COMPARISON OF READING AND MATH SCORES OF FRESHMEN FROM G10 AND G12 CURRICULA: INPUTS FOR AN INTERVENTION PROGRAM

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ABSTRACT

This study aims to compare the reading and math skills of Freshmen students of Arellano University on G10 and G12 curriculum. Furthermore, the study examines the relationship between the reading and math scores of the said interpretation.

Mathematical Computation skills significantly improved in a G12 curriculum. There is no difference in the means of the mathematical vocabulary, attitude and word problem skills from a G10 and G12 curriculum.

Reading vocabulary skills significantly improved in a G12 curriculum.

There is no difference in the means of the comprehension skills from a G10 and G12 curriculum. Reading comprehension levels correspond to increased success with math problems.

A positive and substantial relationship exists between reading efficiency and math proficiency.

On May 15, 2013, Republic Act No. 10533, otherwise known as The Enhanced Basic Education Act of 2013 or the K-to-12 was passed into law. RA 10533 added two years of Senior High School (SHS) to broaden the goals of high school education for college preparation, vocational and technical career opportunities as well as creative arts, sports and entrepreneurial employment. It also make education learner-oriented and responsive to the needs, cognitive and cultural capacity, and the circumstances of learners, school and communities through the use of appropriate medium of teaching and learning, including mother tongue. (2019)

The Senior High School curriculum, as part of the K to 12 program, was developed in line with the curriculum of the Commission of Higher Education (CHED) – the governing body for college and university education in the Philippines. This ensures that by the time students will graduate from Senior High School, they will have the standard knowledge, skills, and competencies needed to go to college. (2012)

The Philippine Senior High School is composed of four (4) tracks: Academic; Technical Vocational Livelihood; Arts & Design; and Sports. Under the Academic Track, there are four (4) strands which, include Accountancy & Business Management (ABM); Science, Technology, Engineering & Mathematics (STEM); Humanities & Social Sciences (HUMMS); and General Academic Strand (GAS). All Senior High School students regardless of their chosen career track and strand shall take the core or general education subjects such as English, Mathematics and Social Sciences. (www.deped.gov.ph)

The K to 12 is aimed at addressing the deficiency of the Philippine educational system particularly in the basic education, elementary and high school, in order to meet the standards of the international education criteria and for students to be at par with the students in neighboring countries.

For the first time, the Philippines joined the Programme for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD) in 2018, as part of the Quality Basic Education reform plan and a step towards globalizing the quality of Philippine basic education.

The DepEd *Statement on the Philippines' ranking in the 2018 PISA results*: By participating in PISA, we will be able to establish our baseline in relation to global standards, and benchmark the effectiveness of our reforms moving forward. The PISA results, along with our own assessments and studies, will aid in policy formulation, planning and programming.

Released on December 3, 2019 the 2018 PISA results revealed that the Philippines has an average reading score of 340, the lowest among the 79 countries surveyed; and an average science score of 357 an average mathematics score of 353, the second lowest among the 79 countries.

School year 2019-2020 marked the enrollment in the collegiate level of the first batch of K-12 students. Enrolled freshmen who completed K-12 were administered 2 diagnostic tests: Gates Mac-Ginitie Reading Test and the Test of Mathematical Abilities.

Since school year 2007-2017, all incoming freshmen of Arellano University in all campuses took 2 diagnostic tests: Gates Mac-Ginitie Reading Test and the Test of Mathematical Abilities. The freshmen students in all campuses who obtained reading and math scores within the Stanine 1-3 range interpreted as struggling, were required to take English and Math enhancement courses for a semester.

Methodology

This study aims to compare the reading and math skills of Freshmen students of Arellano University on G10 and G12 curriculum. Furthermore, the study examines the relationship between the reading and math scores of the said interpretation.

G10 refers to the freshmen students for the 1st semester of SY 2015-2016 who graduated Fourth Year High School/the equivalent of Grade 10. G12 refers to the freshmen students for the 1st semester of SY 2019-2020 who graduated Grade 12.

The Gates MacGinitie Reading Test (GMRT) Form S was used to measure the reading skills while the Test of Mathematical Abilities (TOMA-2) was utilized to assess the mathematical skills.

