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Research article

Students' Motivation and Intention Towards Learning Mathematics and Mathematics Performance: Analysis with Their Preferred Track in the Senior High During the Grade 11 in the K-12 Implementation

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Abstract

This research study presents analyses on the students' motivation and intention towards learning Mathematics, Mathematics performance and students' preferred track in the senior high during the first batch of the K-12 implementation. The respondents of this research study were the 276 third-year high school students from University of San Carlos – North Campus. This batch of students will be the first batch to enrol the grade 11 in the senior high school during the school year 2016 – 2017. The findings revealed the following: a) Mathematics performance has ***no relationship*** between the students' perception on the idea that their friends think that Mathematics is a worthwhile class and students' intention to continue taking Mathematics classes; b) Mathematics performance has ***low correlation*** between the students' attitude towards doing Mathematics and students' perception on their ability to do Mathematics; c) The preferred track in the senior high is ***independent*** from the students' perception on the idea that their friends think that Mathematics is a worthwhile class and students' intention to continue taking Mathematics classes; d) the preferred track in the senior high is ***dependent*** from students' attitude towards doing Mathematics and students' perception on their ability to do Mathematics; e) The students who preferred STEM have ***higher*** Mathematics grade than those who prefer Arts and Design, General Academic, and Humanities and Social Sciences; and f) The students who prefer ABM have ***higher*** Mathematics grades than those who prefer Arts and Design.

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I. INTRODUCTION

Each of the universally recognized components of attitudes – interest, enjoyment, motivation to learn, confidence, anxiety, and task value – has been acknowledged in research as significant to success in learning (Nisbet & Williams). Woolfolk and Margetts (2007) point out that students' interest in, enjoyment and excitement about what they are learning is one of the most important factors in education. They also point out that when students' motivation levels are increased, they are more likely to find academic tasks meaningful.

Motivation is perceived as a pre-requisite of and an indispensable component for student engagement in learning (Saeed & Zyngier, 2012). Saeed and Zyngier (2012) also cited that, student engagement in learning is not only an end in itself but it is also a means to the end of students achieving sound academic outcomes. This is important because authentic engagement may lead to higher academic achievement throughout student life (Zyngier, 2008).Newmann (1992) posited that engaged students make a psychological investment in learning. And that these student try hard to learn what school offers. Students take pride not simply in earning the formal indicators of success (grades for example), but in understanding the material and incorporating or internalizing it in their lives.

The nature of the link between attitudes and learning has been described by Ajzen&Fishbein (2000) in their 'theory of personal action' which states that attitudes influence intentions, which in turn influence behavior. Behavior then leads to personal experiences which in turn have an effect on attitudes.

Indeed, research over many years has established that attitudes play a significant role in learning Mathematics (Zan, Brown, Evans &Hannula, 2006). McLeod (1992) accounts that student confidence correlates positively with achievement in mathematics, and that the relationship is quite strong. Overall, therefore, there is clear evidence to show that attitudes are integrally linked to learning and achievement, including mathematics learning and achievement (Nisbet & Williams).

This paper's significance is that it proposes to analyze the association of students' motivation an intention towards learning Mathematics, Mathematics performance. And in the light of the K-12 implementation, these variables are also associated with the preferred track when the students will enrol grade 11.

II. OBJECTIVES

This study aimed to establish association of the students' motivation intention towards learning Mathematics, Mathematics performance and preferred track in the grade 11 during K-12 implementation. Specifically, this study aimed to:

1) Establish students' motivation and intention towards learning Mathematics;
2) Show association between students' motivation and students' intention towards learning Mathematics;
3) Difference in the students' motivation and intention towards learning mathematics according to:
    a. Gender;
    b. Location of residence; and
    c. Preferred track in grade 11 during the K-12 implementation.
4) Establish difference in the Mathematics performance according to their preferred track in the grade 11 during K-12 implementation;
5) Show association between Mathematics performance and students' motivation and intention towards learning Mathematics;

III. METHODOLOGY

This methodology employed of this research study is discussed in the subsections below:

A. Research Design

This study conducted survey methodology to investigate students' motivation and intention towards learning mathematics. Then employing quantitative approach from a descriptive perspective. A correlation approach was adapted to show relationship between the following: a) students' motivation and students' intention towards learning Mathematics; b) Mathematics performance and students' motivation and intention towards learning mathematics and c) preferred track in the senior high school and students' motivation and intention towards learning mathematics.

