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Students' Mathematics Confidence and Engagement

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Abstract : This descriptive-correlational study aimed to determine the relationship of mathematics confidence and engagement of Grade-7 students in the public and private high schools of the Division of Antique, Philippines. Specifically, it sought to determine the level of mathematics confidence and engagement of Grade 7 students when taken as an entire group and when they are classified as to sex, type of school, learning style, ICT use and teachers' teaching style. It also sought to determine if there is a significant difference in the mathematics confidence and engagement of Grade-7 students when they are classified as to sex, type of school, learning style, ICT use and teachers' teaching style. This study involved 297 randomly selected Grade-7 students of the selected public and private high schools in the Division of Antique. Data on mathematics confidence and engagement were gathered using the questionnaire-checklists devised by the researcher. Other data-gathering instruments used included the standard Learning Style Inventory by Barsch (1994) and Grasha-Riechmann Teaching Style Inventory (1996), and the researcher-made ICT Use Inventory. Statistical tools employed in this study were frequency, percentage, mean, and standard deviation as descriptive statistics. t-test, One-Way ANOVA, and Pearson r set at .05 alpha level were the inferential statistics employed. All statistical computations were processed through Statistical Package for Social Sciences (SPSS) software version 20.0. The results of the study revealed that the Grade 7 students were "moderately confident" and "moderately engaged" about mathematics when they were taken as an entire group and when they were classified according to sex, type of school, learning style, ICT use and teachers' teaching style. No significant difference existed in the mathematics confidence of Grade-7 students classified according to sex, type of school, learning style, ICT use and teachers' teaching style. A significant difference was noted in the Grade-7 students' level of mathematics engagement when they were classified according to ICT use while no significant difference existed in the mathematics engagement of the students classified according to sex, type of school, learning style and teachers' teaching style. A highly significant positive relationship existed between mathematics confidence and engagement of Grade 7 students.

***Index Terms* - mathematics; mathematics confidence; mathematics engagement**

INTRODUCTION

Confidence in learning mathematics has emerged as an important variable in mathematics achievement. A genuine interest and confidence in the subject enable students to be motivated to manage learning.

With the K to 12 mathematics curriculum implementation today, the curriculum goals are critical thinking and problem solving. These goals, moreover, can be achieved by the content, skills and processes, values and attitudes, tools and context. In mathematics, the content includes number and number sense, measurement, geometry, patterns and algebra, statistics and probability. The skills and processes, on the other hand, include knowing and understanding, estimating, computing and solving, visualizing and modeling, representing and communicating, conjecturing, reasoning, proving and decision-making, applying and connecting. The values and attitudes are accuracy, creativity, objectivity, perseverance and productivity while the tools demand manipulative objects, measuring devices, calculators and computers (and tablet PCs) and internet. And, the context describes the beliefs, environment, language, culture, and learner's prior knowledge and experiences (Ulep, 2013).

Moreover, according to Ulep (2013), the underlying learning principles and theories of K to 12 mathematics curriculum are described as experiential and situated learning, reflective learning, constructivism, cooperative learning and discovery and inquiry-based learning. The curriculum is further described as spiral where it builds upon previously learned knowledge and deepens understanding of topics. In a spiral curriculum, the learners revisit a topic which complexity increases with each revisit, and such new knowledge developed has a relationship with previously learned knowledge.

However, students' participation especially in a mathematics class seems wanting although some students proved to be smart. Studies have shown that students are not engaged in school and are harder to motivate (Steinberg, Brown, & Dornbusch, 1996).

To attain the goals of the K to 12 mathematics curriculum implementation today, students as early in their Grade-7 need the mathematics confidence and engagement.

The researcher believes that there is a need to look into how students see themselves as capable of doing mathematics and how it relates to their involvement; thus, this study.

NEED OF THE STUDY

This study aimed to determine the relationship of mathematics confidence and engagement of the Grade-7 students in the public and private high schools of the Division of Antique, Philippines.

Specifically, it sought answers to the following questions:

1. What is the level of mathematics confidence of the students when they are taken as an entire group and when they are grouped as to type of school, sex, learning style, ICT use, and teachers' teaching style?
2. What is the level of mathematics engagement of the students when they are taken as an entire group and when they are grouped as to type of school, sex, learning style, ICT use, and teachers' teaching style?
3. Is there a significant difference in the mathematics confidence of the students when they are grouped as to type of school, sex, learning style, ICT use, and teachers' teaching style?
4. Is there a significant difference in the mathematics engagement of the students when they are grouped as to type of school, sex, learning style, ICT use, and teachers' teaching style?
5. Is there a significant relationship between the mathematics confidence and mathematics engagement of the students?

Hypotheses

Based on the aforementioned problems, the following hypotheses were tested:

1. There is no significant difference in the mathematics confidence of the students when they are grouped as to type of school, sex, learning style, ICT use, and teachers' teaching style.
2. There is no significant difference in the mathematics engagement of the students when they are grouped as to type of school, sex, learning style, ICT use, and teachers' teaching style.
3. There is no significant relationship between the mathematics confidence and mathematics engagement of the students.

Theoretical framework

The study is anchored on Bandura's (1994) theory of self-efficacy and Weiner's (1985) attribution theory.

Self-efficacy theory deals with the "can I" questions. It deals with justifications that a person makes to decide whether or not to instigate the event. It is concerned not with the skills one has but with the judgments of what he can do with whatever skills one possesses. Self-efficacy then is an individual's belief that he or she can perform a particular task or behavior.

The attribution theory, on the other hand, deals with the why questions, how people make explanations for events in their lives and then analyze how they contend with emotional and behavioral results of these explanations. While self-efficacy deals with justifications that a person can make, attribution theory deals with justifications made after an event. According to this theory, the explanations that people tend to make to explain success or failure may be internal or external.