The Gates MacGinitie Reading Test (GMRT) Form S is a standardized survey of achievement in reading It includes two tests: vocabulary and comprehension.

The Test of Mathematical Abilities-Second Edition (TOMA-2) has been developed to provide standardized information about attitudes, vocabulary, story problems and computation.

There was a total of 1,709 students who took the GMRT at the beginning of the first semester of SY 2015-2016, representing the G10 curriculum and a total of 1,040 students who took the GMRT at the beginning of the first semester of SY 2019-2020, representing the G12 curriculum.

There was a total of 1,776 students who took the TOMA-2 at the beginning of the first semester of SY 2015-2016, representing the G10 curriculum and a total of 948 students who took the TOMA-2 at the beginning of the first semester of SY 2019-2020, representing the G12 curriculum.

Null Hypothesis

Ho = There is no significant difference between reading and math scores on a G10 and G12 curriculum.

Ho = There is no significant relationship between reading scores and math scores.

Results

Table 1

Test of Difference between G12 and G10 Mathematics Ability of the Respondents

Variables	Year	Mean	Computed t	Tabular t at 0.05	Description	Decision
Vocabulary	2020/G12	11.97	0.32	1.96	Not Significant	Accept Ho
	2015/G10	12.05				
Attitude	2020/G12	38.38	1.47	1.96	Not Significant	Accept Ho
	2015/G10	38.93				
Computation	2020/G12	19.17	3.80	1.96	Significant	Reject Ho
	2015/G10	18.56				
Problem Solving	2020/G12	8.79	0.82	1.96	Not Significant	Accept Ho
	2015/G10	8.92				
Over All	2020/G12	78.24	0.29	1.96	Not Significant	Accept Ho
	2015/G10	78.43				

Table 1 reveals that the difference between G12 and G10 mathematics ability of the respondents were not significant in the vocabulary, attitude and problem solving skills ; however, there was a significant difference in the computation skills.

Table 2

Test of Different between 2020 and 2015 Reading Ability of the Respondents

Variables	Year	Mean	Computed t	Tabular t	Description	Decision
Vocabulary	2020	17.17	10.06	1.96	Significant	Reject Ho
	2015	14.57				
Reading Comprehension	2020	16.61	1.07	1.96	Not Significant	Accept Ho
	2015	16.86				
Over All	2020	33.78	5.76	1.96	Significant	Reject Ho
	2015	31.34				

Table 2 reveals that the difference between G12 and G10 reading ability of the respondents were not significant in comprehension; however, there was a significant difference in vocabulary.

Table 3

Test of Relationship between Math Ability and Reading Ability of the Respondents for 2019-2020

Pairs	Variables	Computed r	Tabular r at 0.05	Description	Decision
1	Reading Vocabulary and Reading Comprehension	0.49	0.1946	Significant	Reject Ho
2	Computation & Problem Solving	0.49	0.1946	Significant	Reject Ho
3	Math Vocabulary & Math Computation	0.56	0.1946	Significant	Reject Ho
4	Reading Comprehension & Math Problem	0.52	0.1946	Significant	Reject Ho
5	Reading Voc & Math Problem	0.49	0.1946	Significant	Reject Ho
6	Math Vocabulary & Problem Solving	0.52	0.1946	Significant	Reject Ho
7	Reading Comp & Math Voc	0.44	0.1946	Significant	Reject Ho
8	Reading Voc & Math Voc	0.42	0.1946	Significant	Reject Ho
9	Reading Comp & Math Comp	0.39	0.1946	Significant	Reject Ho
10	Reading Voc & Math Comp	0.31	0.1946	Significant	Reject Ho

Table 3 reveals that all math scores and reading scores variables have significant relationship.

Discussion

The primary purpose of this study was to compare the reading skills and math skills of Freshmen students of Arellano University on G10 and G12 curriculum and investigate the relationship between reading skills and math skills.

A comparison of the math scores of G10 and G12 reveals a significant difference in the computation skills. A cursory examination of the subjects taught in Grade 11 and Grade 12 shows that it is necessary for students to develop their computation skills to enable them to pass their courses: in the ABM (Accountancy, Business and Management) strand, business math and business finance, applied economics; in the STEM (Science, Technology, Engineering and Mathematics) strand, pre-calculus, basic calculus, general physics 1 and 2. There are topics in the two (2) core or general education subjects in Mathematics (General Mathematics, Statistics & Probability) in the Senior High School curriculum, which are being repeated from previous studies in the lower grade levels. Repetitions of such have become an opportunity to link student's prior knowledge in exploiting a deeper and more practical mathematics in the specialized subjects.

