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Econometric Modelling on Happiness in Learning Mathematics: The Case of Senior High Students

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Abstrak

Penelitian ini mengembangkan model ekonometrik pada kebahagiaan siswa dalam pembelajaran matematika untuk mengidentifikasi faktor-faktor yang memengaruhinya. Data diambil dari 115 mahasiswa kelas 11 di Universitas Negeri Visayas. Hasilnya menunjukkan bahwa sekitar 61% mahasiswa menilai diri mereka relatif bahagia. Tingkat kebahagiaan yang mereka harapkan relatif sama dengan yang mereka tunjukkan secara aktual dan ini merupakan salah satu model yang signifikan buktinya. Siswa yang mengikuti program STEM dan sejenisnya pada jenjang sekolah menengah atas (SMA) tampak lebih bahagia. Pendapatan di rumah, tunjangan, dan kesehatan mental tampak menunjukkan pengaruh yang tidak seberapa pada kebahagiaan belajar. Sementara itu siswa yang menghabiskan banyak waktu di perpustakaan dan tinggal di perdesaan cenderung bahagia dalam belajar. Lebih lanjut, kondisi kesehatan fisik tampak berbanding terbalik dengan kesejahteraan siswa dalam belajar matematika, sementara itu relasi sosial dan jarak rumah ke sekolah tidak berkontribusi pada kebahagiaan siswa.

Abstract

This study developed econometric models on the students' happiness in learning mathematics to identify its influencing factors. A complete enumeration of 115 grade 11 students in the Visayas State University were employed as participants. Results showed that about 61% of the students considered themselves as moderately happy in learning. Their expected happiness is approximately the same with their actual happiness, which is one of the significant determinants in the models. STEM students among other strands in senior high school are more likely happy learners. Household income, allowance, and mental health condition show a small influence on their happiness in learning. Students who spend more time in the library, and those living in rural places tend to be happy in learning. Furthermore, physical health condition shows an inverse effect on students' well-being in learning mathematics, while social relationships and the distance from home to school do not contribute to their happiness.

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INTRODUCTION

Happiness is a measure of individual welfare or subjective well-being. Social scientists and educators are studying on the happiness of learning and training concepts of an individual in order to improve and develop the education system (Abecia et. al., 2014; Casinillo & Aure, 2018; Marques, 2011; Sadeghi et al., 2012). Happiness is the ultimate goal of every person, and education is a worthy means to live a happy life (Bailey, 2009). A study of Tenedero (2009) stated that according to educators, happiness in learning is a worthwhile aim of education. Happiness in learning is important since students make choices based on what makes them happy (Park, 2014). In the study of Frey and Stutzer (2010), it is stated that each individual wants to be happy in life. In fact, students must be satisfied and happy in learning in order to achieve quality performance in the classroom (Pilten, 2016; Popovic & Lederman, 2015). Apparently, the happiness in learning of students is influenced by their demographic profile, social life, and learning experiences (Monk-Turner & Turner, 2012).

Accordingly, Singh (2014) claimed that it is important for students to feel happy and content with their studies. If students are happy to go to school, then it might be possible that school provides a stimulating environment for them. Happiness in schooling is one of the significant factors in academic performance (King et al., 2014). Students with positive vibes would tend to perform better than those who are not. Happiness influences students' interest in the endeavor they are in. In the study of Hoyles and colleagues (2010), students perceived that the fundamental structure of happiness consists of high self-esteem, high self-confidence, social factors, occupational factors, and family factors. As of now, little work is done in establishing a relationship between happiness and socio-economic factors in learning mathematics in senior high students using econometrics approach, hence, this study is conducted.