B. Sample and Settings

This study was conducted at the Basic Education Department – North Campus (BED-NC), University of San Carlos, a privately owned University located in Cebu City, during 4th quarter of the school year 2014 – 2015. The BED-NC had pioneered the operation of the grade 11 and grade 12 Tech-Voc track in Visayas. This serves an experimental batch with thirtyeight (38) scholar students sponsored by the University.

There were three sets of respondents in this research study: 1) teachers handling secondary mathematics at BED-NC – they validated the content the questionnaire. The revision of the questionnaire was made based on their comments/questions/suggestion; 2) three (3) randomly selected third-year high school students from the BED-NC – they validated the readability of the research questionnaire; and 3) the third-year high school students of BED-NC – the respondents of the research study. This batch is the first official batch to enrol the grade 11 in the K-12 implementation.

C. Measures

The survey questionnaire was composed of the following parts: 1) Part I presented the demographic data of the student respondents and the preferred course to take up in college; 2) Part II determined the students' motivation and intention towards learning Mathematics – which was adapted from the proposed questionnaire by Caldwell (2012).While the over-all Mathematics grade of the respondents was obtained from the Registrar's Office at the BED-NC.

D. Data-Gathering Procedure

This research study underwent the following data-gathering procedures:

Validation of the Research Questionnaire – The proposed questionnaire by Caldwell (2012) was adapted and scrutinized to fit in Mathematics. After the revision, it was presented to the secondary Mathematics teachers from the BED-NC to validate the content of the questionnaire. They made certain revision emphasizing the appropriateness for the secondary level Mathematics students. The revision was then made and finalized through the guidance of their comments, questions, and suggestions. Then the revised questionnaire was pilot tested to three (3) third-year high school students from the BED-NC to test its readability. Then, minor revisions were made based on the observations during the pilot testing.

Data Gathering – The third-year students, excluding the students selected for pilot testing, were asked to answer the survey questionnaire during their Mathematics class inside their classroom. The Mathematics teacher read the Part II questions to the students and gave a bit of explanation to every item to ensure that each student answers the questions accordingly. The data on Mathematics grade were also gathered from the Registrar's office to ensure official and accurate data.

Data Analysis – The data were tabulated and computed using both MegaStat and SPSS to ensure similar results prior to making interpretations.

IV. RESULTS AND DISCUSSIONS

The following findings were based on the result of the statistical and analytical analysis of various data:

A. Students' Motivation and Intention Towards Learning Mathematics

Table 1: Students' Motivation and Intention Towards Learning Mathematics

Variables	SA	A	U	D	SD	Wx	Description
Attitude Towards Doing Math	81	252	191	28	5	3.7	Agree
Perception of One's Peer	22	129	268	112	16	3.1	Undecided
Perceived Ability to Do Math	77	224	189	63	6	3.5	Agree
Intention to Continue Taking Math Classes	81	189	177	62	45	3.4	Undecided

Table 1 shows the students' motivation and intention towards learning Mathematics. The table reflects the following weighted means: a) 3.7 (agree), which means that the students have a ***positiveattitude*** towards doing Mathematics. This implies that they feel good about going to Mathematics lessons and enjoy them; b) 3.1 (undecided), which means that the students were ***undecided*** on the idea if their friends think that Mathematics is a worthwhile class; c) 3.5 (agree), which means the students have a ***positiveopinion*** towards their ability in doing Mathematics. This implies that they can do Mathematics homework and participate in Mathematics lessons; and d) 3.4 (undecided), which means that the students were ***undecided*** on the idea of looking forward to another Mathematics lessons next year.

Motivation towards learning about a subject and towards learning in general can strongly influence student intentions to choose that subject and even how well that student may perform (Caldwell, 2012).

In understanding student motivations toward learning, Pintrich (2003) distinguished between what students want and what motivates students in the classroom, suggesting that an important factor is whether students care about or think the task is important in some way. More recently, Krapp and Prenzel, (2010) and Prendergast (2011) focused on the concept of interest and asked how can interest in science be generated and maintained? They suggest that interest can be considered as an 'affective variable' and an interest that is primarily caused by external factors can be called a 'situational interest'.