A comparison of the reading skills scores of G10 and G12 reveals a significant difference in the vocabulary scores. Due to the demands of all the subjects for Grade 11 and Grade 12, one could infer that vocabulary should consequently improve.

A comparison of the vocabulary, attitude and word problem solving skills in math showed no significant difference between the G10 and G12 group.

A comparison of the comprehension scores showed no significant difference between the G10 group and G12 group.

The overall results of this study concur with the current body of literature in that there exists a relationship between reading achievement and mathematics achievement.

An earlier research in Northern British Columbia revealed a strong positive correlation between the students' levels of reading comprehension (as reflected in their Gates MacGinitie reading test results) and their scores on the math Provincial Achievement Test Part B (Lovell 2011)

A correlational research design was used to to determine the strength and direction of the relationship between the three different levels of reading achievement on the Texas Assessment of Knowledge and Skills and the mathematics achievement of middle school students in a large urban school district in southwestern United States as assessed by the Texas Assessment of Knowledge and Skills. The results from this study suggests that reading achievement has an important role in the mathematics achievement of middle students in high stakes testing, which is something that should be considered from the classroom all the way up to the top of the educational chain of command. (Hernandez 2013)

Another study investigated the relation between students' reading ability and their achievements in advanced mathematics, physics, and chemistry when controlling for their mathematical ability. The study included 1,446 Dutch secondary school students who had taken their final examinations in these subjects. Using multivariate multilevel models, we found that both math and reading ability (the latter only in the pre-university track) were positively related to the examination grades on mathematics, physics, and chemistry. (Korpershoek, 2014)

As cited in Hargrove's research (2015) reading performance was found to be associated with mathematics performance at each grade level. More and more researchers have examined the relationship reading has on mathematics performance. The findings of Grimm (2008) was that reading comprehension has a relationship with the conceptual understanding and problem solving that are essential to success in mathematics. This finding supports the belief that reading comprehension is necessary for mathematical success. (Halaar, Kovas, Dale, Petrill, and Plomin, 2012)

The relationship between reading and math scores of freshmen in this study reconfirms an earlier finding for incoming college freshmen using the same diagnostic tools. (Calderon and Pua, 2010)

Research shows a strong correlation between students comprehension and their knowledge of text structures and between students mathematical comprehension and their knowledge and use of multiple representations. (Bosse and Falconer, 2008)

Emerging from these studies isnthe role of comprehension. Comprehension is the key but there is one significant way that teaching

reading and math are similar. When a child is learning to read, everybody knows that proficiency is all about bringing meaning to the printed page. For example, I can "read" anything in Spanish, since I've studied some Spanish, yet still not understand much of what I'm reading. Likewise, no child can be considered to be a proficient reader if he or she can pronounce the words but doesn't understand the material. (Burns, 2005)

Comprehension is key to being a successful reader, and the same standard should hold true for math. If children have memorized the math facts and can perform computational procedures, teachers often think of them as proficient. But we've seen over and over again how children can borrow, carry, bring down, or invert and multiply without understanding why the procedures work or how to apply them to problem-solving situations. The challenge is to help math students develop meaning and make sense of what they do. (Burns, 2005)

Listening to teachers reword or interpret mathematics problems for their students specifically leads to the subject of reading and interpretation. Martinez and Martinez (2001) highlight the importance of reading to mathematics students:

> [Students]… learn to use language to focus through problems, to communicate ideas coherently and clearly, to organize ideas and structure arguments, to extend their thinking and knowledge to encompass other perspectives and experience, to understand their own problem-solving and thinking processes as well as those of others, and to develop flexibility in representing and interpreting ideas. At the same time they begin to see mathematics, not as an isolated school subject, but as a life subject – an integral part of the greater world, with connections to concepts and knowledge encountered across the curriculum. (p.47)

