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Correlation of numerical competence and senior high school readiness of grade 10 learners

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Abstract

Equipping learners with ample numerical skills will enable them to face the challenges of the industrialized society. Hence, an investigation was conducted on numeracy competence, related factors, and senior high school readiness via a correlational research approach among 291 Grade 10 learners officially registered in four secondary schools in the Province of Eastern Samar, Philippines, during the school year 2019-2020. The results revealed that most of the highly numerate respondents preferred the Academic track over the Technical, Vocational, and Livelihood track. Track preference and senior high school readiness were all found to correlate significantly with respondents' level of numeracy competence; hence a new framework is developed. Thus, it is recommended among teachers to employ strategies that will strengthen learners' numerical readiness in acquiring relevant and contextualized information pertinent to the school setting. The research findings offer a viable framework for teachers to experiment with different approaches to teaching numeracy to students to increase their learning involvement and positive attitude toward mathematics.

Keywords: *correlation, numeracy competence, readiness, senior high school, track preference*

Introduction

The Philippines, as a growing and competitive economy of the 21st century, looks forward to the preparation of a competitive Filipino workforce with knowledge and understanding of analytical and critical concepts through the delivery of quality education. However, according to Abramovich, Grinshpan, and Milligan (2019), the present status of quality improvement of mathematics education is a pressing issue for all educators and practitioners around the globe. Even and Ball (2010) noted that school authorities in several countries were under pressure to improve mathematics learning opportunities to provide for the future and prepare the next generation for a technologically advanced and dynamic society.

The Department of Education envisioned to produce competitive graduates through highly established educational standards, as indicated in Republic Act No. 9155 (R.A. No. 9155), also known as "the Governance of Basic Education Act of 2001". This act requires DepEd to "formulate national educational reforms to promote quality delivery of services and achieve basic education outcomes. In light of this, the Department of Education (DepEd) implemented Republic Act No. 10533 (R.A. No. 10533), also known as the K–12 Program, which aims to provide Filipino learners with skills and competencies that meet the demands of the modern era" (Official Gazette of the Republic of the Philippines, 2013, p.1). Despite its continuous improvement, the Philippine educational system assessment results gradually fall below the target. The latest PISA (2018) average score of Mathematics, Science, and the Reading result placed the Philippines 76th out of 77 countries.

Moreover, the country placed 77th out of 78 in countries' PISA (2018) Mathematics result. On the other hand, UNESCO (2015) reported that while National Achievement Test (NAT) and the Mean Percentage Scores (MPS) increased over the years, they remain below the 75% goal of the Philippine Educational Standard. Apart from that, Filipino learners rarely top international assessment. Evidently, in the 2008 Trends in International Mathematics and Science Study (TIMSS), Filipino learners got the 10th rank among ten countries in Advanced Mathematics (Castillo, 2012). While, in the 2003 TIMSS, the Philippines ranked 23rd out of 25 participating countries.

Most of the learners with difficulties in Mathematics fail to achieve the acceptable learners' numeracy competence (Bryant et al., 2008). As Maier (2003) predicted, many well-educated adults have the cognitive ability but lack the confidence to handle higher math, which was attributed to their poor numeracy competence. Hence, research conducted locally and internationally recommends using high-quality numeracy instruction to the learners to ensure mastery of these foundational skills such as analytical ability at an early age (Littlemore & Low, 2006). Interestingly, Dray et al. (2010) revealed that there is "still much needs to be done to sustain new learning so that students continue to develop the necessary number skills required for safe nursing practice" (p.94). This resulted in imposing numeracy competence as a prerequisite competency in 21st-century Mathematics learning to ensure well-founded learners in terms of numeracy competence, exhibiting analytical and critical ways to approach a problem with sound reasoning and creativity. This moved the researcher to examine carefully various constructs relevant in developing learners to become numeracy competent–geared with the power of computing to discover, innovate and solve problems in terms of academics or even in dealing with different scenarios in a real-life setting.

Hence, this study determined the track preference, level of numeracy competence, learners-related factors, and senior high school readiness among grade 10 students of selected secondary schools in Eastern Samar. Furthermore, it aimed to identify the relationship among the stated variables.