Conceptual Framework

Confidence, as self-assurance resulting from a belief in one's own ability to achieve things, and self-efficacy are similar. The confidence one has about Mathematics is likewise his belief on his capability in learning Mathematics. Thus, students with strong self-efficacy are hard workers and are engaged more frequently than students with low self-efficacy.

Meanwhile, attribution theory explains how students feel and see themselves about mathematics and their engagement on it. Their engagement in Mathematics can also be explained by his/her confidence. In this study, then, sex and learning style are factors considered internal to the students while type of school, ICT use, and teachers' teaching style are the external factors.

Figure 1 illustrates the framework of the study.

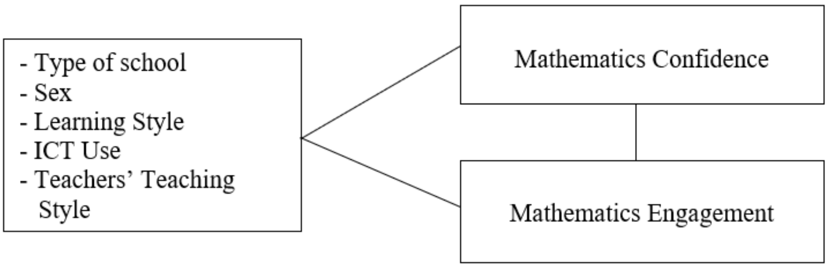

Figure 1. Paradigm of the Study

Significance of the Study

The results of the study will be beneficial to the following:

DepEd officials. Results of the study would provide key officials in the Department of Education basis for policy formulation in their concern toward improved school achievement. They may design training programs that would help improve teachers' repertoire of skills needed in the K to 12 curriculum. They also may consider ICT infrastructure or improving schools' ICT infrastructure to ensure adequate access by students to ICT.

Curriculum planners. The results will contribute to knowledge base in mathematics education and will be useful in revisiting the present curriculum. The study may remind about integrating ICTs into the curriculum.

Teacher training institutions. Teacher-training institutions may find the results of the study useful in strengthening preservice education with focus on the pedagogical approaches towards the development of mathematical capability among the students. The study would show that there is a need for an increased emphasis on the application of ICT in teaching and learning in teacher education during pre-service, induction and in continuing professional development.

School heads/principals. Knowing the mathematics confidence and involvement of students, school principals may be able to extend the much needed support such as to allocate a budget for ICT infrastructures, its maintenance and development of their ICT systems for the total development of students.

Mathematics teachers. The results of the study may help mathematics teachers develop strategies that will work to engage students in Mathematics and to create a learning environment that are realistic and meaningful. The result of the study may remind teachers that there should be development of teaching skills that facilitate the integration of ICT in teaching and learning. The result of the study also may remind the teachers that they should regularly review their use of ICT with a view to expanding the settings in which it can be used and their repertoire of teaching strategies, including opportunities for students' engagement with the technology which include: exploring the use of wide range of resources and applications as possible, for example educational software, peripherals, e-mail, presentation software, and the internet. As to the learning styles of students, this study may remind Math teachers to gradually expand class activities that substantially expand students' learning style preferences.

Guidance Counselors. The study may inform the schools' guidance counselors to help raise students' confidence.

Students. With the results, students may be enlightened that their confidence and engagement are important in their achievement in school. The result of the study may show them that ICT use contributes to their mathematics learning and engagement.

Parents. Parents may be informed of the mathematics confidence and engagement of their children so that they may be able to attend to their needs.

Other researchers. Results of the study will serve as springboard for further studies on specific areas of engagement.

Scope and Limitations of the Study

This descriptive-correlational study determined the relationship between mathematics confidence and engagement of the Grade-7 students in the public and private high schools of the Division of Antique, Philippines.

Two hundred ninety-seven randomly selected Grade 7 students from the eight private and public high schools were involved in the study. They were classified as to sex, type of school, learning style, ICT use, and teacher's teaching style.

Data were gathered with the use of the researcher-made questionnaire-checklists on mathematics confidence and engagement.

The statistical tools employed the frequency count, percentage, mean and standard deviation as descriptive statistics. t-test, ANOVA and Pearson r set at 0.05 alpha level were used as inferential statistics. All statistical computations were processed through the SPSS software version 20.0.

Definitions of Terms

The following terms used in the study are defined operationally:

"Mathematics confidence" refers to a feeling that someone is good at mathematics or has the ability to succeed at mathematics as measured by the Mathematics Confidence Questionnaire-Checklist. It is described as Very Highly Confident, Highly Confident, Moderately Confident, Less Confident, and Not Confident.

"Mathematics engagement" refers to someone's involvement in mathematics tasks and activities. It is measured by the Mathematics Engagement Questionnaire-Checklist and categorized as Very Highly Engaged, Highly Engaged, Moderately Engaged, Less Engaged and Not Engaged.

"Type of school" refers to either public or private high school in the Division of Antique where the respondents are enrolled.

"Learning style" refers to the way a student learns whether a student is visual, auditory or tactile learner based on the standard Barsch Learning Style Inventory (1994).

"ICT use" refers to the students' exposure to the ICT tools & gadgets which include television, cellphone, computer/laptops and other gadgets classified as frequent or occasional user based on their responses to the ICT Use Inventory.

"Teacher's teaching style" refers to the way a teacher teaches whether the teacher is Expert, Formal Authority, Personal Model, Facilitator or Delegator. It is measured by the standard Teaching Style Inventory by Grasha and Reichmann (1996).

