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Computational Skills of Non-Mathematics Major Students: Basis for Enhanced Mathematical Intervention

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Abstract
Mathematics concept, forms as foundation to any field of specialization, providing avenue for critical thinking and logical reasoning. The authors of this study investigated the computational skills of non-math identified using cluster sampling. Data were gathered by means of a standardized questionnaire and classroom observations. Based on the findings, the result reveals that the respondents from technology students (BSIT and BSHRM) were poor in the manipulative skills while respondents from teacher Education students (BSHTE) whose average age is twenty-two (22) were good in manipulative skills. All respondents under survey resulted to poor performance on Combining-Like-Terms, Removal-Of-Grouping-Symbols and Substitution- Skills. The researchers concluded that computational skills of non-math major vary from courses, and from the average age of the respondents. Furthermore, poor performance may be attributed to their overdue duration of their learning in math, and could be associated with their non-interest on the survey because it is not a major part of their curriculum. Thus, the researchers recommend that instructors would formulate intervention to cater this less-develop majors in Palompon Institute of Technology- Tabango Campus. Descriptive research design was utilized in obtaining the needed information from the fifty-five (55) first year students' respondents' skill of the non-math students.

Keywords: mathematical manipulation, less-develop skills, poor performance, Tabango, Leyte, Philippines.

Introduction

Learning mathematics in different ways particularly among learners that are non-mathematically inclined is more challenging in the teaching process. Mathematics instruction in past is still remains important as of today. However, strategies vary from one learner to the other. It is important to note among mathematics teachers that conceptual understanding is very important for the students to understand and develop mathematics computational skills. The National Council for Mathematics Teachers emphasized that students should be allowed to solve problems in a ways that make sense to them. However, the quality of teaching and learning mathematics has been one of the major challenges and concerns of educators. Computational skills in math are fundamental in our daily activities but many mathematics teachers failed to contextual their mathematical instructions in transmitting the mathematical concepts to the learners. Mathematics is a precise discipline; however, teachers occasionally do not realize that a

slight deviation in language can render the content erroneous. Teachers should use instructional language with care (Molina, 2014).

Inappropriate pedagogy in teaching particularly in teaching mathematics could promote misconceptions and mathematics anxiety resulting to poor performance of the students in math. According to Aschcraft and Moore (2009), students with higher anxiety in math performed poorly in math and tend to develop negative attitudes towards math including the intent to take further math courses. Boaler (2002) and Beilock (2008) cited by Siebers (2015) said that math anxiety exists due to the method behind instructions used by the teachers as well as the assessment given to the learners.

Teaching methods greatly influence students' attitudes and ability in learning mathematical concepts. Ynus & Ali (2009) cited three most common types of teaching methods that usually improve students' academic performance. These methods include direct instruction, facilitative method and coaching method. Using different teaching methods also implied structuring the classroom into different learning environment including individualized activity to cooperative learning activity.

Turner et al. (2002) pointed out many students particularly non-mathematics major tends to avoid mathematic subjects or repeatedly take mathematic subjects. They said that the avoidance was typically due student's behaviour in response to the teachers teaching styles in math that is unsupportive to the students learning style preference. This scenario makes the non-Mathematics major to thinks that math is difficult. They did not choose math as their specialization because they are afraid in dealing numbers and in terms of computation they experience that it is difficult, exhausting because there are lots of formulas to be memorized and there are lots of rules to be followed, sometime it's easy and sometimes it's difficult, it is challenging yet interesting, they get easily bored specially when they don't know what to do and by that experiences that non-mathematics major encountered the researchers want to help them. Mathematics doesn't mean all about computation because math is everywhere.

However, if the teacher in mathematics successfully and effectively transmits the mathematic concepts to the students promoting conceptual understanding, via different ways, different context, explorative connecting multiple concepts, then learners becomes responsive and participative. Giving different learning opportunities to the learners is a crucial role and responsibility of the teacher in the classroom (Chadwick, 2009).

Much of the problems of failure of students in mathematics, particularly at the elementary level are due to lack of their mastery of the basic arithmetical operations of additions, subtraction, multiplication, and division. To assist students in learning mathematical concepts easier, instructional materials must be properly provided such us textbooks, supplementary material and manipulative (National Research Council, 2001).

Moreover, National Research Council (2014) emphasized different ways for effective teaching. They said that to teach effectively in math, teachers used evidence of student thinking toward mathematical understanding and adjust their instruction according to the level and pace of the learners and at the same time find support that extend the learning. Building fluency with mathematical concepts and procedures is also necessary in developing conceptual understanding of the students making them become skilful in mathematical manipulations. Teachers should be abundance of instructional decisions that promote effective learning environment for mathematics (Artzt, A. F., Armour-Thomas, E., & Curcio, F. R. (2008).