The term happiness or subjective well-being has been studied by social scientists and economists, which directly refers to the life satisfaction of individual (Frey & Stutzer, 2002; Guazzelli and Zilli, 2016). In fact, in the study of Can and colleagues (2017), happiness at learning is when a student responds to and enjoys what he/she is doing which is affected by different factors. It is a situation when students are happy in learning and not being pressured; instead, they are being efficient in achieving predetermined goals (Abecia et al., 2014). A happy student tends to perform well in school, and being academically well makes them happier. King and colleagues (2014) reveals that students' happiness is governed by some economic determinants. A student who is involve with social and leisure activities has a higher chance of being happy and satisfied in life (Park, 2014). It also found out that health conditions and wellness outcomes are associated with happiness and happiness perspectives (Chaiprasit and Santidhirakul, 2011).

In a University in the Visayas region of the Philippines, senior high students face numerous barriers that impact their overall perceived happiness, especially in learning Mathematics. Norris (2012) stated that mathematics as a discipline is significant in many areas in academic and professional aspect. To date, the University offers different strands with different specialization, namely: Technical-Vocational and Livelihood Tracks (TVL), Accountancy, Business and Management (ABM), and Science, Technology, Engineering, and Mathematics (STEM). All these strands have general mathematics as one of the required subject. Nowadays, the 21st century learners are experiencing social and emotional issues. One frequently cited cause to this issue is the improper usage of technology (Boholano, 2017; Casinillo et al., 2020). They faced an increasingly noisy and confusing digital world. Students spend more time in using technology for pleasure rather than for learning purposes. This issue affects their well-being in learning. Also, Schiffrin & Nelson (2010) revealed that students who have high stress levels are less likely to report high perceived happiness in learning mathematics. Consequently, this leads to low academic performance in mathematics courses (Casinillo, 2019).

In general, this study aimed to develop econometric models that determine the significant determinants that influence subjective happiness on senior high students using ordinary least square (OLS) and binary logit regression. Specifically, this study was conducted to: (1) characterize the happiness, socio-demographic and economic profile of senior high students; (2) compare the level of expected and actual happiness of these students in learning; (3) identify and investigate significant determinants affecting the level of happiness of students; (4) provide inputs to policy-makers on improving the educational system and well-being of seni-

or high students. The purpose of this study is to present statistically significant factors that may affect students' actual happiness in learning mathematics. In fact, results of this study will influence the strategy of the mathematics educators in teaching, and to understand the dynamics of nature of the learners in terms of their degree of happiness. Furthermore, this can also serve as a guide for policy-makers and contributes to the body of knowledge in terms of students' well-being.

METHOD

The study employed a research design that is descriptive and inferential in nature that described and determined significant factors affecting the level of happiness in learning mathematics among senior high students. In describing categorical and qualitative data, descriptive statistics was used such as frequencies, proportions, or percentages. Also, for quantitative data, the following descriptive measures were used: mean, standard deviation, minimum and maximum. Under the inferential statistics, an econometric models were undertaken in determining statistically significant factors of actual happiness in learning mathematics, namely: ordinary least square (OLS) and binary logit regressions. Both descriptive and inferential statistical methods were undertaken using a software called STATA v.14.

Table 1 Senior High Strands and Distribution of Participants of the Sstudy

Strands	Number of Students enrolled	Participants of the study	Percentage (%)
STEM	77	70	90.91
TVL	5	4	80.00
ABM	42	41	97.62
Total	124	115	92.74

This research was limited to the response of all Grade 11 senior high students who enrolled General Mathematics as one of the required subjects of the K to 12 program during the first semester of school year 2018-2019. The distribution of participants in this study is shown in Table 1. The number of participants of the study is not equal to the number of students enrolled since they are not available, and some refuse to participate during the conduct of the study. Also, there were few students who participated who leaves several missing data in the questionnaire; hence, they were excluded in the survey.

As for ethical consideration, the senior high students were oriented on the purposes of the study. The following students were informed that the data gathered will be treated with utmost confidentiality and the participation was strictly voluntary.