REVIEW OF RELATED LITERATURE

This section reviews literature related to the present investigation. It contains a discussion of the following topics: Mathematics Learning, Mathematics Confidence, Mathematics Engagement and Mathematics Teaching.

Mathematics Learning

Learning mathematics is a complex endeavor that involves developing new ideas while transforming one's ways of doing and thinking (Anderson, 2007). The learning of mathematics in schools is centered on building skills, using algorithms, and following certain procedures as well as students' construction or the acquisition of mathematical concepts.

Today, mathematics is often learned through problem solving. Problem solving is one of the most important skills in mathematics which is taught in today's mathematics classrooms. It demands thinking and creativity rather than memorization and skills learned by rote. Research has solidly established the importance of conceptual understanding in the learning of mathematics. By aligning factual knowledge and procedural proficiency with conceptual knowledge, students can become effective learners. They will be able to recognize the importance of reflecting on their thinking and learning from their mistakes. Students become competent and confident in their ability to tackle difficult problems and are willing to persevere (National Council of Teachers of Mathematics).

Technology is an essential part of the world and, therefore, plays a role in classroom. Research shows that when calculators are used appropriately in the classroom, students' arithmetic skills do not decline and students are likely to experiment more and become better at solving problems. (Retrieved from: https://www.google.com.ph/url?sa=t&rct=j&q=&esrc=s& source=web&cd=2&ved=0CCYQFjABahUKEwi_7Jvz58DHAhWRjo4KHbjqCXY&url=https%3A%2F%2Fwww.edu.gov.on.ca %2Feng%2Fstudentsuccess%2Flms%2Ffiles%2FFamilyCommunityOverview.doc&ei=GpTaVb_3NJGdugS41aewBw&usg=AF QjCNE-RBeMwNv5GXXWSy3R_p61loNfSA&sig2=RGGdr60ppmPW3JJzcpA_tw)

According to Melcher (2014), active engagement has long been known to be a core principle of effective instruction. The more time students are actively engaged in learning, the more they will learn. Encouraging students to work together and share their thinking will assist students in gaining a deeper conceptual understanding of complex mathematical ideas.

Engaging students in mathematics may provide them avenue to develop positive attitudes towards mathematics and learning mathematics (Gilderdale and Kiddle, 2011). It can be achieved through the following measures: (1)Using a wide range of tasks and resources, (2) Having enthusiastic teachers, with a 'can do' positive attitude, (3) Giving plenty of opportunities for students to experience success, (4) Doing hands-on approaches to learning, (5) Using real life examples and explore links with other subjects, (6) Offering positive role models of mathematicians, (7) Clubs - e.g. older students mentoring younger students, (8) Posters publicizing maths, (9) Sharing learning with parents (e.g. maths evenings to encourage positive attitudes amongst parents), and (10) 'Making enjoyable': Maths challenges, competitions, puzzles of the month, celebrate achievements.

Mathematics Confidence

For many students, according to Maleh (2010), learning mathematics in school can be a stressful experience. The concepts are new and the materials are complex. However learning math can be enjoyable because the satisfaction of solving a complicated math problem is a satisfaction unlike any other.

In traditional mathematics classrooms students work independently on short, single answer exercises and an emphasis is placed on getting right answers, however students not only learn mathematics concepts and skills, but they also discover something about themselves as learners (Anderson, 2006; Boaler, 2000; Boaler & Greeno, 2000). Students may learn that they are capable of learning mathematics if they can fit together the small pieces of the “mathematics puzzle” delivered by the teacher (Anderson, 2007).

Additionally, when correct answers on short exercises are emphasized more than mathematical processes or strategies, students come to learn that doing mathematics competently means getting correct answers, often quickly. Students who adopt the practice of quickly getting correct answers may view themselves as capable mathematics learners. In contrast, students who may require more time to obtain correct answers may not see themselves as capable of doing mathematics, even though they may have developed effective strategies for solving mathematical problems (Anderson, 2007).

On one hand, Boaler & Greeno (2000) further emphasize that when students are able to develop their own strategies and meanings for solving mathematics problems, they learn to view themselves as capable members of a community engaged in mathematics learning. When their ideas and explanations are accepted in a classroom discussion, others also recognize them as members of the community. On the other hand, students who do not have the opportunity to connect with mathematics on a personal level, or are not recognized as contributors to the mathematics classroom, may fail to see themselves as competent at learning mathematics.

According to Gilderdale and Kiddle (2011), encouraging children’s confidence in mathematics is crucial to helping them develop a positive attitude to the subject. In order to develop confident learners of mathematics who are able to work independently, teachers must in the classroom: (1) acknowledge all contributions positively, encourage learning from mistakes, welcome wrong answers as the springboard to new understanding, (2) use positive language, (3) encourage independent and small group research, and (4) value different approaches to solving problems.

Although mathematics has been introduced as early as at the preparatory school level, a large number of students still have problems in solving basic mathematics. Students are expected to have already achieved a certain level of standards in their mathematical knowledge prior to entering the university. An increasing attention has been done to examine factors that contribute to falling standards of students’ achievement in mathematics. One most important factor, that is psychological in nature, is mathematics self-confidence or self-efficacy (Khairum, et al., 2014). Confidence refers to self-assurance resulting from a belief in one’s ability to achieve things. According to Bandura (1977), it is “not a measure of the skills one has, but a belief about what one can do under different sets of conditions with whatever skills one possesses”.

Students are conscious of what they are capable of and can determine quite accurately what they know and what they do not know (Stankov, et.al., 2012). Self-confidence plays an important role in learning because it is a predictor of a learner’s learning behavior, such as the degree of effort made and the expectation of outcome (Maclellan, 2014). It is one of the critical reasons that make students feel difficult to learn mathematics. Such a negative feeling may consequently make a student give up learning mathematics (Brown, et.al., 2008).