Other reasons for poor performance of students in mathematics particularly non-mathematics major is the inadequate understanding by most classroom teachers on the learning difficulties of their students. Mathematical instructions should focus conceptual understanding before dealing with different algorithms. Both teachers and students need to develop a conceptual understanding of math (Molina, 2014). Furthermore, Molina (2014) also added that another tradition in math teaching aside on focus of algorithms is the shortcut method. He said that using algorithms and shortcut in teaching math is not very bad; however, teachers should ensure first that conceptual understanding is clearly embedded in the mathematics instructions. Mastery of the concept will able to lead the students to different mathematical manipulations.

The guidelines of the National Council of Teacher of Mathematics (NCTM, 1991) highlighted the importance of building connections between mathematics and students' personal lives and cultures. Rosa (2000) affirmed that practical problems that reflect and profoundly linked to the daily lives of students promote effective learning. Bridging connections between academic and the real world in classroom activities promote higher conceptual understanding (Rosa, M., 2010). Alternative methods of teaching and conceiving mathematical problem solving, students can clearly understand the concepts taught to them. Teachers also could appreciate the efforts of the students and understand how students think and manipulate mathematical problems (Carraher, D.W. & Schliemann, A.D., 2002).

Investigating the basic arithmetic skills particularly among non-mathematics students is the primary concerned of the researchers in this study. Thus the researchers were motivated to conduct a research on finding out computational skills among the Non-Mathematics major Students of Palompon Institute of Technology –Tabango Campus (PIT-TC).

Statement of the Problem

Investigating the Computational Skills of Non-Mathematics Major Students was the main objective of the study. Specifically, it aimed to identify respondent's computational skills such as the manipulative skills in the combining like terms, equating parenthesis, and substitution skills. The findings of this study will the Basis for Enhanced Mathematical Intervention in the school.

Significance of the Study

This study showed significant contributions to mathematics educators, curriculum makers, students and all other institutional stakeholders providing insights and feedbacks on the computational skills of the students that are non-mathematics major.

Method

Research Design of the Study

This descriptive research aimed to gather information regarding the profile of the Respondents and to determine the descriptor of their computational skills. Data gathered were analyzed quantitatively using statistical software wherein the conclusions and recommendations were derived.

Research Locale and Respondents of the Study

The study was conducted at Palompon Institute of Technology-Tabango Campus school year 2016-2017 involving non-mathematics first year college students. Universal sampling was used in determining the respondents for the research.

Research Instruments
Survey questionnaire with two parts was the primary instruments used by the researchers in the data gathering. Part 1 of the questionnaire dealt on the personal profile of the respondents while the second part (Part 2) dealt on the computational skills of the respondents in mathematics. The researchers also performed actual observation as the secondary instrument to verify and triangulate the information.

Collection of Data
The researchers personally gathered data collection. However, prior to the collection of data letter request asking permission and approval to conduct the study in Palompon Institute of Technology was properly observed. After obtaining the necessary permit, the researchers oriented the target participants about the research and at the same time established rapport with them. The researchers also assured ethical consideration and observance of intellectual property to the respondents by keeping all the gathered information with utmost confidentiality. Moving on the next steps, the researcher administered the survey questionnaire to the respondents. The respondents were given one hour only in answering the survey questionnaire.

Treatment of Data
Data gathered were analyzed using descriptive statistics in order to identify proportions. Mean was used to determine the general weighted average of the computational skills and the profile of the students.

Statistical Findings
Table 1 and Table 2 presents the statistical computations of the gathered data.

Table 1: Average of Age and Percentage of Gender

COURSE	**AVERAGE**			**PERCENTAGE**	
	AGE	**SEX**			
		MALE	**FEMALE**	**MALE**	**FEMALE**
BSIT	18	7	0	33.3%	0%
BSHRM	19	3	12	14.3%	35.3%
BSHTE	22	11	22	52.4%	64.7%
TOTAL		21	34	100%	100%

Table 1 shows the average of age and the percentage of gender of the respondents. As shown from the table, the average age of BSIT students were eighteen (18) and the total male respondents were seven (7) or thirty-three point three percent (33.3%). The average age of BSHRM students were nineteen (19) and the total male respondents were three (3) or fourteen point three percent (14.3%) and the total female respondents were twelve (12) or thirty-five point three percent (35.3%). The average age of BSHTE students were twenty-two (22) and the total male respondents were eleven (11) or fifty-two point four percent (52.4%) and the total female respondents were twenty-two (22) or sixty-four point seven percent (64.7%).