The questionnaire for the level of happiness is based on the study of Lyubomirsky and Lepper (1999). A two-item scale was administered to determine the measure of subjective happiness of the students, that is, the expected and actual happiness. Each of the items is completed by choosing one of ten options, that is, 1 to 10 scaling; 1 for being a very unhappy student and 10 for being a very happy student. The interpretation of perception scores for Likert-type scale is based on the study of Warmbrod (2014). The questionnaire for the happiness score was tested for reliability and found out that the Chronbach's alpha is equal to 0.86 with the aid of Statistical Packages for Social Sciences (SPSS), which suggests that the instrument is valid and reliable. In the factors of happiness in students' learning, we based our questionnaire on the study of Noddings (2003) and King et al. (2014). The questionnaire on the demographic profile and different economic determinants affecting the level of happiness or welfare of students in learning is grounded on the study of Graham (2004), and Guazzelli and Zilli (2016) which is a structured questionnaire for categorical and open-ended type for cardinal questions.

Before the conduct of the study, the permission of the Visayas State University-Senior High school (VSU-SHS) principal was requested. For the data collection, a constructed questionnaire was developed to determine the socio-demographic profile, level of happiness in learning and its possible determinants. According to the study of Schiffrin and Nelson (2010), the level happiness in learning is best measured during the actual classroom setting. Hence, by complete enumeration, primary data was gathered using a developed questionnaire during the middle of the semester.

Descriptive measures were employed to the different variables of interest. The expected and actual happiness was compared and tested for the significant difference using the Wilcoxon signed-rank test since the paired variables are ordinal scale. Measuring the level of happiness of students in learning mathematics was used to compare levels in an absolute sense. Hence,

the actual happiness in the model was treated as a continuous variable, and considered the OLS regression as the first econometric model in this study. In OLS, the procedure is to estimate the values of the regression parameters. The OLS model takes the following equation (Greene, 2008):

$$Hi=\beta_0+\beta_1 x_{i1}+\cdots+\beta_p x_{ip}+\varepsilon_i \quad (1)$$

where i=1,...,n, which denotes the i^{th} senior high student. In this study, H_i was the level of actual happiness of the i^{th} student, and x_{it} are the different determinants influencing happiness, with t=1,2,...,p (p determinants). For the interpretation of the OLS model, the parameters βt are the main interest to be estimated, it is the approximate change in the level of actual happiness of students in every 1 unit change in the independent variable x_t while holding other determinants constant.

The second econometric model in this study is the binary logit model. The actual happiness was coded as follows: 0 - (1-5) and 1- (6-10). In the binary logit model, it is assumed that the students will choose two alternatives, that is, 0 – unhappy student and 1 – happy student. This logit model is based on the logistic probability function and can be expressed as follows (Stock and Watson, 2007):

$$Pi=Pr(H=1 \mid x_1, x_2, \ldots, x_p) = f(\beta_0+\beta_1 x_1+\cdots+\beta_p x_p) \quad (2)$$

where P_i is the probability that a student is happy in learning or unhappy given the following determinants x_t, $t \in \{1, 2, \ldots, p\}$, βj, $j \in \{0, 1, 2, \ldots, p\}$ are the parameters of the model to be estimated, and H is the actual happiness of students. Thus, the logistic distribution function can be written as:

$$Pr(H=1 \mid x1, x2, \ldots, xp) = \frac{1}{1+e^{-(\beta_0+\beta_1 x_1+\cdots+\beta_p x_p)}} \quad (3)$$

where e is the base of natural logarithms, and the parameters βj, $j \in \{0, 1, 2, \ldots, p\}$ were estimated using the Maximum Likelihood Estimation (MLE) technique. The probability of a happy student in learning is given by

$$P_i = \frac{e^{\beta_0+\beta_1 x_1+\cdots+\beta_p x_p}}{1+e^{\beta_0+\beta_1 x_1+\cdots+\beta_p x_p}}, \quad (4)$$

while the probability of an unhappy student in learning is as follows:

$$1-P_i = \frac{1}{1+e^{\beta_0+\beta_1 x_1+\cdots+\beta_p x_p}} \quad (5)$$

Hence, taking the logarithm of both sides in the ratio of equations (4) and (5), will result to:

$$\text{Log}\left(\frac{P_i}{1-P_i}\right) = \beta_0+\beta_1 x_1+\cdots+\beta_p x_i \quad (6)$$

The left hand side of equation (6) represents the log of odds that a student is either happy in learning or not. The diagnostic test for the econometric models namely: multicollinearity test, homoscedasticity test, and normality test for residuals were performed to ensure a valid results for interpretation using STATA v.14 (Greene 2008; Stock and Watson, 2007).

