Social Intelligence and Mathematics Anxiety of High School Students

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INTRODUCTION

The anxiety phenomena can be understood through the concept of anxiety arousal. This is associated with self-related cognition. One example of self-deprecating thought is negative self-evaluation of one's self (Zaman & Semul, 2013). Moreover, anxiety among secondary school students creates strong negative emotions and can hinder a person's cognitive, learning and academic performance. Fear of mathematics comes early in the educational process and if this is not handled properly, it will negatively affect the students to adulthood. In learning mathematics, emotional intelligence (EI) and social intelligence (SI) impact on how a person deals with emotions, mathematics and the general self-regulations strategies that the person adopts (Nor, Ismael, & Yusof, 2016).

In United States, elementary students struggle with mathematics because of mathematics anxiety. Young Americans with mathematics anxiety often have decreased mathematics achievement and have avoided higher-level mathematics courses and mathematical careers. The inclusion of emotions in mathematics is an outlet for students that can lead to mathematics anxiety reduction (Emmert, 2015).

In the study conducted by Facun, Mati, and Bautista (2014), they found that Math anxiety affects Math achievement of the students. It also revealed that among the three domains of Math anxiety, it is the psychological and emotional domain that affected most the achievement of the Filipino students in Mathematics. Likewise, Uyboco's (2016) agreed to Duterte's assessment that many Filipinos suffer from math anxiety. He admitted that he was one of those, and as an algebra teacher, he has seen many of his students break into cold sweat when they start seeing x's and y's on the board. He also agreed that calculus and trigonometry are too complex for high school students and their absence from the curriculum wouldn't really matter for most of them anyway.

In Marawi City, Alico and Maraorao (2017) found that students have significantly higher level of mathematics anxiety. The descriptors of mathematics anxiety showed that fear of assessment and evaluation, like final grading, upcoming tests, and taking an exam, were the main causes of anxiety. It was found out that female students were more anxious than male ones. Findings imply that mathematics and language teachers need to improve their teaching methods and styles to alleviate, if not eliminate, students' anxieties.

Meanwhile, it was also observed in La Paz National High School that many of the students were not really fond of Math subject and hence, they were not participative during the class discussions. It was found out by empirical observation and pre-interview during the lunch-break discussion conducted by the researcher that most students hate Mathematics.

However, there are limited researches conducted associating social dimensions and mathematics anxiety. To fill this gap, the relationship of social intelligence to Mathematics anxiety was investigated in this study. This was recommended in the study conducted by Rambow (2008) stating that social competence as strongly related to the level of math anxiety experienced by students requires further and a follow-on study is needed. This is to determine if social competence would benefit students who experience math anxiety.

This study hoped to contribute to Mathematics education by giving insights on the role of social intelligences on Mathematics anxiety to come up activities that are helpful in achieving the goals of Department of Education to achieve excellence and address literacy problem. Thus, this study was deemed essential for teachers in a way that they will be able to design intervention schemes for their students to enhance their social intelligence and gradually eliminate math anxiety. The results generated can be of great use to the school.

Theoretical and Conceptual Bases

Social intelligence plays a crucial role in workplace environments, especially for individuals in leadership positions. The ability to anticipate the responses of others while acting wisely and in a predictive manner is a vital component of this type of intelligence (Ledford, 2015).

In this study, three dimensions of social intelligence were considered which are manipulation, empathy, and social irritability which were also studied by Lelková and Lorincová (2017). They explored personality traits' predictive power on these three dimensions of social intelligence. They found out that that sociability and self-confidence have significant predictive power in predicting manipulation. Sociability and emotional stability do not have significant power in predicting empathy. Sociability has significant predictive power in predicting social irritability but on the other hand self-confidence does not have significant predictive power in predicting social irritability. Also, Frankovsky and Birknerova (2014) support that the three indicators of social intelligence are manipulation, empathy, and social irritability.

