study of Ruzek and Schenke (2019). A visual learning style is correlated to the learning experience of students (Table 11). Visual learning makes the students being creative whereby something new ideas will generate to their minds and somehow valuable is formed. Learning mathematics will build their minds on having the quality or power of creating something original (Beghetto, 2016). Furthermore, study habits is influencing the students learning experience except for challenging (Table 11). Perhaps, it is worth noting that learning mathematics is unpredictable unlike any other subjects which only requires memorizing. Hence, it can be gleaned that a good performance in mathematics is not just derived from an exhaustive study habits but to their past knowledge and interest of the said subject (Casinillo and Aure, 2018).

Table 11. Correlation (Spearman rho) between the students' learning experience and cognitive factors

Cognitive Factors	**Learning experience**					
	Routinely	*Creative*	*Challenging*	*Enjoyment*	*Logical*	*Rewarding*
Mathematics Attitudes	.317** (<0.001)	.211** (0.002)	.139* (0.046)	.382** (<0.001)	.332** (<0.001)	.341** (<0.001)
Mathematics Anxiety	-.313** (<0.001)	-.266** (<0.001)	-.013 (0.853)	-.433** (<0.001)	-.160* (0.021)	-.181** (0.009)
Mathematical Resilience	.202** (0.003)	.258** (<0.001)	.164* (0.018)	.297** (<0.001)	.251** (<0.001)	.408** (<0.001)
Resilience on Value	.285** (<0.001)	.340** (<0.001)	.098 (0.160)	.353** (<0.001)	.275** (<0.001)	.338** (<0.001)
Resilience on Struggle	-.028 (0.691)	.042 (0.546)	.183** (0.008)	.100 (0.154)	.117 (0.092)	.224** (0.001)
Resilience on Growth	.133 (0.055)	.179* (0.010)	.129 (0.064)	.209** (0.003)	.180** (0.010)	.356** (<0.001)
Learning Style	-.041 (0.557)	-.097 (0.166)	-.093 (0.184)	-.023 (0.749)	-.142* (0.042)	-.161* (0.021)
Visual Preference	.212** (0.002)	.293** (<0.001)	.229** (0.001)	.141* (0.043)	.308** (<0.001)	.169* (0.015)
Auditory Preference	.033 (0.641)	.090 (0.198)	.103 (0.140)	.003 (0.971)	.099 (0.156)	.012 (0.861)

Tactile Preference	.016 (0.816)	.100 (0.152)	.193** (0.005)	.055 (0.435)	.083 (0.236)	.024 (0.728)
Study Habits	.284** (<0.001)	.257** (<0.001)	.117 (0.094)	.213** (0.002)	.156* (0.025)	.173* (0.013)

**- Correlation is significant at the 0.01 level (2-tailed); *- Correlation is significant at the 0.05 level (2-tailed).

It is revealed that students consider learning mathematics as a challenging subject which is positive indicator to their level of achievement in mathematics (Table 12). This goes to infer that senior high students in a university are struggling to survive their mathematics subjects. In fact, college instructors are more tough teachers compare to secondary teachers. The college instructor makes the problem challenging and students will have to concentrate and put some effort to solve. Another reason why students are struggling is that, in the study of Casinillo and Aure (2018), senior high students of VSU are not allocating more time in studying the said subject since they have a lot of other subjects aside mathematics. However, students who prefer challenges in mathematics tend to persist longer at difficult math problems. Perhaps, student shows a greater interest in the subject, and have higher academic achievement than their peers (Turner & Meyer, 2004). Also, it is shown that students experience in learning mathematics is logical. This means that a classroom climate and instructional interactions are related to the way in which logical learning is integrated into mathematics activities and focus on how it is perceived by students. This will help the students to improve their academic performance in mathematics. Perhaps, studying mathematics helps the students develop their skills in logical thinking, problem-solving and decision-making in real world (Prez et al., 2018).