RESULT AND DISCUSSION

This section shows the descriptive measures on the variables of interest in the study. Also, this presents the comparison of the level of actual and expected happiness in learning mathematics and econ-ometric models that determine the influencing factors of happiness in learning based on complete enu-meration of grade 11 students.

A. Characterization on the Variables of Interest

Table 2 shows the descriptive measures of the response variables and its predictors in this study. On average, about 61% of the students considered themselves as moderately happy learning mathematics and among others are unhappy. The expected happiness differs a little compared to the actual happiness. This goes to infer that some expectations of students before the class start are not meet in the actual situation. Students' mean age is just the right age for their grade level.

The mean household income is relatively higher since most of their parents' occupations are in government positions with high salary rate and/or engaged in business. Mostly, students with low weekly allowance were the students residing near the University, and students with high weekly allowance live in places far from the campus. On the average, students are residing far from the University, hence, there is a large portion of allowance allocated for transportation expense.

Table 2 also reveals that students are not allocating more time studying mathematics.

Table 2 Descriptive Measures for Actual Happiness in Learning Mathematics and Its Influencing Determinants (n=115)

Variables	Mean	Std. Dev.	Min	Max
Actual Happiness[a]	6.113	2.122	1	10
Binary response: Happy student	0.609	0.490	0	1
Expected Happiness[a]	6.661	2.047	2	10
Age (Years)	16.765	0.597	16	18
Dummy: Male	0.365	0.484	0	1
Dummy: Urban	0.417	0.495	0	1
Household Income (Peso)	36102.17	24363.35	5000	150000
Weekly Allowance (Peso)	535.348	386.419	0	3000
Distance from VSU to Hometown (km)	12.987	22.068	1	135
Number of Study hours (weekly)	3.064	3.696	0	35
Dummy: Internet	0.696	0.462	0	1
Dummy: STEM	0.609	0.490	0	1
Learning experience[a]	6.529	1.809	1	10
Perception to teacher[a]	8.794	1.621	3	10
Classroom Environment[a]	7.261	2.351	1	10
Library[a]	6.574	2.197	1	10
University Compound[a]	6.878	2.344	1	10
Leisure: Religious[a]	6.678	2.281	1	10
Leisure: Sports[a]	7.209	2.226	1	10
Leisure: Rest[a]	8.052	2.196	1	10
Love relationship[a]	5.843	3.105	1	10
Family relationship[a]	8.548	1.773	3	10
Friendship[a]	8.478	1.754	1	10
Classmate relationship[a]	7.643	2.053	1	10
Physical health[a]	7.687	2.083	2	10
Emotional health[a]	6.721	2.364	1	10
Mental health[a]	6.600	2.688	1	10

Note: a - scale: 1 to 10. (1 for being a very unhappy student and 10 for being a very happy student)

Mostly, students were studying mathematics a few hours before the exam schedule for the reason that they have a lot of loads in their curriculum. Students rely on the internet in studying mathematics since most of the students now owns smartphones and laptops.

About 61% of these students took STEM as their chosen strand. STEM students are expected to encounter more units in mathematics compare to the other strand. Learning experiences in mathematics in the University is positively perceived by the students. Students' overall rating on their teachers and the University compound is relatively high. This implies that they considered it as a whole to be conducive for the teaching-learning process in mathematics. On the average, leisure time, social relationship and health status of students can be describe as good due to their higher ratings. This infers that these students are active to leisure activities and recreation, socially oriented, and healthy citizen.