Table 2: Correlation Among Students' Motivation and Intention Towards Learning Mathematics

Variables		r	r^2
Attitude Towards Doing Math	Perception of One's Peer	0.017	0.000
	Perceived Ability to Do Math	0.516	0.266
	Intention to Continue Taking Math Classes	0.621	0.385
Perception of One's Peer	Perceived Ability to Do Math	0.085	0.007
	Intention to Continue Taking Math Classes	0.098	0.010
Perceived Ability to Do Math	Intention to Continue Taking Math Classes	0.505	0.255

Table 2 shows the correlation among the students' motivation and intention towards learning Mathematics. The table reflects the following: a) ***no relationship*** between "attitude towards doing Math" and "perception of one's peer" – 0.017, "perception of one's peer" and "perceived ability to math" – 0.085, and "perception of one's peer" and "intention to continue taking Math classes" – 0.098; b) ***moderate relationship*** between "attitude towards doing Math" and "perceived ability to do math" – 0.516 and "perceived ability to do math" and "intention to continue taking Math classes" – 0.505; and c) ***moderately high relationship*** between "attitude towards doing Math" and "intention to continue taking Math classes" – 0.621.

Table 3: Difference on Students' Motivation and Intention Towards Learning Mathematics, According to Gender

Variables	Gender	Wx	Description	chi-square	df	p-value	Remarks
Attitude Towards Doing Math	Female	3.6	Agree	13.24	4	0.0102	Significant
	Male	3.7	Agree				
Perception of One's Peer	Female	3.0	Undecided	2.23	4	0.6926	Not Significant
	Male	3.1	Undecided				
Perceived Ability to Do Math	Female	3.5	Agree	3.29	4	0.5108	Not Significant
	Male	3.6	Agree				
Intention to Continue Taking Math Classes	Female	3.2	Undecided	11.1	4	0.0255	Significant
	Male	3.5	Agree				

Table 3 shows the difference among the students' motivation and intention towards learning mathematics, according to gender. At 5% level of significance, the table reflects the following: a) there is ***a significant difference*** between the male and the females' "attitude towards doing Mathematics" and "intention to continue taking Math classes"; and b) there is a ***no significant difference*** between the male and the females' perception on their friends thinking that Mathematics is a worthwhile class and their perceived ability to do Mathematics. This implies that the males (3.7) have a ***higherrating*** than the female (3.0) on their attitude towards doing Mathematics. Also, males (3.5) have a ***higherlevel of intention*** than the females (3.5) to continue taking Math classes.

If the student's attitude towards learning science is good/positive then it is likely that they will feel good about going to science lessons and subsequently enjoy those lessons (Caldwell, 2012).

Peer pressure is a significant factor when trying to understand behaviour. If the student's friends/peers think that science is worthwhile and most of their friends/peers are enrolled in a science subject, then it is also likely that the student's perceptions of science will be mediated through this group's opinion (Caldwell, 2012).

Table 4: Test of Independence Between Students' Motivation and Intention Towards Learning Mathematics and Location of Residence

Variables	Residence	Wx	Description	chi-square	df	p-value	Remarks
Attitude Towards Doing Math	Cebu	3.7	Agree	23.54	16	0.1001	Not Significant
	Mandaue	3.3	Undecided				
	Lapu-lapu	3.5	Agree				
	Talisay	3.2	Undecided				
	Others	3.9	Agree				
Perception of One's Peer	Cebu	3.0	Undecided	12.35	16	0.6767	Not Significant
	Mandaue	3.1	Undecided				
	Lapu-lapu	3.5	Agree				
	Talisay	2.8	Undecided				
	Others	3.1	Undecided				
Perceived Ability to Do Math	Cebu	3.6	Agree	22.02	16	0.1424	Not Significant
	Mandaue	3.1	Undecided				
	Lapu-lapu	3.7	Agree				
	Talisay	3.2	Undecided				

	Others	3.6	Agree				
Intention to Continue Taking Math Classes	Cebu	3.4	Undecided	25.3	16	0.0648	Not Significant
	Mandaue	2.9	Undecided				
	Lapu-lapu	3.3	Undecided				
	Talisay	3.2	Undecided				
	Others	3.6	Agree				

Table 4 shows the relationship between the students' motivation and intention towards learning mathematics and location of residence. At 5% level of significance, the table reflects that there is ***no significant relationship between*** the location of residence and the following: a) attitude towards doing Mathematics – 0.1001; b) perception of one's peer – 0.6767; c) perceived ability to do Mathematics; and d) intention to continue taking Mathematics – 0.0648. This implies that the students' motivation and intentions towards learning Mathematics is ***independent*** from its location of residence.