According to Kleitman, et al. (2013), students with high self-confidence may attain better performance in tasks and engage in target tasks more actively than those who are less confident about the tasks. In addition, students with high self-confidence usually regard difficult tasks as meaningful tests while those with low self-confidence tend to avoid calling for help (Ryan, et.al, 2005).

Parsons et al. (2009) conducted a study on students’ confidence in their ability in mathematics. It was found that the majority of students were fairly confident during their first year study. Students gained confidence in mathematics and felt sufficiently more confident in their future use of mathematics. Most students used the support for mathematics and described how it had helped them improve their ability and self-confidence.

Beller & Gafni (2006) identified a major contributing factor to female’s lower participation in engineering and mathematics careers, that is many girls begin to doubt their ability to learn mathematics. As a result, girls are typically more likely than boys to progress no further in mathematics than eight grade algebra, and are subsequently under prepared for many math intensive majors and programs.

Past studies found that digital games had potentials to enhance students’ confidence (Radford, 2000). Furthermore, digital games can also enhance students’ learning motivation and their learning performance (Nussbaum, 2007). Therefore embedding math learning into digital games may be a possible solution to enhance students’ self-confidence, learning motivation and learning performance.

Mathematics Engagement

Mathematics has been perceived as a subject for a few to excel. In response to the alarming stereotype on mathematics, various approaches are formulated to improve the situation and ensure that students receive better grades in the subject. A comprehensive engagement of students during learning is necessary for them to develop mathematical concepts and to ensure that students participate fully in the activities (Ali, 2013).

Engagement refers to one's direct experience of the world and her or his active involvement with others (Wenger, 1998). Much of what students know about learning mathematics comes from their engagement in mathematics classrooms. Through varying degrees of engagement with the mathematics, their teachers, and their peers, each student sees her or himself, and is seen by others, as one who has or has not learned mathematics.

Engaging in a particular mathematics learning environment aids students in their development of an identity as capable mathematics learners. Other students, however, may not identify with this environment and may come to see themselves as only marginally part of the mathematics learning community.

Recent research into student engagement, the Fair Go Project (Fair Go Team, NSW Department of Education and Training, 2006) focused on understanding engagement "as a deeper student relationship with classroom work".

Fredricks et al. (2004) define engagement as a deeper student relationship with classroom work, multi-faceted and operating at operative, affective, and cognitive levels. Operative engagement encompasses the idea of active participation and involvement in academic and social activities, and is considered crucial for the achievement of positive academic outcomes. Affective engagement includes students reactions to school, teachers, peers and academics, influencing willingness to become involved in school work. Cognitive engagement involves the idea of investment, recognition of the value of learning and a willingness to go beyond the minimum requirements. In terms of engagement with mathematics, engagement occurs when students are procedurally engaged within the classroom, participating in tasks and "doing" the mathematics, and hold the view that learning mathematics is worthwhile, valuable and useful both within and beyond the classroom.

Student engagement with mathematics is crucial and central to increasing participation rates in mathematics. Marks (2000) claimed that students who are engaged in with school are more likely to learn and find the experience rewarding. Joebert and Andrew (2010) supports that in engaging students through enrichment activities in mathematics, the possible benefit is the impact on the learning and understanding of mathematics, over and above enjoyment and participation of students.

Students' engagement at a high level is indispensable in learning mathematical concepts effectively. The following practices are further suggested for implementing effective math lessons, namely: (1)Tasks are built on students' prior knowledge; (2) Scaffolding takes place, making connections to concepts, procedures, and understanding; (3) High-level performance is modelled; (4) Students are expected to explain thinking and meaning; (5) Students self-monitor their progress; and (6) Appropriate amount of time is devoted to tasks (Teaching Today, 2006).

Mathematical tasks that engage students in doing mathematics, making meaning, and generating their own solutions to complex mathematical problems can be beneficial in engaging students and supporting their identity as a mathematics learner (NCTM, 2000). Kabiri & Smith (2003) believe that a good starting point is open-ended mathematical tasks, questions or projects that have multiple responses or one response with multiple solution processes. The mathematics classroom can also be organized to encourage discussion, sharing, and collaboration (Boaler & Greeno, 2000). In this type of classroom setting, teachers "pull knowledge out" of students and make the construction of knowledge part of the learning experience.

Recognizing the need for students' engagement in mathematics and to develop students' engagement, Anderson (2006) encourages mathematics teachers to (1) use mathematical tasks that allow students to develop strategies for solving problems and meanings for mathematical tools; (2) organize mathematics classrooms that allow students to express themselves creatively and communicate their meanings of mathematical concepts to their peers and teacher; and (3) focus on the process and explanations of problem solving rather than emphasize quick responses to single-answer exercises.

Factors in Student Engagement

There are different factors that lead to student engagement. They are next discussed.

Competence and perceived ability. Competence and perceived ability can lead to student engagement(Akey, 2006). To Newmann et al. (1992), the need to express competence is real in every person's life. When one experiences a feeling of success that accompanies competency in something, it tends to cause the person to try and even try harder so that they continue to feel the accomplishment.

In a longitudinal study of 225 kindergarten and 127 first graders Valeski and Stipek (2001) found that perceptions of competence lead to positive attitudes which in turn lead to greater engagement. In their quantitative study, they analyzed data from direct assessments, teacher questionnaires, and classroom observations, perceptions of competence and level of ability were connected to student engagement.

Akey (2006) carried out an exploratory analysis of school context, student attitudes, and behavior, and academic achievement of 449 tenth and eleventh graders over a three-year period. One of her conclusions indicated that perceived academic competence produced a positive effect on math achievement. Her results suggest that students who believe they are competent in the content area would be more academically engaged.