B. Comparing Actual Happiness and Expected Happiness

Table 3 reveals that before General Mathematics class starts, students have a higher expectation of their happiness in learning the subject than the actual happiness. This small expectation gap of happiness is highly significant at 1% level. This result is not surprising because, in nature, students tend to be excited at the start of the class, thus they expect things which favor their welfare. Nevertheless, in the actual classroom setting, some of their expectations were

Table 3 Wilcoxon Signed Rank Test for Actual and Expected Happiness in Learning General Mathematics

Variables	Sample	Z_c	p-value
Actual happiness and expected happiness	115	-2.634***	0.008

not met, which negatively affect their actual happiness in learning mathematics.

C. Econometric Models

In the first model (OLS), the response variable is the actual happiness (Scale: 1-10). The OLS model is highly significant at 1% level (p-value<0.0001), and this implies that in the model (Table 4), all coefficients taken together is not equal to zero, which further implies that the econometric determinants explain the variation of the actual happiness of students in learning mathematics. All predictors in the model have Variance Inflation Factor (VIF) lesser than 10, that is, with the absence of multicollinearity of the econometric models (Stock & Watson, 2007).

The Breusch-Pagan test reveals that the variances of the OLS model are not heteroscedastic (χ^c_2=1.01,*p*-value=0.3152), and by Shapiro-Wilk W test, it is also revealed that the residuals are normally distributed (*W*=0.988,p-value=0.4270). For the logit model (Table 4), the response variable is the binary response (0-unhappy student and 1-happy student). The model also is significant at 1% level (*p*-value<0.0001), which means that the combined effect, of all the variables in the model, is different from zero (Greene, 2008). Hence, the model have some relevant explanatory power to explain the happiness of students' learning, which is consistent with the study of Markussen et al. (2018).

Table 4 shows that there are 49.29% and 53.05% of the variation of the level of actual happiness in learning that is explained by the OLS and binary logit model, respectively. The OLS model (Table 4) shows that the expected happiness of students directly influences their actual happiness in learning mathematics. This increase implies that in every expectation of students, most of them were being meet in the actual happenings in the classroom. The logit model also reveals that students with higher expected happiness has an odd of 1.55 times higher of being happy learners compare to students with lower expectations (Table 4).

In other words, the probability of being a happy student is expected to be 0.61 for high expected happiness. Students who live in rural places are more likely happy students in learning mathematics and this chance is about 94.45%. Rural places are less destructive and more peaceful, a better place for studying mathematics (Brown et al., 2016).

Table 4 shows that the OLS model implies that students from a family with lesser household income, seems to be a happy learner. Parents with lower income have more time with their children to guide in their studies since their job is per hour basis. The weekly allowance of students also contribute a little to their happiness as a student. On the other hand, the logit model (Table 4) tells that household income and the weekly allowance has an average of 50% chance to influence their happiness in learning, but this chance is not significant. Purchasing power for wants and needs can bring more comfort to a student. Both OLS and logit models show that the distance from student's residence to school, the number of study hours per week, and the internet usage does not influence the actual happiness of learning. This result is consistent with other studies in mathematics education (Norris, 2012).

The STEM students have higher chance (94.1%) of being happy compared to non-STEM students. The models also tell that these students were experiencing a positive learning process which positively contribute to their well-being (Popovic & Lederman, 2015). If the students' have a positive experience in the classroom, then they are more likely to be happy learning mathematics (Can et al., 2017). This increase means that STEM students find the mathematics subject as challenging, rewarding, logical, enjoyable, and creative (Kitchen, Sonnert, & Sadler, 2018).

In fact, it has a chance of 72.94% of being happy in learning if they have these experiences. Regardless of how they perceived their teacher, the classroom environment, and the university compound, these do not impact their happiness in learning mathematics, which is contrary to the findings of Pilten (2016).