Table 5: Test of Independence Between Students' Motivation and Intention Towards Learning Mathematics and Preferred Track in the Senior High

Variables	Course	Wx	Description	chi-square	df	p-value	Remarks
Attitude Towards Doing Math	Tech-Voc	3.8	Agree	55.29	20	3.72E-05	Significant
	Arts & Design	3.6	Agree				
	ABM	3.8	Agree				
	HUMSS	3.1	Undecided				
	STEM	3.7	Agree				
	Gen. Acad.	3.6	Agree				
Perception of One's Peer	Tech-Voc	2.9	Undecided	24.77	20	0.2106	Not Significant
	Arts & Design	2.6	Disagree				
	ABM	2.8	Undecided				
	HUMSS	3.0	Undecided				
	STEM	3.2	Undecided				
	Gen. Acad.	3.1	Undecided				
Perceived Ability to Do Math	Tech-Voc	3.4	Undecided	100.67	20	9.57E-13	Significant
	Arts & Design	3.2	Undecided				
	ABM	3.5	Agree				
	HUMSS	3.0	Undecided				
	STEM	3.5	Agree				
	Gen. Acad.	3.6	Agree				
Intention to Continue Taking Math Classes	Tech-Voc	3.1	Undecided	16.16	20	0.7064	Not Significant
	Arts & Design	2.9	Undecided				
	ABM	3.5	Agree				
	HUMSS	2.9	Undecided				
	STEM	3.4	Undecided				
	Gen. Acad.	3.4	Undecided				

Table 5 shows the relationship between the students' motivation and intention towards learning mathematics and preferred track in the senior high. At 5% level of significance, the table reflects that there is ***no significant relationship between*** the preferred track in the senior high and the following: a) perception of one's peer – 0.2106; and b) intention to continue taking Mathematics classes – 0.7064. This implies that the preferred track in

the senior high is ***independent*** from student's perception of one's peer and intention to continue taking Mathematics classes.

In addition, the table reflects that there is ***a significant relationship between*** the preferred track in the senior high and the following: a) attitude towards doing Mathematics – 3.72E-05; and b) perceived ability to do Mathematics – 9.57E-13. This implies that the preferred track in the senior high is ***dependent*** from attitude towards doing Mathematics and perceived ability to do Mathematics.

B. Students' Mathematics Performance

Table 6: Difference Among the Math Grades of Students Grouped According to their Preferred Track in the Senior High

Courses	Mean	n	Std. Dev	F	p-value	Remarks
TV	80.4	20	4.28	3.49	0.0046	Significant
AD	76.0	4	2.45			
ABM	81.3	37	3.68			
HUMSS	80.3	27	4.00			
STEM	82.1	101	4.39			
GenA	79.8	41	3.83			

Table 6 shows the difference among the Mathematics grades of the students grouped according to their preferred track in the senior high. At 5% level of significance, the table reflects a p-value of 0.0046. This means that there is ***a significant difference*** among the grades of the students. With this, the next Table 6-a reflects the p-values of the pairwise t-test in order to establish where the difference lie.

Table 6-a: Pairwise t-test to Establish Where the Difference Lie

		p-values	Remarks
STEM	AD	0.0042	Significant
	Gen A	0.0034	Significant
	HUMSS	0.0488	Significant
	TV	0.1003	Not Significant
	ABM	0.3528	Not Significant
AD	Gen A	0.0784	Not Significant
	HUMSS	0.0522	Not Significant
	TV	0.0518	Not Significant
	ABM	0.0146	Significant
Gen A	HUMSS	0.6298	Not Significant
	TV	0.5959	Not Significant
	ABM	0.1043	Not Significant
HUMSS	TV	0.9319	Not Significant
	ABM	0.3239	Not

			Significant
TV	ABM	0.4184	Not Significant

At 5% level of significance, Tables 6-a showed that there is ***no significant difference*** between the following: a) STEM and the following: Tech-Voc – 0.1003; and ABM – 0.3528; b) Arts and Design and the following: General Academic – 0.0784; Humanities and Social Sciences – 0.0522; and Tech-Voc – 0.0518; c) General Academic and the following: Humanities and Social Sciences – 0.6298; Tech-Voc – 0.5959; and ABM – 0.1043; d) Humanities and Social Sciences and the following: Tech-Voc – 0.9319; and ABM – 0.3239; and e) Tech-Voc and ABM – 0.4184.