Objectives of the study

This research correlated the numeracy competence and senior high school readiness among Grade 10 learners of selected secondary schools in the four secondary schools in the province of Eastern Samar during the school year 2019-2020. Specifically, it sought answers to the following objectives:

1. Determine the respondents' preferred track in selected secondary schools in the schools' division of Eastern Samar;
2. Examine the level of numeracy competence of the respondents who preferred the following track;
    2.1 Academic; and
    2.2 Technical, Vocational and Livelihood;
3. Assess the extent of Senior High School readiness of the respondents in terms of
    3.1 Academic Readiness;
    3.2 Emotional Readiness; and
    3.3 Social Skills/Readiness;
4. Determine the relationship between the respondents' level of numeracy competence and their preferred track;
5. Determine if there is a significant difference between the respondents' numeracy competencies who preferred Academic and Technical, Vocational and Livelihood (TVL) tracks; and
6. Determine the relationship between the respondents' level of numeracy competence and their extent of Senior High School readiness in terms of;
    6.1 Academic Readiness;
    6.2 Emotional Readiness; and
    6.3 Social Skills/Readiness.

Conceptual framework of the study

The reviewed literature has shown the areas of a student's life that affect his plans, decisions, and career choice: numeracy competence and level of readiness. The present study attempted to examine how these variables work with each other.

The researcher examined the learners' extent of readiness to partake in senior high

school education in terms of academic readiness, emotional readiness, and acquired social skills. The first box represented the predictive variable, specifically the extent of learners' readiness to partake in senior high school in terms of; (1) academic readiness, (2) emotional readiness, and (3) social readiness. The second box represented the criterion variable, which includes numeracy competence among grade 11 learners as per the study results in four preferred secondary schools in the first and second districts in the municipality of Dolores, province of Eastern Samar.

Moreover, the researcher directed this study in establishing a relationship between learners' numeracy competence and level of senior high school readiness and related factors, respectively, since most literature proposed that these demographics are related to the numeracy competence and readiness of the learners.

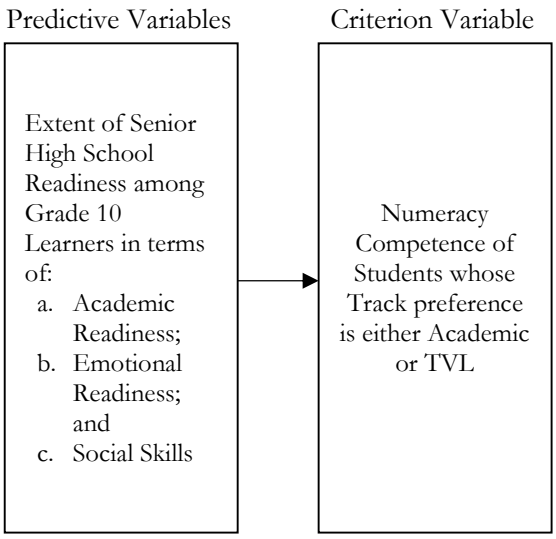

Figure 1. Conceptual paradigm of the study

Methodology

Research design

This correlational study determined the factors associated with the numeracy competence among Grade 10 learners in the four selected secondary schools at the first and second districts of the Municipality of Dolores, namely, Dolores National High School (DNHS), Dapdap National Technical Vocational High School (DNTVHS), Hinolaso National High School (HNHS) and Hilabaan National High School (HNHS), during the school year 2019-2020 using adopted research instruments.

Furthermore, this research method aims to show if there is a significant relationship between and among the variables (Best & Khan, 2013). Moreover, this study determined how track preferences and senior high school readiness influence the numeracy competence of Grade 10 learners in selected four secondary schools in the schools' division of Eastern Samar.

Respondents of the study and sampling method

With the total population of 1163 Grade ten learners, the sample size of 291 was determined based on the Krejcie and Morgan Table. The sample size of Dolores National High School is 187 or 64%; followed by Dapdap National Technical Vocational High School with a sample size of 37 or 13%, while Hilabaan National High School is 35 or 12% and Hinolaso National High School has 32 or 11% sample size as distributed equally using the Kreijcie and Morgan approach in determining sample.