Manipulation. One core part of social intelligence is manipulation which is a verification of predictive power personality traits, namely extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. It was concluded that extraversion, openness to experience, and agreeableness have significant predictive power in predicting manipulation while conscientiousness and neuroticism do not have significant predictive power in predicting manipulation. This dimension can be predicted by sociability and self-confidence (Lelková & Lorincová, 2017).

Empathy. Second dimension of social intelligence is empathy which is understanding others' emotions. The application of empathy in the educational environment is tremendous. Empathy is the ability to put oneself into the emotional body of another person. This is particularly applicable for children who come from a disadvantaged background, and need to learn the skill of empathy in order to become emotionally driven toward success. Empathy can be built through the observation of others, then thinking deeply about why people behave and react in the ways that they do, and finally identifying the behaviors that are either helpful or detrimental in challenging situations. The ability to understand other people's emotions, persuasions, motivation, conflict resolution mechanisms, and reasons for cooperation are probably the skills most essential for success in education and in the life that will come beyond the classroom (Lynch, 2016). However, Lelková and Lorincová (2017) found out that empathy cannot be predicted by sociability and emotional stability.

Social Irritability. And the last core part of social intelligence is the social irritability. This dimension cannot be predicted by self-confidence. People suffering by social irritability are usually nervous in contact with other people and feelings of others baffle them. Adapting to other people is a problem for them and a

weakness and wishes of others often confuse them. They become nervous around people who are willing to do anything for them (Cizmar, 2016).

In this study, three factors of Math anxiety were considered which are physical and emotional factors, assessment factors, and social factors.

Physical and Emotional Factors. Onwuegbuzie (1997) revealed students with elevated levels of mathematics anxiety exhibited physical manifestations of the phenomenon, including headaches, muscle tension, perspiration, and feeling sick. In addition to several educational researchers having documented the existence and effects of mathematics anxiety and identified several research efforts that identified the phenomenon's antecedents. Emotional symptoms of frustration, worry, panic, and depression were also identified.

Assessment Factors. Classroom is also a place where math anxiety can develop and flourish. Math anxiety may have its roots in teaching and teachers, with math anxious teachers resulting in math anxious students at times. Teaching by math anxious teachers is characterized by an over-reliance on traditional instructional activities such as: drills, flash cards, and work sheets; assigning the same work for everyone; teaching to the textbook; insisting on only one correct way to complete a problem; concentrating more on basic skills rather than concepts; and, whole class instruction and assessment (Whyte & Anthony, 2012).

Social Factors. Social factors such as mathematical myths may also induce or reinforce math anxiety for some students. For example, the myth that boys are better than girls in math and that only some people have a 'math mind' can undermine positive self-efficacy beliefs. Too often, situations are encountered in which it is 'cool' to hate mathematics, with people readily stating, with some pride, 'I'm no good at math', as though displaying a badge of honor or promoting membership to the "I Hate Math" group. As a subject mathematics is unique as embarrassment often does not result from failure (Latterell, 2005).

This endeavor was recommended in the study of Bryant (2005) on his study entitled *The Components of Emotional Intelligence and the Relationships to Sales Performance* stating that further research into the area of Emotional Intelligence and its relationship to performance may be considered. Also, Sloan (2010) in his study entitled *A Quantitative and Qualitative Study of Math Anxiety among Pre-service Teachers* mentioned that a follow-up study should be conducted with the subjects at the conclusion of their student teaching experience to determine whether the changes in math anxiety levels were consistent over time is also a proof.

Additionally, Rambow (2008) also added from his study *The Relationship Between Emotional and Social Competence of Math Instructors and Math Anxiety Levels of Adult Students Enrolled in College Mathematics Course* that emotional and social competence as strongly related to the level of math anxiety experienced by students requires further and a follow-on study is needed to determine if emotional and social competence would benefit students who experience math anxiety.

Several research studies and claims were used to anchor this study.

Self-theories deal with how an individual perceives some of her attributes such as intelligence. People endorse basically one of two theories: growth mindset or fixed mindset. In the case of the former, people believe that intelligence can be developed (incremental theory), whereas in regard to the latter, people believe that intelligence is a fixed trait (entity theory). These theories play an important role in motivation and achievement, as shown by Carol Dweck's life-long research (Koebel, Schmitt, & Spaeter, 2016).