Students who used the school library has a chance of 65.11% being happy in learning mathematics based on the logit model (Table 4). Students' leisure activities and social relationship have no influence on their happiness in learning mathematics. It means that good academic performance in mathematics can be achieve by self-determination of student (Olafsen et. al., 2017).

The OLS model shows that good physical condition of students is inversely related to their happiness in learning mathematics. The model indicates that there is 0.23 increase in happiness in every 1 unit decrease in the rating of physical health holding other variables constant. This relationship can be explained that those who

Table 4 Econometric Models for the Level of Happiness in Learning General Mathematics and Its Influencing Determinants (n=115)

Independent variables/ determinants	OLS Model		Logit Model	
	Coefficient (b)	Std. Error	Coefficient (b)	Std. Error (c)
Constant	-2.75712^{ns}	4.40874	-23.78473*	12.55159
	(0.533)		(0.058)	(4.68e-11)
Expected Happiness[a]	0.29750***	0.09498	0.42974**	0.19787
	(0.0020)		(0.030)	(1.53686)
Age (Years)	0.23623^{ns}	0.26568	1.04044^{ns}	0.72923
	(0.376)		(0.154)	(2.83047)
Dummy: Male	0.39973^{ns}	0.38984	-0.25861^{ns}	0.84354
	(0.308)		(0.759)	(0.77213)
Dummy: Urban	-0.8057**	0.30930	-2.83556**	0.9623
	(0.011)		(0.003)	(0.05869)
Household Income (Peso)	-0.00001*	6.76e-06	-0.00002^{ns}	0.00002
	(0.094)		(0.229)	(0.99998)
Weekly Allowance (Peso)	0.00083*	0.00045	0.00064^{ns}	0.00097
	(0.069)		(0.513)	(1.00064)
Distance from VSU to Hometown (km)	-0.00162^{ns}	0.00736	0.012247^{ns}	0.019333
	(0.827)		(0.526)	(1.01232)
Number of Study hours (weekly)	0.00828^{ns}	0.04161	-0.0.8168^{ns}	0.08801
	(0.843)		(0.353)	(0.92157)
Dummy: Internet Usage	-0.33910^{ns}	0.38655	-1.43389^{ns}	1.06420
	(0.383)		(0.178)	(0.23838)
Dummy: STEM Students	1.05065**	0.41585	2.76906***	1.00664
	(0.013)		(0.006)	(15.94364)
Learning experience[a]	0.55115***	0.11802	0.99163***	0.34144
	(0.000)		(0.004)	(2.69563)
Perception to teacher[a]	-0.01748^{ns}	0.12366	0.07634^{ns}	0.25389
	(0.888)		(0.764)	(1.07935)
Classroom Environment[a]	-0.14183^{ns}	0.11063	-0.33182^{ns}	0.27743
	(0.203)		(0.232)	(0.71762)
Library[a]	-0.02091^{ns}	0.11013	0.62402*	0.396076
	(0.850)		(0.084)	(1.86642)
University Compound[a]	0.04811^{ns}	0.08991	-0.43940^{ns}	0.27812
	(0.594)		(0.114)	(0.64443)
Leisure: Religious[a]	-0.12530^{ns}	0.08931	-0.27264^{ns}	0.20456
	(0.164)		(0.183)	(0.76137)
Leisure: Sports[a]	-0.03307^{ns}	0.09543	0.30129^{ns}	0.24144
	(0.730)		(0.212)	(0.73987)
Leisure: Rest[a]	-0.08871^{ns}	0.08952	-0.26381^{ns}	0.19922
	(0.324)		(0.185)	(0.76812)
Love relationship[a]	0.01556^{ns}	0.05289	0.12654^{ns}	0.12866
	(0.769)		(0.325)	(1.13490)
Family relationship[a]	0.126765^{ns}	0.15261	-0.08198^{ns}	0.32527
	(0.408)		(0.801)	(0.92129)
Friendship[a]	0.120687^{ns}	0.14451	0.09633^{ns}	0.31905
	(0.406)		(0763)	(1.10112)
Classmate relationship[a]	-0.03026^{ns}	0.12132	0.27455^{ns}	0.28756
	(0.804)		(0.340)	(1.31594)
Physical health[a]	-0.22610**	0.10100	-0.12377^{ns}	0.23863
	(0.043)		(0.604)	(0.88358)
Emotional health[a]	-0.04467^{ns}	0.14014	-0.37760^{ns}	0.32678
	(0.752)		(0.248)	(0.68550)
Mental health[a]	0.29288**	0.11874	0.96927***	0.32703
	(0.016)		(0.003)	(2.63601)
	R^2= 0.6041		***Pseudo R^2= 0.5305***	
	Adjusted R^2= 0.4929			