This study involved randomly selected Grade 10 learners who are (1) currently registered during the school year 2019-2020, and (2) has plans to enroll in the Senior High School Program for Grade 11 and 12 after completing Junior High School education, which is the proposed inclusive period of the study.

Research instrument

The researcher used two sets of instruments; (1) Participants' track preference, readiness to partake in Senior High School, and assessment of related factors, and (2) an adopted 12-item numeracy tool.

The first part of the first instrument is a checklist requiring the participants to provide their socio-demographic characteristics regarding age, gender, average family income, preferred track, and location. The second part collected participants' senior high school readiness using a 15-item checklist-based questionnaire grouped into academic (1-5), emotional (6-10), and social (11-15) skills readiness to be responded using a 5-point

Likert scale, which was adopted from Cuy and Salinas (2019). The third part required learners to assess the related factors' impact on their numeracy competence regarding the parent, home, learner, and teacher factors rated using a 5 – point Likert scale, an adopted instrument from Villalon (2019). The second instrument is an adopted 12-item numeracy tool from the Department of Education regional office, made and validated via regional memorandum 279, series of 2019. The instrument aimed to measure learners' competencies on the four fundamental operations in mathematics (addition, subtraction, division, and multiplication). It was solely designed to determine the mastery level of the learners on the four fundamental operations, 1 minute per item. These materials have undergone content validation among teachers in a non-participating school for language use and the instrument's structure. Furthermore, a total Cronbach alpha value of 0.74 was computed, signifying that the whole research instrument is valid.

Data gathering procedure

The data gathering was conducted in two ways: survey questionnaires to the learners and administering the numeracy test to the four selected secondary schools. The data gathering proceeded after the compliance of all the requisite permission from concerned government agencies. Initially, the researcher sought permission to conduct the study from the Dean of the Graduate Studies of Eastern Samar State University, Borongan City, through a letter of request. Another letter addressed to the Schools Division Superintendent of the Schools Division of Eastern Samar, Department of Education (DepEd), Region VIII, was secured when the said approval was given. Upon the acceptance of the approval by the Schools Division Superintendent of the Schools Division of Eastern Samar, several letters addressed to the Secondary School Principals of the three selected schools were sent for their approval of the study. Only upon their consent was the survey conducted among the 291 participants.

Data analysis

The data were tabulated, organized, analyzed, and interpreted using descriptive tools such as frequency count, percentage, and median to determine the respondents' preferred track, numerical, and perceived senior high school readiness. Furthermore, the correlational statistical tools, namely, Spearman's Rank Correlation, Mann-Whitney U-test, and Pearson Product Moment of Correlation, were used to establish relationships and significant differences on the variables at 0.05 alpha level.

Ethical considerations

For ethical consideration, the confidentiality of the research outputs was placed in anonymity, and that the respondents were informed on the purpose of the data gathering. The giving of rewards was employed to avoid instances where learners will withdraw from the research and that no force was made to compel them to participate.

Results and discussion

Respondents' preferred track in selected secondary schools in the schools division of Eastern Samar

Table 1. Respondents' preferred track in selected secondary schools in the schools' division of Eastern Samar

Preferred Track	Frequency	Percent
Academic	202	69.4
Technical, Vocational, and Livelihood	89	30.6
Total	**291**	**100**

Table 1 presents the Grade 10 learners' track preference in selected secondary schools in the schools division of Eastern Samar. Out of the 291 respondents, 202 (69.4%) preferred academic tracks, while 89 (30.6%) chose Technical, Vocational, and Livelihood tracks. The result indicates that most of the respondents plan to register on strands under academic track such as that of Science, Technology Engineering and Mathematics (STEM), Humanities and Social Science (HUMSS), Accountancy and Business Management (ABM), and the General Academic (G.A.) in the nearest secondary school offering senior high school program.