On the other hand, there is ***a significant difference*** between the following: a) STEM and the following: Arts and Design – 0.0042; General Academic – 0.0034; and Humanities and Social Sciences – 0.0488; and b) Arts and Design and ABM – 0.0146. This implies that the students who preferred STEM (82.1) have higher Mathematics grade than those who prefer Arts and Design (76.0), General Academic (79.8), and Humanities and Social Sciences (80.3). Also, students who prefer ABM (81.3) have higher Mathematics grades than those who prefer Arts and Design (76.0).

Table 7: Correlation Between Math Grades and Students' Motivation and Intention Towards Learning Mathematics

Dep. Variable	Ind. Variable	r^2	r
Math Grade	Attitude Towards Doing Math	0.061	0.247
	Perception of One's Peer	0.000	0.009
	Perceived Ability to Do Math	0.11	0.332
	Intention to Continue Taking Math Classes	0.028	0.167

Table 7 shows the correlation between the students' motivation and intention towards learning Mathematics and their Mathematics grades. As reflected on the table, Mathematics grades has: a) ***no relationship*** between perception of one's peer (0.009) and intention to continue taking Mathematics classes (0.167); and b) ***low correlation*** between attitude towards doing Mathematics (0.247) and perceived ability to do Mathematics (0.332)

Students are interested in all sorts of activities external to the school environment. Their daily environment offers many cognitively stimulating activities in many contexts that may lead to a 'situational interest'. The TPB may be of some value in this respect when used in the educational context. Given that students' historical learning experiences can affect engagement and motivation with a subject (Ainley and Ainley, 2011).

If student motivation towards science lessons is positive, then it is at least conceivable that their attitude and subsequent intentions towards the subject will also be positive (Caldwell, 2012). Caldwell (2102) suggests that, using the TPB model as a framework, the intention to engage in science is affected by '*attitudes towards doing science*' which is impacted by the *perception of one's peers* towards engaging in science (subjective norms) and the student's *perceived ability to do science* (perceived behavioural control). Accordingly, motivation could be thought of as a combination of these three factors.

If the student's perceived ability to perform well in science is good/positive then it is likely that they will feel enabled to participate effectively in science lessons and that they can complete their homework assignments (Caldwell, 2012).

If the student's intention is to continue to take science classes both now and in the next year, then it is suggested that the combined effect of all the categories, including this one, will contribute to understanding student motivation towards science (Caldwell, 2012).

In a research study of Saeed and Zyngier (2012), the researchers cited that copious research studies have revealed that intrinsically motivated students have higher achievement levels, lower levels of anxiety and higher perceptions of competence and engagement in learning than students who are not intrinsically motivated. There is a positive correlation between intrinsic motivation and academic achievement (Saeed & Zyngier, 2012).

V. CONCLUSIONS

Based on the findings of this study, the following conclusions are derived:

1) The students have a ***positiveattitude*** towards doing Mathematics but were ***undecided*** on the idea if their friends think that Mathematics is a worthwhile class. They have a ***positiveopinion*** towards their ability in doing Mathematics but were ***undecided*** on the idea of looking forward to another Mathematics lessons next year.
2) There is ***no relationship*** between the following: a) attitude towards doing Math and perception of one's peer; b) perception of one's peer and perceived ability to math; and c) perception of one's peer and intention to continue taking Math classes.
3) There is a ***moderate relationship*** between the following: a) attitude towards doing Math and perceived ability to do math; and b) perceived ability to do math and intention to continue taking Math classes.
4) There is a ***moderately high relationship*** between attitude towards doing Math and intention to continue taking Math classes.
5) The males have a ***higherrating*** than the female on their attitude towards doing Mathematics. Also, males have a ***higherlevel of intention*** than the females to continue taking Math classes.
6) The students' motivation and intentions towards learning Mathematics is ***independent*** from its location of residence.
7) The preferred track in the senior high is ***independent*** from the students' perception of one's peer and intention to continue taking Mathematics classes, but ***dependent*** from attitude towards doing Mathematics and perceived ability to do Mathematics.
8) The students who preferred STEM have higher Mathematics grade than those who prefer Arts and Design, General Academic, and Humanities and Social Sciences. Also, students who prefer ABM have higher Mathematics grades than those who prefer Arts and Design.
9) Mathematics grades ***no relationship*** with students' perception of one's peer, students' intention to continue taking Mathematics classes, and ***low correlation*** with students' attitude towards doing Mathematics and students' perceived ability to do Mathematics.

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