Bandura's theory is a social theory of learning, and by accepting the interference of cognitive processes such as the perception of others, the imagination, the self-control, and more, his theory became socio-cognitive. Moreover, in time his theory became ever more far-reaching. Concepts such as self-regulation, self-

reflection, beliefs on self-sufficiency, and even moral values made Bandura's theory on learning become full of humanism, too. This theory is applicable since this has something to do with self-regulation, self-reflection, beliefs and values as can be reflected in the emotional and social intelligence and Math anxiety (Soponaru, Dîrtu, Ciuhodaru, & Iorga, 2016).

Erikson's psychosocial development maintained that personality develops in a predetermined order through eight stages of psychosocial development, from infancy to adulthood. During each stage, the person experiences a psychosocial crisis which could have a positive or negative outcome for personality development. This is applicable in this research because the emotional and social intelligence and Math anxiety are parts of the development (McLeod, 2018).

Statement of the Problem

The main purpose of this study was to determine significant relationship of students' social intelligences and Mathematics anxiety. Specifically, this aimed to seek answers to the following:

1. What is the level of social intelligence in terms of:

2.1. manipulation,

2.2. empathy, and

2.3. social irritability?

3. What is the level of Mathematics anxiety in terms of:

3.1. physical and emotional factors,

3.2. assessment factors, and

3.3. social factors?

4. is there a significant relationship between social intelligence and Mathematics anxiety of high school students?

Null Hypothesis

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant relationship between social intelligence and Math anxiety.

Research Design

This study utilized quantitative non-experimental descriptive correlational research. According to Curtis, Comiskey, and Dempsey (2016), the role of correlation research which concerned with establishing relationships between two or more variables in the same population or between the same variables in two populations is very important part of a research study especially in quantitative non-experimental. Understanding the associations and relationships that exist among human phenomena is a remaining incentive for scientific investigation in all of the social science disciplines, and that motivation surpasses even the most differentiated model distinctions between various research methods.

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Respondents

The respondents of study were the Grade 10 students from two different sections of a certain public school in Carmen, Davao del Norte during the fourth quarter of school year 2018-2019.

Table 1**.** Distribution of Respondents

Section	**Population**
Rizal	34
Bonifacio	30

Instead of selecting a sample for the respondents, the researcher purposively considered complete enumeration. There were 64 students included in the conduct of survey. The researcher chose these students purposively because these students were enrolled in the school where the researcher is currently connected.

The population considered in this study as Alferez and Duro (2018) explained that population is a complete and entire collection of elements to be studied. In addition, De Belen and Feliciano (2015) refers the entire number of people under study when considered called complete enumeration. Moreover, Arnab (2017) added that the sampling error is absent in a complete enumeration or census procedure but in collecting information from a unit in complete enumeration, the information regarding the value of the characteristic under study is not free from error. That non-sampling error arises at any stage of conducting a survey such as planning, data collection, processing the data, and tabulation as well report writing.

Additionally, this also considers purposive sampling technique since according to Ang-ug, Casocot, Garcia, and Tado (2014), this technique is based on the selection of respondents determined based on the belief that they could be the sufficient group to purposively address the phenomenon and objective of the research. The criteria have been laid down as above mentioned.

Purposive sampling technique was considered since the researcher took Junior High School students as the respondents.

Research Instrument

This study utilized survey questionnaires assessing the self-perceived levels of emotional and social intelligences and Mathematics anxiety of high school students. The social intelligence questionnaire was based from the study of Frankovsky and Birknerova (2014), there are three indicators which are manipulation, empathy, and social irritability with seven items each indicator.

The dependent variable is the mathematics anxiety based from the study of Oyenekan, Olalekan, Sulaimon, and Aikabeli (2018) with physical and emotional factors, assessment factors, social factors as its three indicators and each indicator has five items.