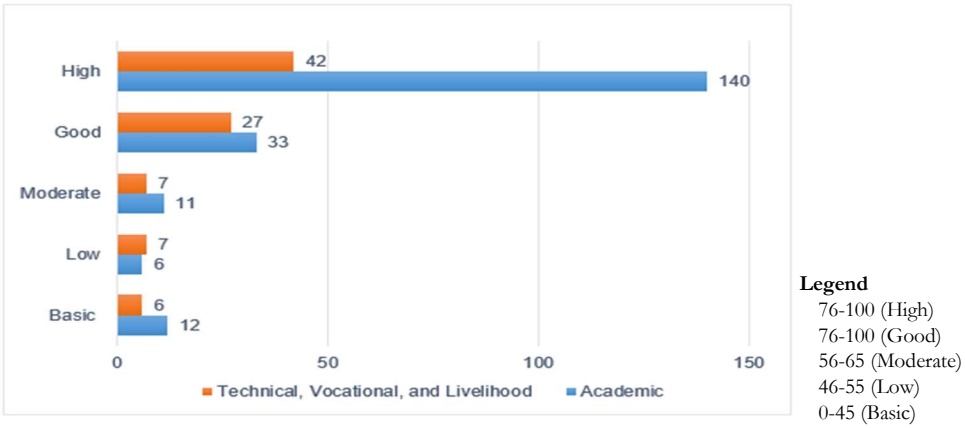

Figure 2. Level of numeracy competence of the respondents who preferred Academic,

The result is related to the findings on the meta-analysis conducted by Orale et al. (2016) on the status of K-12 Education in the Philippines, USA, and Japan which revealed that about six in every ten learners preferred the academic track, about four chosen TVL and very few went to Sports, Arts and Design track. A similar trend was observed from the 2016 enrolment report of the Department of Education of about 60.6% enrolled in the academic track and is slightly higher from the predicted senior high school academic track enrolment rate (49%) in the study of Lagajino et al. (2015) among incoming Grade 10 learners in the Adventist University of the Philippines.

The findings imply that the incoming Grade 10 student manifests the nature of career-oriented individuals who look forward to acquiring baccalaureate degrees from higher education after completing basic education, termed as diploma seekers (Kemboi et al., 2016; & Okabe, 2013). Considering that the research sites are located in some agricultural land in the province, it is quite surprising that the respondents preferred Academic over TVL tracks. This can be rooted in the limited resources available and is currently needed in some of the strands under TVL track (e.g., Home Economics) offered in the country, as mentioned by Uy and Martinez (2019) in their articles about problems on SHS track offerings in the country, such as that of resources and lack of highly qualified teachers with ample experience in the industry. Similarly, Orale and Sarmiento (2016) noted that some academic or TVL strands are not readily accessible in the town or barangay (village), necessitating travel to other towns or villages to achieve them. Hence, the teachers and school administrators should guide and help their learners choose the right and appropriate track.

Level of numeracy competence of the respondents who preferred Academic, or Technical, Vocational, and Livelihood tracks

Figure 2 shows a comparison of respondents' level of numeracy competence, specifically those who preferred either Academic or Technical, Vocational and Livelihood tracks. The analysis was made using simple frequency counts, and raw scores were categorized into the five levels of numeracy competency: Basic, Low, Moderate, Good, and High.

It can be gleaned from the figure that 140 respondents preferred the Academic track, and 42 respondents who chose the Technical, Vocational and Livelihood (TVL) track who showed a "High" level of numeracy competence. While, there are only six (6) respondents who showed a "Basic" level of numeracy competence, which is half the number of respondents who preferred the Academic track. Generally, the result shows that the majority of the respondents who preferred the Academic track performed better than those who preferred the Technical, Vocational, and Livelihood (TVL) track.

This result opposes several research studies, including Said et al. (2017), who revealed that most high achievers in secondary schools are at level 1. Only 0.96% are at a high

level of numeracy competence. Athanasou (2012) mentioned that there are about 64% of Australians who were below minimal competence, including numeracy, Miranda (2016) who discovered that some Grade 10 learners have an insufficient level of mathematical language and problem-solving performance, Asiahwati (2015) who showed that the minimum percentage of score in the numeracy test was 17% with a standard deviation of 12.80 and majority of the learners belong to the basic level based on five levels of numeracy. Cruz and Lapinid (2014) demonstrated that 40% of their survey participants could not translate worded problems satisfactorily. On the lighter side, the result is related to the findings of Maier (2003), who mentioned that grown-up learners have high confidence in math, which is helpful in a range of computational and conceptual skills involving real-life problems. The result implies that the incoming Grade 11 learners have already acquired great numeracy competence, which is entirely connected to the track preferences of the respondents.