Teacher support. Research also indicates that teacher support, closeness and encouragement have been associated with student's behavioral, emotional, and academic engagement (Akey, 2006). In their research on motivation in students enrolled in third to sixth grade, Furrer and Skinner (2003), found that students who felt valued by their teachers were more involved in activities in the classroom and viewed those activities as interesting and fun. However, students that did not feel valued felt boredom, unhappiness, and anger during class activities.

While Furrer and Skinner (2003) found that teacher encouragement increased student involvement, other research indicates that teacher dependency can have negative effects. Birch and Ladd (1997) found in a study of 206 kindergarten students that the students that had an unhealthy dependency on their teachers were less likely to be engaged in the classroom.

Teacher support plays an extremely important role in promoting engagement in the classroom. Ryan and Patrick (2001) found that teacher care and support promoted positive student/teacher communication self-regulated learning, and less off-task behaviour in mathematics classes. Teachers that created and maintained environments within their mathematics classrooms where mutual respect was valued, student ideas were respected, and student efforts were appreciated were more likely to have students that applied themselves more on cognitive tasks.

Attard (2011) in her study on "The influence of Teachers on Student Engagement with Mathematics During the Middle Years," found that the most powerful influence on engagement in mathematics for these students appeared to be that of their teachers. This influence can be viewed at two interconnected levels. The first level includes the pedagogical repertoires employed by the teacher, and the second, the pedagogical relationship that occurs between the teacher and students. That is, the connections made between the teacher and student, and the teacher's recognition of and response to the learning needs of his or her students. Although this study has limitations in terms of the selective nature of the sample, it is suggested that the development of positive pedagogical relationships forms a critical foundation from which positive engagement can be promoted and this may be generalized to a wider student population.

Community and school participation. A sense of community or belonging to the school built by participation both in class, out of class, and during extra-curricular activities is a predictor of student engagement (Voelkl, 1997).

Battistich et al. (1997) found in their research on elementary through high school aged children that academic engagement was positively affected by students' sense of community. They found that the warmth and supportiveness of the teacher and the classroom, an emphasis on personal values, an encouragement of cooperation, and a drawing out of student thinking and expression of ideas advanced their sense of community. Data in their study were collected yearly over a period of 15 years using questionnaires and observations from more than 550 classes and involved more than 4000 students.

Student engagement in the classroom is a necessity for learning. Developing a sense of membership, or bonding, is essential in order to promote student engagement. According to Newmann et al. (1992), students are inclined to engage themselves in academic work if they experienced bonding, or a sense of membership in their school. Developing a sense of membership requires certain factors from a school, namely clarity of purpose, fair treatment, personal support, opportunity to experience success, and a climate of caring.

Research says that a sense of community and school participation fosters engagement.

Quality of instruction and challenging tasks. Literature on quality of instruction, task challenge to include the use of authentic work suggests that these factors are predictors of student engagement (Akey, 2006).

In a longitudinal study of high school students in the United States, Shernoff and his colleagues (2003) found that academically meaningful activities aided in engaging students. Higher expectations and challenges that were afforded to the students led to higher engagement. Along this, they suggest that teachers should think of their students as learners and should appropriately adjust instructional acitivities in the classroom to meet the needs, developmental stages, and interests of the students.

Authentic works students perform in the classroom that entails extrinsic rewards, offers students a sense of ownership that is connected to the real world and involves some fun is more authentic and more likely to engage student (Newmann, 2002).

Marks (2000) utilized data from over 3600 surveys of fifth-, eighth-, and tenth-grade students in mathematics and social studies classrooms in her study. The study included data from both student questionnaire and teacher questionnaires. The results indicated that authentic work contributed to the engagement of students.

Peer connections. Studies have also shown that peer groups can put down students who are striving for academic success and who are academically engaged (Ogbu, 2003). An intensive longitudinal study by Steinberg et a. (1996) of more than 20,000 students in nine high schools in California noted that peers "are the chief determinants of how intensely they are invested in school, how much effort they devote to their children. However, in Furrer and Skinner's (2003) study, it was found that peer connections do not seem to affect student engagement at all.

Classroom structure and environment. The organization of the classroom structure and the classroom environment has also been shown to be a predictor of student engagement. Students experience increased engagement when they feel that the classroom environment in under their control (Shernoff, et.al., 2003). If students believe they have control over their learning environments, then they are more likely to be engaged.

Parental involvement. Furrer and Skinner (2003) also ascertained the impact of family involvement in the learning process on student engagement. They researched students' sense of relatedness as a factor in academic engagement. They found that relatedness to parents was a high predictor of student engagement in the classroom. Students who entered the classroom with a high level of parental relatedness were more apt to be willing to follow the classroom agenda.

A research by Adams and Sargent (2012), from their multivariate analyses, indicated that particular teaching methods were associated with increased student engagement and decreased stress, encouragement to ask questions and active discussion were associated with higher levels of student engagement and lower levels of student stress.

Wahid and Sharhrill (2009) investigated the factors that contribute to pre-university students' engagement towards the learning of mathematics. They investigated upper-age level students (ranged from 16 to 18 years old) who were about to continue their study to higher level of education and investigations were conducted to identify the dimensions that drives them to pursue a mathematical course and what attributed them to have this motivation. Results revealed that students who set their learning goal would never fear to invest time in their learning toward this subject specifically. From the analyzed interview transcript, most students spent hours of studying on homework alone, and some spent another extra hours on revising, and on past year questions. Some students were willing to invest extra time in school for discussion or group study. They were observed to be willing to spend time on out-of-class learning just for their study. Moreover, it was revealed that the students' behavioral engagement was closely related to cognitive and affective engagement. Attentiveness and diligence were proved to be closely related to deep strategy. Students with deep strategy were closely correlated to be highly attentive and working hard on mathematics problems without easily giving up.