Note: a - scale: 1 to 10; b - p-value are enclosed by parentheses (Two-tailed test); c - Odds ratio are enclosed by parentheses; ns- not significant; * - significant at 10% level; ** - significant at 5% level; *** - significant at 1% level.

physically fit are not into studying mathematics (Tachie and Chireshe, 2013), perhaps they are occupied to some other things like physical activities or sports. Those students with good mental conditions have a probability of 0.72 for being happy in learning. These students enjoyed solving mathematics problem and had fun in learning mathematics rather than being pressured in passing the subject (Can et al., 2017).

CONCLUSION

This study sought the influencing factors of the degree of happiness in learning mathematics of senior high students which is crucial for improving teaching strategies and well-being of students. The results of the study revealed that there were factors that influenced the happiness of the students in learning mathematics based on the econometric models. Students with positive expectation in their happiness in learning are those students who are fond of mathematics.

It is concluded that STEM students are kind of students who find learning mathematics a fascinating and a challenging experience rather than a burden in their course and this result is similar to the findings of Kitchen and colleagues (2018). Further, those students who devote more time in library use tend to be more likely happy learners which is consistent with the study of Norris (2012). It is interesting to consider that household income, and weekly allowance are not the greatest determinant of happiness for the study sample.

Their weekly allowance only has a slight influence in their learning happiness; in fact, students from lesser earning family are more likely happy in learning mathematics since these students are motivated to pursue their goals in life. It infers that physically fit students are more motivated to learn physical activities rather than studying mathematics. This is consistent with several other studies on mathematics education, happiness, and health (Alabekee et al., 2015; Helliwell et al., 2012).

It is concluded that happiness in learning the subject is greatly affected by the students' interest (Tenedero, 2009). Hence, teachers must develop students' interest in the subject. Teachers must make classroom atmosphere motivating and stimulating to students to boost their interest on the subject (Casinillo and Guarte, 2018). At the same time, the students must also be motivated to learn and do their best in each class discussions and class activities. In this aspect, the teacher can directly influence the students (Popovic and Lederman, 2015).

To date, the qualification of senior high teachers in VSU-SHS is not a master's graduate in mathematics which do not meet the civil service commission standard for state and universities. With one of K-12 policy which is to comply with global standards, teachers' educational attainment should be improved, that is, the minimum requirement should be master's degree in education major in mathematics. Teachers should provide appropriate modules, or any references for further reading suitable for 21st century learners.

Follow-up sets of exercises should be given for library work to enhance learned skills in the classroom. Teachers should ensure that their students must have the proper setting of priorities over studying and physical activities. The school must also provide educational social activities so that students can build connections and interacts between other students. The school as well may provide a scholarship program to support those students whose parents are earning a minimum wage.

It is recommended that similar study should be conducted in any university offering senior high school with larger sample size to better understand the students' happiness in learning. A periodic evaluation of happiness can help the teachers and students improve the effectiveness of the teaching-learning process. Teachers must initiate developments to mathematics curriculum, and come up with new relevant strategies to improve the well-being of students. For future research direction, an empirical analysis on economics of happiness in teaching should be conducted to understand the teachers' side of well-being and to support the findings of the current study.

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