Extent of senior high school readiness

As indicated in Table 2, respondents' readiness to pursue senior high school education is high/very satisfactory in all three dimensions: academic, emotional, and social skills (overall median = 4). The respondents strongly agreed that they had a clear idea of what they wanted to do with their preferred senior high school track, were quick in getting things done, and organized things independently. However, the respondents perceived average self-motivation to partake in Senior High School programs. This shows that the respondents were aware of senior high school secondary education difficulties, requiring guidance before enrolling in a more advanced secondary level of education.

Kobrin et al. (2012, p.9) argued that "high school education frequently falls short of adequately prepared learners for higher-level courses, which are typically faster-paced and necessitate individuals to develop higher-level operations." Learners must consider that educational climates are becoming more academically, physically, emotionally, psychologically, and mentally demanding on learners as junior high school graduates progress toward a culture of accelerated learning. As a result, learners in the twenty-first century should expect a more complex educational system designed to develop problem-solving skills and critical thinking needed to thrive in an accelerated secondary academic setting and prepare for college and careers. In the light of these findings, learners must possess the right attitude to be well-prepared and thrive in college. This finding also suggests that the school must develop a mass information drive about senior high schools' programs, activities, expectations and check learners' readiness (academic, social skills, and emotional aspects) before exposing them to the actual program. The learners must imbibe within themselves the importance of being on the right track aligned to their abilities, learning needs, and opportunities for learning growth.

Table 2. Extent of Senior High School readiness

Indicators of Senior high school readiness	Overall median	Interpretation
Academic Readiness	4	High
Emotional Readiness	4	High
Social Skills Readiness	4	High

Relationship between the respondents' level of numeracy competence and their preferred track

The learners' numeracy competency was investigated as to its relationship to their senior high school track preference using Spearman Rho correlation. Table 3 indicates a high positive correlation between learners' numeracy competence and preferred track (rho = .832). Moreover, since the p-value is smaller than the significance level, there is ample evidence to reject the null hypothesis and declare a significant relationship between the two variables.

This is consistent with the findings of Sison et al. (2017), who found that learners preferred academic tracks because they provide learners with ample understanding and capacity to solve complex problems, examine information, and make sense of existing facts to develop solutions for the improvement of man's way of life. The results of the assessment

of learners' numeracy competence are alarming. Teachers in Senior High School must find new ways to engage learners in the teaching and learning process by employing unique instructional strategies and revisiting the curriculum plan for better instructional purposes. These imply that learners should try harder to grasp math concepts and be encouraged to do well on classroom or national assessment exams.

Table 3. Test on the relationship between the respondents' level of numeracy competence and their preferred track

Predictive Variable	Criterion Variable	rho	Correlational Interpretation	p-value	Decision	Interpretation
Preferred track	Numeracy competence	.832	High	.000	Reject H_0	Significant

Mann-Whitney U-test on the difference between the respondent's level of numeracy competence

The learners' numeracy competencies were compared to their preferred track using the non-parametric Mann-Whitney U-test as depicted in Table 4. The table shows that the numeracy mean rank of the academic-preferred learners (mean rank = 157.88) is greater than the learners who preferred the TVL track (mean rank = 119.03). The computed Z-value of -14.163 is associated with the level of numeracy effect size on learners' preferred track by dividing the Z-value by the square root of the total number of respondents, which provides -.8302 defined as a large effect. Moreover, since the computed p-value is lesser than the level of significance set at 0.05, the researcher finds just evidence to reject the null hypothesis and declared that there is a significant difference in the numeracy competence levels of the respondents when grouped according to senior high school track preference. The result is related to the Mamolo (2019, p.5) study, which revealed that "the academic track learners have significantly different competency than the TVL track."