From the aforementioned investigation, the researchers were able to conclude that engagement is a necessity for student success. Engaging students in the classrooms is a critical component to help them succeed as a learner in school and in life. Therefore it was a great challenge to the teachers to engage students in mathematics class or to give engaging activities. Students were intrinsically motivated when they experienced enjoyment and satisfaction gained from deeper understanding. On top of that, students depended on their teacher and parents as a set of motivation for them to maintain their grades.

Irrespective of what the curriculum is and how it is enacted, few would argue that the amount of time spent on learning is not an important variable. Gettinger and Seibert (2011) use the term academic learning time (ALT) to refer to the amount of time during which students are actively, successfully, and productively engaged in learning. The importance of time as a variable in mathematics learning was a focus of considerable researches. The consensus was that more time spent productively on learning equated to more and deeper learning. Seifert and Beck (2004) noted that students appear to achieve optimally when they are listening and thinking, when teachers challenge the students' intellect.

Technology has opened up a whole new dimension for actively engaging students (Melcher, 2014). There are numerous software applications and websites that provide math games for students of all ages. Available websites have not only games but provides tutorials and homework help for students.

Educational research indicated that the most valuable learning occurs when students actively construct their own mathematical understanding, which is often accomplished through the use of manipulatives. Seefeldt and Wasik (2006) maintained that "In order to have opportunities to learn math, children need firsthand experiences related to math, interaction with other children and adults concerning these experiences and time to reflect on the experiences."

Manipulatives can come in a variety of forms and they are often defined as "physical objects that are used as teaching tools to engage students in the hands-on learning of mathematics"(https://www.teachervision.com/pro-dev/teaching-methods/48934.html). Manipulatives can be purchased at a store, brought from home, or teacher and student made. Smith (2009), stresses that manipulatives must fit the developmental level of the learners. Manipulatives can be used in teaching a wide variety of topics including problem solving, reasoning, connections, and estimations. Of significance also in the use of manipulatives is to get parents involved in school.

Mathematics Teaching

With the shift from the traditional methods of teaching mathematics reforms in mathematics education were initiated due to the impact of technology on curriculum and the emergence of new approaches to how mathematics is learned. According to Battista (1999), basic to the reform was the "what and how" of mathematics teaching. This approach is focused on problem solving, mathematical reasoning, justifying ideas, making sense of complex situations and independently learning new ideas. Students must be provided with opportunities to solve complex problems, formulate and test mathematical ideas and draw conclusions. They must be able read, write and discuss mathematics, use demonstrations, drawings and real-world objects, and participate in formal mathematical and logical arguments.

Sabean and Bavaria (2005) have synthesized a list of the most significant principles related to mathematics teaching and learning. This list includes the expectations that teachers know what students need to learn based on what they know, teachers ask questions focused on developing conceptual understanding, experiences and prior knowledge provide the basis for learning mathematics with understanding, students provide written justification for problem solving strategies, problem based activities focus on concepts and skills, and that the mathematics curriculum emphasizes conceptual understanding.

National Council of Teachers of Mathematics Principles state that effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn well. Students' understanding of mathematics, their ability to use it to solve problems, and their confidence in doing mathematics are all shaped by the teaching they encounter in school (NCTM, 2000). To be effective, teachers must understand and be committed to students as learners of mathematics. They must know and understand deeply the mathematics they are teaching and be able to draw on that knowledge with flexibility in their teaching tasks. Teachers must be supported with ample opportunities and resources to enhance and refresh their knowledge.

Students need to develop understandings of how a concept or skill is connected in multiple ways to other mathematical ideas. Effective teachers support students to make connections by providing them with opportunities to engage in complex tasks and by setting expectations that they explain their thinking and solution strategies and that they listen to the thinking of others (Anghileri, 2006). Teachers can assist students to make connections by using carefully sequenced examples, including examples of students' own solution strategies, to illustrate key mathematical ideas (Watson & Mason, 2006). By progressively introducing modifications that build on students' existing understanding, teachers can emphasize the links between different ideas in mathematics.

Making connections across mathematical topics is important for developing conceptual understanding. Teachers can also help students to make connections to real experiences. When students find they can use mathematics as a tool for solving significant problems in their everyday lives, they begin to view the subject as relevant and interesting.

How teachers organize classroom instruction is likewise very much dependent on what they know and believe about mathematics and on what they understand about mathematics teaching and learning. Sound content knowledge enables teachers to represent mathematics as a coherent and connected system (Ball & Bass, 2000). When their knowledge is robust, teachers are able to assess their students' current level of mathematical understanding. They use their knowledge to make key decisions concerning mathematical tasks, classroom resources, talk, and actions that feed into or arise out of the learning process.

No matter how good their teaching intentions, teachers must work out how they can best help their students grasp core mathematical ideas (Hill, et.al, 2005). In addition to having clear ideas about how they might build students' procedural proficiency they need to know how to extend and challenge students' thinking. To do this successfully they need substantial pedagogical content knowledge and a grounded understanding of students as learners. Such teachers are aware of the possibility of students' conceptions and misconceptions. This knowledge informs teachers' on-the-spot classroom decision making. It enables more finely tuned listening and questioning, more focused and connected planning, and more insightful evaluation of student responses.

The literature reviewed presented the importance of developing confidence in mathematics and mathematics engagement in learning mathematics and in improving performance in the subject. The literature reviewed also enabled the researcher to gain insights which would be helpful in the completion of the present investigation.