The survey questionnaires have undergone validation process to ensure the content validity. The first draft of the research instrument was submitted to the research adviser for comments, suggestions and recommendations to improve its presentation with the corrections to be included and integrated. The final copies were submitted to panel of experts for refinement. The final revision was made by incorporating the

corrections, comments and suggestions given by the expert validators before the gathering of data. The ratings of the validators were computed and consolidated to know the status of the questionnaires. Further, reliability index was observed through pilot testing on the same grade level of students with 52 respondents. The data gathered were computed using Cronbach Alpha test to identify the items to be removed and to be revised so that the questionnaires address the comprehension of the students according to their level before the final conduct.

After the pilot testing and item analysis, the Mathematics anxiety questionnaires yielded to reliability index of 0.908, while the social intelligence questionnaire yielded a reliability index of 0.769, and the emotional intelligence questionnaire has reliability index of 0.912 which all passed the standard requirement.

Data Gathering Procedure

In gathering the data, the following procedures were observed:

After the approval of the school head to conduct the study, the researcher asked the approval of the respondents by letting them signed the informed consent and approval that they volunteered to respond the survey. Then, the researcher personally administered the survey questionnaires on Social Intelligences and Mathematics Anxiety Scale to the respondents in the school identified. The students responded to the questionnaires administered to them. The researcher then retrieved the questionnaires after the respondents have answered. The researcher then checked, tabulated, and consolidated the results and then gave it to statistician for the analysis of data.

Data Analysis

The following are the statistical tools used to analyze the data gathered:

Mean. This was used to determine the level of social intelligences and Mathematics anxiety.

Pearson-r. This was used to determine the significant relationship between social intelligence and Mathematics anxiety of high school students.

RESULTS AND DISCUSSIONS

Table 2 presents the level of social intelligence with the levels of its indicators: manipulation, empathy, and social irritability. The manipulation *(M=3.10; S.D.=0.63),* empathy *(M=3.25; S.D.=0.57),* and social irritability *(M=3.35; S.D.=0.62)* were all in moderate level. Moreover, the rating scores of students on manipulation tends to be more dispersed from the mean compared to other indicators.

Table 2. Level of Social Intelligence of High School Students

Social Intelligence	Mean	S.D.	Descriptive Level
Manipulation	3.10	0.63	Moderate
Empathy	3.25	0.57	Moderate
Social Irritability	3.35	0.62	Moderate

These students have moderate *(M=3.10; S.D.=0.63)* manifestations of manipulation on being able to persuade others to do important things and in using others for their own benefit. In terms of empathy, these students have moderate *(M=3.45; S.D.=0.57)* manifestation of empathy in being able to guess the feelings of others even when they do not want to show it and in recognizing the wishes of others. In social irritability, these students have moderate *(M=3.35; S.D.=0.62)* manifestation of social irritability by feeling

nervous whenever interacting with others and by feeling uncomfortable when adapting to new and a manifestation of social irritability by being baffled with weaknesses of others.

These high school students have moderate ability to socially adapt with surroundings. They have moderate ability to persuade others to do almost anything for their own benefit and to persuade them to take their side while using the lives of others for their own advantage. Their ability to recognize intentions, feelings, and weaknesses of other people and adapt to new people, guess their wishes as well as fulfill them is also in moderate level. While they have moderate level of feeling nervous in contact with other people, feelings of others baffle them, and adapting to people is a problem for them.

Without social intelligence, succeeding in life is almost impossible. However, the findings show that these first-year students have the potential to achieve their life aims. Thus, social intelligence is an important developmental aspect of education. Moreover, social intelligence is useful in terms of solving problems in social life and helps to tackle various social tasks. Hence, social intelligence is crucial to be further developed in the education sector. It was noted by prior researchers that having a high level of social intelligence is extremely essential, in order to be successful in life (Nagra, 2012).

Table 3 presents the level of mathematics anxiety with the levels of its indicators: physical and emotional factors, assessment factors, and social factors. The physical and emotional factors *(M=3.02; S.D.=0.76)*, assessment factors *(M=3.29; S.D.=0.79)*, and social factors *(M=3.11; S.D.=0.66)* were all in moderate level. Moreover, rating scores of students on assessment factors tend to be more dispersed from the mean compared with other indicators.