Table 12. Correlation (Spearman rho) between the students' learning experience and General Mathematics grade

	Learning experience					
	Routinely	*Creative*	*Challenging*	*Enjoyment*	*Logical*	*Rewarding*
General Mathematics Grade	0.074 (0.382)	0.116 (0.166)	0.167* (0.046)	0.105 (0.212)	0.246** (0.003)	0.114 (0.175)

**-Correlation is significant at the 0.01 level (2-tailed); *-Correlation is significant at the 0.05 level (2-tailed).

Students' attitude is very crucial in learning mathematics and level of achievement (Table 13). A positive learning attitudes of senior high students in the classroom setting leads to active engagement which increases their ability to understand clearly on the topics (Code et al., 2016). An attitude towards mathematics reflects on the student's self-confidence, happiness, motivation and anxiety levels when it comes to the difficulty of the subject (Mazana et al., 2019). This results is consistent to the study of Han and Carpenter (2014) that attitudes consist of cognitive, affective and behavioral reactions that students display towards mathematics or the surrounding based on their feelings or interest which impact

their ability to grasp. Mathematical resilience has a positive impact to the students' mathematics achievement particularly in resilience on struggle (Table 13). This refers to the students' capacity to recover quickly from difficulties and toughness they have experience in the classroom (Johnston-Wilder & Lee, 2010). At first, students experienced a culture shock in the new classroom environment since college level teachers are highly competitive and idealistic. But as the time goes by, these students cope with the topic and became interested to the subject. Mathematical resilience exists when the students uses a mental processes and behaviors in promoting personal assets particularly with grades and protecting self-reputation from the potential negative effects of the difficulty of the subject.

Table 13. Correlation (Pearson r) between the students' cognitive factors and General Mathematics grade

Cognitive Factors	**General Mathematics Grade**	***p-value***
Mathematics Attitudes	0.308**	<0.001
Mathematics Anxiety	-0.023	0.789
Mathematical Resilience	0.214*	0.010
Resilience on Value	0.148	0.078
Resilience on Struggle	0.226**	0.007
Resilience on Growth	0.143	0.088
Learning Style	0.066	0.435
Visual Preference	0.098	0.243
Auditory Preference	0.066	0.433
Tactile Preference	-0.160	0.057
Study Habits	0.056	0.504

******-Correlation is significant at the 0.01 level (2-tailed); *****- Correlation is significant at the 0.05 level (2-tailed).

CONCLUSION

Findings of the study shows that the students' attitude towards mathematics is influencing their learning experience which is a very important factor in improving their academic performance. And this mathematics attitude can be enhancing by the teacher affective support and classroom instruction. In order to reduce mathematical anxiety, teachers must increase student involvement by modeling mathematical thinking, emphasizing important topics and adjusting instruction to meet student well-being. Though mathematics is quite challenging and logical for the students, mathematical resilience of students can be improved by providing feedback on progress, and helping students manage their mathematical frustrations. Mathematics teacher improve the students' academic performance and study habits by emphasizing the challenge of the subject, effort and student accountability. Furthermore, it is concluded that most of the senior high students are visual learners. Hence, mathematics teachers should provide appropriate classroom instruments that is suitable for 21st century learners that students can practice visualizing or pictures some

concepts in mathematics. This will help them grasp the difficult topics by adding meaningful symbols, equation, figures and graphics which provide them visual cues.

It is highly recommended that a parallel study should be headed in a university offering senior high school with a bigger population to gather accurate and richer information. An extensive evaluation of learning experience can aid the teachers and students improve the efficiency and effectivity of mathematics education. It is also recommended that teachers must shows enthusiasm and creates a positive environment in which students are willing to take risks in a challenging topics in mathematics. This is by implementing meaningful activities in mathematics embedded in real-life situations. For future study, an empirical analysis on regression modeling should be conducted in order to understand how much question in regards to learning experience and its corresponding cognitive factors. This is to support the findings of the current study and to find new approaches to mathematics education.

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