RESEARCH METHODOLOGY

This section describes the research design, locale of the study, respondents of the study, data-gathering instrument used, the procedure employed and the statistical tools used in data analysis.

Research Design

This study made use of the descriptive-correlational design. The purpose of descriptive research design is to describe the nature of the situation as it exists at the time of the study and to explore the cause of a particular phenomenon (Travers, 1978). Correlational research, on the other hand, is a research design involving collection of data to determine whether, and to what degree, a relationship exists between two or more quantifiable variables (Gay, et.al., 2002).

This research design was utilized in the study in its attempt to determine the relationship between the students' mathematics confidence and engagement.

Locale of the Study

The study was conducted in the different public and private high schools in the Division of Antique, Philippines. One (1) public and one (1) private high school were randomly chosen from each of the four (4) clusters in the Division.

Respondents of the Study

The respondents of the study were 297 selected Grade 7 students from eight selected high schools in the Division of Antique. Two high schools—one public and one private were selected by simple random sampling from each of the four clusters in the entire school division.

From a population of 1132 Grade 7 students, the sample size was determined using Slovin's formula. A total of 297 students served as respondents to the study. Proportionate sampling technique was employed to determine the number of respondents for each public and private high school involved while systematic sampling was used to draw sample students from each school.

Table 1 shows the distribution of respondents by school.

Table 1
Distribution of Respondents by School

Cluster	School	N	n
I	Private	117	30
	Public	210	55
II	Private	165	45
	Public	144	36
III	Private	102	26
	Public	180	48
IV	Private	34	9
	Public	180	48
Total		1,132	297

The respondents were classified according to sex, type of school enrolled, learning style, ICT use, and teachers' teaching style.

As reflected in Table 2, majority of the respondents are female, are enrolled in public high schools, and are both ICT users. The dominant learning style is auditory and the teachers are expert in terms of teaching style.

Table 2
Distribution of Respondents by Variable

Variables	f	%
Sex		
Male	117	39
Female	180	61
Total	297	100
Type of School		
Private	111	37
Public	186	63
Total	297	100
Learning Style		
Visual	92	31
Auditory	115	39
Tactile	29	10
Multi-modal	61	20
Total	297	100
ICT Use		
Occasional User	149	50
Frequent User	148	50
Total	297	100
Teacher's Teaching Style		
Expert	122	41
Personal Model	18	6
Facilitator	113	38
Delegator	44	15
Total	297	100

Data-Gathering Instruments

The primary instruments used in the study were researcher-made questionnaire-checklists on mathematics confidence and engagement and some validated instruments on student engagement in mathematics and mathematics confidence. The researcher based the ideas and concepts in the instrument from the different sources in the literature.

The research instrument used is composed of three parts. The first part includes personal information of the respondent such as name which is optional, sex, class section, name and address of school, and type of school. The second part is the Mathematics Confidence Questionnaire-Checklist while the third part is the Mathematics Engagement Questionnaire-Checklist.

Mathematics Confidence Questionnaire-Checklist. The Mathematics Confidence Questionnaire-Checklist contained 30 items. The respondents were asked to check to the column that best described their confidence in mathematics. The following options were used: Always, Often, Sometimes, Seldom, and Never.

Mathematics Engagement Questionnaire-Checklist. Mathematics Engagement Questionnaire-Checklist also contained 30 items. Options such as Always, Often, Sometimes, Seldom, and Never were also used to describe the respondents' involvement in mathematics-related tasks and activities.

In scoring, the options in both questionnaire-checklists were assigned the following weights: 5 for Always, 4 for Often, 3 for Sometimes, 2 for Seldom, and 1 for Never. The scoring was reversed for items that were stated in the negative.

Validation of the instrument. Both sets of questionnaire-checklists were submitted to a committee of five experts to evaluate the content. The members were requested to examine each and to decide whether to: Accept, Reject and Modify it. The suggestions of the members were looked into by the researcher for items evaluated as "Modify".

The agreement ratio was set at 80% and higher in deciding whether the item was to be retained or excluded in the final draft of the instrument.

Although some of the items in the instrument were modified as suggested, all the items were included in the final instrument based on the members' evaluation.

The validated questionnaire-checklists are found on Appendix J.

Three secondary instruments were likewise used in the study to classify the respondents according to the learning style, ICT use and teachers' teaching style.

Learning Style Inventory. The Learning Style Inventory is a standard instrument by Basch. It contains 24 items where the responses will reveal the respondent's learning style as Visual, Auditory, Tactile or a combination of these learning styles.

ICT Use Inventory. This is a researcher-made instrument composed of 21 items. The items measure the respondent's exposure to the different Information Communications Technology gadgets and devices. Responses to the items were Always, Sometimes, and Never.

This instrument had also undergone content validation by a committee of experts. All items were considered for inclusion by the committee.

Teaching Style Inventory. The Teaching Style Inventory is a standard instrument by Grasha-Reichmann. It is made up of 39 items where the teacher-respondents were asked to indicate their degree of agreement or disagreement to the items.

Teaching styles revealed by this inventory are Expert, Formal Authority, Personal Model, Facilitator, and Delegator. The highest mean rating among these teaching styles revealed the teacher's style in teaching.

Data Gathering Procedure

The Assistant Schools Division Superintendent Officer-in-Charge and the school principals of the different public high schools in the Division of Antique, the Antique Diocesan Superintendent and the school principals of the diocesan high schools, and the College President as well as the principal of the high school department of Saint Anthony's College who were involved in this study were approached by the researcher to obtain permission to conduct the study among Grade-7 students.

The respondents' consent indicating their willingness to participate in the study was secured from them by signing in the return slip. All ethical guidelines applicable to the treatment of human subjects in research were observed in all the steps of the study.