Table 3. The Level of Mathematics Anxiety of High School Students

Mathematics Anxiety	Mean	S.D.	Descriptive Level
Physical and Emotional factors	3.02	0.76	Moderate
Assessment Factors	3.29	0.79	Moderate
Social Factors	3.11	0.66	Moderate

These students have moderate *(M=3.02; S.D.=0.76)* manifestation of physical and emotional factors by getting emotionally upset when doing or thinking about Mathematics and still of physical and emotional factors by having trouble sleeping after working on Mathematics. In the assessment factors, students have moderate *(M=3.29; S.D.=0.79)* by considering Math tests more stressful than other subjects and by feeling like there is a need to prepare much more for Mathematics test than for other subjects. In the social factors, students have moderate *(M=3.11; S.D.=0.66)* manifestations by feeling that others have a more Mathematical mind and by having a Mathematics teacher who is really disliked for one reason or another.

Students have also moderate level of negative disposition of the students towards Mathematics. They moderately manifest negative emotions towards Mathematics. They also have moderate level of negative disposition during assessments and exams, and also a moderate level to influence of others in acquiring negative disposition.

Merritt (2011) found out that math anxiety is a general concern for all students, in that there were no differences in measures of math anxiety between boys and girls or Black students and White students.

Table 4 shows the significant relationship between emotional intelligence and Mathematics anxiety.

It can be noted that self-awareness has very low positive correlation *(r-value=0.235; p>0.05)* to physical and emotional factors but not significant. Since the p-value is greater than the level of significance 0.05, the null hypothesis is accepted. However, it has low positive significant correlation *(r-value=0.418; p<0.05)* to

assessment factors since the p-value is less than the level of significance 0.05, thus, the null hypothesis is rejected. Meanwhile, it has negligible positive correlation *(r-value=0.060; p>0.05)* but not significant to social factors since the p-value is greater than the level of significance, thus, the null hypothesis is accepted.

Table 5 presents the significant relationship of the different indicators of social intelligence to different dimensions of Mathematics anxiety.

Table 5. Correlation Between Social Intelligence and Math Anxiety

Variable	Physical and Emotional Factors	Assessment Factors	Social Factors
Manipulation	0.208	0.106	0.065
Empathy	0.296*	0.275*	0.315**
Social Irritability	0.118	0.137	0.047

**Correlation is significant at the alpha 0.01 level.

*Correlation is significant at the alpha 0.05 level.

Manipulation has very low positive correlation *(r-value=0.208; p>0.05)* to physical and emotional factors but not significant since the p-value is greater than the level of significance 0.05, thus, the null hypothesis is accepted. Also, it has very low positive *(r-value=0.106; p>0.05)* to assessment factors but not significant since the p-value is greater than the level of significance 0.05, thus, the null hypothesis is accepted. Similarly, it has negligible positive correlation *(r-value=0.065; p>0.05)* but not significant to social factors since the p-value is greater than the level of significance 0.05, thus, the null hypothesis is accepted.

Empathy has very low positive significant correlation *(r-value=0.296; p<0.05)* to physical and emotional factors since the p-value 0.05 is less than the level of significance 0.05, thus, the null hypothesis is rejected. Also, it has very low positive significant correlation *(r-value=0.275; p<0.05)* to assessment factors since the p-value 0.05 is less than the level of significance 0.05, thus, the null hypothesis is rejected. Similarly, it has low positive significant correlation *(r-value=0.315; p<0.05)* to social factors since the p-value 0.05 is less than the level of significance 0.05, thus, the null hypothesis is rejected.

Social irritability has very low positive correlation *(r-value=0.118; p>0.05)* to physical and emotional factors but not significant since the p-value is greater than the level of significance 0.05, thus, the null hypothesis is accepted. Also, it has very low positive *(r-value=0.137; p>0.05)* to assessment factors but not significant since the p-value is greater than the level of significance 0.05, thus, the null hypothesis is accepted. Similarly, it has negligible positive correlation *(r-value=0.047; p>0.05)* but not significant to social factors since the p-value is greater than the level of significance 0.05, thus, the null hypothesis is accepted.