Table 2: Average Description of Computational Skills

COURSE	COMPUTATIONAL SKILLS							
	MANIPULATIVE SKILLS		COMBINING LIKE TERMS		EQUATING PARENTHESIS		SUBSTITUTION SKILLS	
	Average Mean	**Description**	**Average Mean**	**Description**	**Average Mean**	**Description**	**Average Mean**	**Description**
BSIT	15.43	Poor	8.14	Poor	10.71	Poor	2.86	Poor
BSHRM	16.87	Poor	10.33	Poor	11.87	Poor	3.6	Poor
BSHTE	21.45	Good	14	Good	15.48	Good	4.61	Poor

Table 2 shows the description of computational skills of the respondents. As shown from the BSHTE students were "good" in manipulative skills, combining like terms, and equating parenthesis and they were "poor" in substitution skills. The BSIT and the BSHRM students were "poor" in manipulative skills, combining like terms, equating parenthesis and substitution skills.

Discussions

In this study, it was revealed that the average age of BSIT students were eighteen (18), the average age of BSHRM students were nineteen (19) and the average age of BSHTE students were twenty-two (22). On the aspect of the respondents computational skills in math, results showed (Table 2) that the BSIT and the BSHRM students were "poor" in manipulative skills, combining like terms skills, equating parenthesis skills and substitution skills while the BSHTE students were "good" in manipulative skills, combining like terms skills, equating parenthesis skills and they were "poor" in substitution skills. These findings implied that there is a need for remedial classes, intervention or coaching the students particularly the BSIT and BSHRM. These courses require much knowledge in math since the nature of their future job require mathematical manipulations. According to Molina (2014), teachers should help students make connections among concepts, particularly in the real-world problems. As such, the teacher in math should take their part seriously to improve their ways of teaching mathematics to the students. Molina (2014) said that one way of improving teaching is to maximize the instructions and utilize connections among mathematical concepts and ideas to the real-life experiences of the learners.

Moreover, contextualization of instruction is very important in teaching mathematics to ensure deeper understanding on the different mathematical concepts. The context provides the vehicle for discovering the concepts. Students are encouraged to learn when they sense that what they are learning is applicable to them. Using actual contexts and true issues that connect with the students' lives will make learning far richer. Experienced educators and instructional designers often say, "meet your learners where they are" through contextualization. Contextualization allows deeper understanding of concepts and promote higher-level of understanding and thinking (Chadwick, 2009). Thus, teacher must be resourceful and creative to design activities that are enthusiasm in mathematics teaching that encourage students to learn and study mathematics. Johnstone-Wilder & Lee, (2010), mentioned that mathematisation and contextualisation had potential contribution to students learning and valuing mathematics, thereby increasing their motivation to succeed.

Laistner (2016) stressed out that mathematical achievement depends on the knowledge the students has and the students' ability to use that knowledge. In the same manner, students

mathematical ability will depend on the teacher teaches the mathematical concepts. Laistner (2016) added that her research findings revealed that teaching students meta-cognitive strategies increase their mathematical achievements. Ferri (2012) pointed out that learning style of students affect how they individually learn mathematics. Molina (2014) also mentioned that in teaching mathematics, concepts must be emphasized first instead of algorithms and shortcuts to ensure that conceptual understanding is intensely entrenched.

Conclusions and Implication of the study

Based in the results, the researchers concluded that at the average age of 18 years old, BSIT students were "poor" in manipulative skills, combining like terms skills, equating parenthesis skills and substitution skills. At the average age of nineteen (19), BSHRM students, were "poor" in manipulative skills, combining like terms skills, equating parenthesis skills and substitution skills. At the average age of twenty-two (22), BSHTE students were "good" in manipulative skills, combining like terms skills, equating parenthesis skills and "poor" in substitution skills.

Despite of using interactive teaching techniques that would boost the interest of the students in mathematics, still many students that are non-mathematics major performed poorly in math. Their poor performance in math might due to teachers' failure in contextualizing the mathematical concepts giving applications to their daily lives activities and experiences. To promote conceptual understanding in math, real-world problem or application linked and connected in the teaching-learning process. Teaching using contextualization helps students recognize the purpose and skills development of the learners. Collaborations among teachers and students is necessary at varying level of activities to make teaching and learning more fun and effective.

Abrams, Taylor, & Guo (2013) challenge mathematics education to create relevant pedagogy as one way of supporting positive learning outcome of the learners particularly in mathematics. Recommendation posted by the researcher is further studies with more thorough exploration on computational skills could be conducted regarding this topic of interest. Furthermore, comparative study on the investigation of mathematical computational skills of both mathematics major and non-mathematics students to determine their significant difference.

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