This finding implies that learners must be numerate before enrolling in Senior High School since that ability is widely required in most areas and disciplines of the said secondary program. Moreover, educators need to identify learners who are at risk academically and provide appropriate instructional strategies to meet the learners' needs. Mastery of fundamental facts, mental computation, and some attention to hand techniques will continue to be required among learners to improve in that area of concern.

Table 4. Mann-Whitney U-test on the difference between the respondents' level of numeracy competence with respect to their preferred track

Criterion Variable	Predictive Variable	Mean Rank	p-value	Decision	Interpretation
Level of numeracy	Academic	146.77	.000	Reject H_0	Significant

Relationship between the respondents' level of numeracy competence and their extent of Senior High School readiness

The learners' numeracy relatedness to their senior high school readiness in terms of academic readiness, emotional readiness, and social skills readiness were analyzed using the Pearson r correlation. Table 5 shows a negligible, positive correlation between learners' level of numeracy competence and academic readiness, which was statistically significant (r = .166, p = .003). A similar condition occurs on the second predictive variable – emotional readiness (r = .096, p =.049). These findings imply that learners' academic and emotional readiness does not necessarily lead to a successful Senior High School life. Also, teachers must avoid harmful stereotyping of learners that usually hamper learners learning and development.

Similarly, social skill readiness and level of numeracy competence were correlated, and the data revealed a weak association of the two variables, which is statistically significant (r = .233, p = .002). Similarly, Conley et al. (2014) and Cuy and Salinas (2019) found a similar result trend. This implies that if a student has high self-esteem, there is a possibility that he

can be successful in pursuing senior high school education.

In summary, findings of this study lend support for the hypothesis that numeracy competence has a direct association with some factors, in this case, learners and teacher factors, and the extent of senior high school readiness of academic, emotional, and social skills aspects among Grade 10 learners in the first and second districts in the municipality of Dolores, Eastern Samar. The significant difference in the numerical competence derived in the present study findings supports DepEd and a separate grading system for academic, technical, vocational, and livelihood tracks. Also, this is a simple reminder that teachers must provide differentiated instructions to learners enrolled in these tracks as a significant difference/relationship occurs between them.

Table 5. Test on the relationship between the respondents' level of numeracy competence and Senior High School readiness

Criterion Variable	Predictive Variable	r	Correlation Interpretation	p-value	decision	Interpretation
Level of Numeracy Competence	Academic Readiness	.166	Small	.003	Reject H_0	Significant
	Emotional Readiness	.096	Negligible	.049	Reject H_0	Significant
	Social Skill Readiness	.233	Small	.002	Reject H_0	Significant

Conclusion and recommendations

Based on the findings derived, most of the junior high school completer-respondents in the four secondary schools are highly numerate and prefer the academic track over Technical Vocational and Livelihood track. They perceived themselves to have high levels of academic, emotional, and social skill readiness. An in-depth analysis revealed a statistically significant relationship between learners' level of numeracy competence and preferred senior high school track. At the same time, a substantial difference in the level of numeracy competence was observed between those respondents who preferred academic or TVL tracks. Finally, all the three aspects of senior high school readiness, namely academic, emotional and social-skill readiness, were significantly related to learners' numeracy competence. The overall result suggests a positive connection between the learning environment and learners' positive and active participation in the lesson in any manner possible will improve performance in mathematics. These findings provide an avenue or basis for teachers to explore varied approaches in teaching numeracy among learners to increase their participation and show a positive attitude towards mathematics.

Hence, the following recommendations are offered. Since high school readiness was a good predictor of learners' level of numeracy competence, the teachers must develop instructional activities that strengthen learners' readiness to acquire new information relevant to the school setting. Hence, contextualization of the subject matter is highly valued recommended. Senior High School teachers must fully understand the condition of the learners so that s/he will be able to craft appropriate teaching and learning interventions that will improve numeracy competence and foster schooling among senior high school learners. Conduct similar research with a larger, more diverse sample to confirm the results of this study and improve the generalizations of the results.

Declaration of conflict of interest

The author declares that there is no conflict of interest.

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