The above results revealed that only empathy has significant relationship to all dimensions of math anxiety, the rest of the indicators have none. This means that other indicators have no significant relationship with math anxiety. As empathy increases, the rest of math anxiety dimensions also increase.

The above finding is supported with the a concept that solving complex mathematical equations may be a breeze for the most minds but navigating social situations present an entirely different challenge. Social intelligence is a key element in a comprehensive education. Social intelligence is a skill developed over time, learning from life experiences and interactions with others. It pertains to a person's ability to connect with those around them and make pivotal decisions that impact our lives on a daily basis. Social Intelligence

in learning can help learners to better understand human psychology, behavior, and communication, which opens up a world of opportunities in and out of the online learning environment (Pappas, 2015).

Also, the idea that Mathematics is not a popular subject which tend pupils to dislike it, especially when they fail to obtain the desired academic results, and it can cause anxiety and even phobia, supports the above result. The difficulties they find are not only due to insufficient knowledge of the elements of math, but also to the (in) ability to transfer knowledge in order to face different situations successfully. There are high rates of school failure or failure, mostly in the two compulsory years at the secondary level (Vasilescu, 2015).

RECOMMENDATIONS

Based on the findings and conclusions, the following recommendations are generated:

1. Administrators may design programs that will help teachers in managing and innovating strategies that develop students' social intelligence to, at most, a very high level and in eliminating mathematics anxiety or at least bringing it to very low level. Moreover, at the institutional level, programs and curricular strategies may be implemented to enhance both social intelligence and against math anxiety.
2. Teachers are encouraged to choose instructional strategies that enhance students' social intelligence. Math instruction and tasks should be attractive to students, in order to prevent the formation of anxiety in the subject. Similar advice involves the use of hands-on devices and manipulatives in learning. Such instructional measures may enhance the three variables studied as well as success and counteract math anxiety as a result. It is recommended further that teachers may utilize appropriate strategies and pedagogical principles in teaching Mathematics that will enhance the social intelligences of students to a very high level and eliminate math anxiety or at least bring it down to a very low level. Math anxiety can be reduced by the development of a positive yet realistic self-concept in math – all while keeping in mind that improvements in students' self-concept will be short-lived without enhancing knowledge acquisition and improving achievement. In examinations, teachers may introduce anxiety-reducing measures such as using humorous examination tasks, or dividing the learning contents into several smaller examinations instead of one extensive examination. Given that pressure enhances math anxiety and its effects in examinations, teachers should set enough time for math examinations and avoid time constraints. It is very important that teachers take the time to identify students who have math anxiety so they can assist the students by implementing strategies and techniques to eliminate math anxiety for those students who may benefit with higher math achievement.
3. Parents are recommended to work with educational practitioners in monitoring the students' social intelligences and enhance them to a very high level and as well as eliminating mathematics anxiety or at least reducing to a very low level. Parents may support their children in developing positive self-concept and preventing the development of math anxiety by, for example, providing adequate feedback or praise to achievement in math, by maintaining realistic expectations for their children's success in math, or by showing how math is used in positive ways, such as in sports, hobbies, and home repair.
4. Students are encouraged to protect themselves against the development of math anxiety by different means. These involve the realistic attribution of success and failure to one's abilities or effort and the development of a positive yet realistic self-concept. Learners should focus more on past successes than failures, and believe in their abilities instead of doubting them. Other measures concern positive learning behaviors, for example, leaving enough study time for repetition of the material to be mastered, allotting enough time to study, and avoiding procrastination. In math-related situations, students may use relaxation techniques to alleviate their anxiety level. Another means for reducing exam anxiety is reappraisal or a change in a situation's evaluation from its potentially threatening characteristics to more positive attributes.

5. Further researches may be conducted in exploring other factors affecting the mathematics anxiety of the students other than social intelligence. Also, further researches replicating this research concept to other settings may be done.

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