In his article, "Reading: a Psycholinguistic Guessing Game" (1967), that began a revolution moving away from a view of reading as rapid accurate sequential word recognition to an understanding of reading as a process of constructing meaning - making sense - of print. That research is part of the basis for the whole language movement and disagreements over his

conclusions about the nature of reading fuel the current "reading wars." (Stenhouse Publishers, 2003)

Goodman defined reading as: a receptive psycholinguistic process wherein the actor uses strategies to create meaning from text (Goodman, 1988). Basically, the study of reading looks at translating a linguistic surface representation (text) into thought. Goodman based much of his theory on analyzing miscues (mistakes) in texts being read-aloud. He believed that efficient readers minimize dependence on visual detail, but focused his theories on the interactions of reader and text. Basic physical sensory information (the physiological process) is cycled into deeper levels of cognitive processes.

Studies suggest the development of subject-specific comprehension strategies and more collaboration between Language Arts and Mathematics teachers may remedy the problem (Rupley, 2012)

In reading, vocabulary instruction is integral; in math, teachers can start a word chart for math terminology, consistently use correct math vocabulary, and encourage children to do the same. In reading, read-aloud books provide students with common experiences from which they can learn; in math, there are many children's books that can provide a stimulus for problem-solving. In reading, teachers blend whole-class discussions, small-group instruction, and individualized reading and writing; in math, the same strategies can be appropriate and effective. (Burns, 2005)

In English, there are many small words, such as pronouns, prepositions, and conjunctions, that make a big difference in student understanding of mathematics problems. A study by Kathryn Sullivan (1982) showed that implementing a brief program helping students distinguish the mathematics usage of "small" words can significantly improve student mathematics computation scores. Words cited by Sullivan include *the, is, a, are, can, on, who, find, one, ones, ten, tens, and, or, number, numeral, how, many, how many, what, write, it, each, which, do, all, same, exercises, here, there, has, and have.*

The use of different reading strategies impacted students' problem solving. Teaching students to break down story problems, learn the steps in solving them, write their own story problems, create math dictionaries, write story problem webs, and listen to themselves reading problems created more

confidence in them and increased the likelihood that they would use these strategies on their own. (Hite, 2009)

Conclusion

Mathematical Computation skills significantly improved in a G12 curriculum.

Reading vocabulary skills significantly improved in a G12 curriculum.

There is no difference in the means of the mathematical vocabulary, attitude and word problem skills from a G10 and G12 curriculum.

There is no difference in the means of the comprehension skills from a G10 and G12 curriculum.

A positive and substantial relationship exists between reading efficiency and math proficiency.

Reading comprehension levels correspond to increased success with math problems.

Recommendations

Arellano University is one with the Department of Education in its adoption of the Basic Education Learning Continuity Plan (BE-LCP) for the school year 2020-2021, a package of interventions that will respond to basic education challenges brought about by COVID 19. The Most Essential Learning Competencies (MELCs) issued by the Department of Education shall be used by the University for its basic education learners for SY 2020-2021.

Most Essential Learning Competencies (MELCs) shall serve as a primary reference of both public and private schools in determining and implementing learning delivery approaches that are suited to the local context and diversity of learners while adapting to the challenges caused by COVID-19.

As it focuses instruction to the most essential and indispensable competencies that our learners must acquire, it is significant that K-12 students must also be taught to read well. So, regardless of whether the learning delivery modality is Online Distance Learning (ODL) or Modular Distance Learning (MDL) through printed materials, the school must make the improvement of reading skills, a priority in all of its academic

programs. A sustained silent reading must be done either synchronously or asynchronously by all classes in basic education, to induce students to read a lot.

With the Dynamic Learning Program (DLP) as the based platform pedagogy for both online distance learning and modular delivery modalities, which works on the principle of "learning by doing", a system of engaging basic education students in modular reading exercises within their class schedules, could teach them to read well.

Effective teachers are needed to dramatically improve students' reading performance in this system. Therefore, teachers have to be properly trained in reading instruction. A generalist classroom teacher does not need to become a reading specialist in order to help her students understand what they read. Even a math or a science teacher may benefit from integrating reading and math or reading and science instruction in her classroom. With this, the teacher gets to create appropriate strategies to raise the levels of math and science literacy of her students and help them develop their meta-cognitive processes for approaching their performance tasks successfully.

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