The researcher personally administered the questionnaires to the respondents in their respective schools. The questionnaires were collected directly after these had been completed by the respondents. The respondents completed the questionnaires anonymously. It was explained to them that all their responses in the questionnaires will be held confidential and will be utilized only for this study.

Data-Analysis Procedure

The data gathered for this research investigation were treated using the following statistical tests:

Frequency. To determine the number of respondents per school and the number of respondents belonging to each category of the variables as well as mathematics confidence and engagement, frequency was used.

Percentage. To determine the proportion of respondents belonging to each category, percentage was used.

Mean. To determine the mathematics confidence and mathematics engagement of Grade-7 students of the public and private high schools, mean was used.

The computed means were interpreted as follows:

Mean	Description	
	Mathematics Confidence	Mathematics Engagement
1.00 – 1.80	Not Confident	Not Engaged
1.81 – 2.60	Less Confident	Less Engaged
2.61 – 3.40	Moderately Confident	Moderately Engaged
3.41 – 4.20	Highly Confident	Highly Engaged
4.21 – 5.00	Very Highly Confident	Very Highly Engaged

Standard deviation. To quantify the amount of variation or dispersion of the mathematics confidence and mathematics engagement of students, standard deviation was used.

t-test. To determine the significant difference in the mathematics confidence and mathematics engagement as perceived by Grade-7 students classified according to sex and type of school, t-test was used.

ANOVA. To determine the significant difference in the mathematics confidence and mathematics engagement as perceived by Grade-7 students classified according to learning style and teachers' teaching style, the One-Way Analysis of Variance was employed.

Pearson r. To find out the significant relationship between the mathematics confidence and engagement , Pearson Product-Moment Coefficient of Correlation (Pearson r) was used.

All inferential statistics was set at 0.05 level of significance.

All statistical computations were processed through the data SPSS version 20.0.

RESULTS AND DISCUSSION

This section presents the findings of the investigation using both descriptive and inferential data and their respective analyses and interpretations.

Mathematics Confidence of Grade-7 Students Taken as an Entire Group and Classified According to Variables

Means and standard deviation were employed to ascertain the level of mathematics confidence of Grade-7 students taken as an entire group and classified according to sex, type of school, learning style, ICT use, and teacher's teaching style.

Entire Group. As revealed in Table 3, the Grade-7 students in this study are "moderately confident" in mathematics (mean = 3.09, SD = 0.38). A perusal of the table further reveals that 3 (or 1%) are "very highly confident", 40 (or 13.5%) are "highly confident", 20 (or 6.7%) are "less confident", and 1 (or 0.3%) is "not confident" about mathematics.

Table 3

Mathematics Confidence of Grade-7 Students Taken as an Entire Group

Mathematics Confidence	F	%
Very Highly Confident	3	1.0
Highly Confident	40	13.5
Moderately Confident	233	78.5
Less Confident	20	6.7
Not Confident	1	0.3
Total	297	100
Mean	3.09	
Standard Deviation	0.38	
Description	Moderately Confident	

As to Variables. When classified according to sex and type of school, the male and female Grade 7 students, in private or public high school, have moderate mathematics confidence (male: mean =3.09, SD = 0.33; and female: mean = 3.08, SD = 0.41); (private: mean = 3.13, SD = 0.46; and public: mean = 3.06, SD = 0.32). Data are contained in Table 4.

Likewise, when classified according to learning style, the visual, auditory, tactile, and multi-modal learners are "moderately confident" in mathematics (mean = 3.12, SD = 0.42; mean = 3.09, SD = 0.36; mean = 3.06, SD = 0.30; and mean = 3.05, SD = 0.38, respectively). The data are, likewise, contained in Table 4.

As reflected in Table 4, both groups of students classified according to the use of ICT, the frequent and occasional users, have moderate mathematics confidence (mean = 3.11, SD = 0.44 and mean = 3.07, SD = 0.31, respectively).

Moreover, a moderate level of mathematics confidence was noted among the Grade 7 students classified according to the teachers' learning style namely: expert, personal model, facilitator, and delegator (mean = 3.08, SD = 0.36; mean = 3.01, SD = 0.18; mean = 3.11, SD = 0.43; and mean = 3.09, SD = 0.36). Table 4 also reveals the data.

Table 4

Mathematics Confidence of Grade-7 Students Classified According to Variables

Variables	Mean	SD	Description
Sex			
Male	3.09	0.33	Moderately Confident
Female	3.08	0.41	Moderately Confident
Type of School			
Private	3.13	0.46	Moderately Confident
Public	3.06	0.32	Moderately Confident
Learning Style			
Visual	3.12	0.42	Moderately Confident
Auditory	3.09	0.36	Moderately Confident
Tactile	3.06	0.30	Moderately Confident
Multi-modal	3.05	0.38	Moderately Confident
ICT Use			
Occasional User	3.07	0.31	Moderately Confident
Frequent User	3.11	0.44	Moderately Confident
Teacher's Teaching Style			

Expert	3.08	0.36	Moderately Confident
Personal Model	3.01	0.18	Moderately Confident
Facilitator	3.11	0.43	Moderately Confident
Delegator	3.09	0.36	Moderately Confident

Mathematics Engagement of Grade-7 Students Taken as Entire Group and Classified According to Variables

The level of mathematics engagement of Grade-7 students as an entire group and when they were classified according to sex, type of school, learning style, ICT use, and teacher's teaching style were determined by computing the mean.

Entire Group. Table 5 reveals that the Grade-7 students are "moderately engaged" in mathematics (mean = 3.00, SD = 0.50). As reflected in the table, 1 (or 0.3%) are very highly engaged while 62 (or 20.9%) are "highly engaged" in mathematics. Sixty-two (or 20.9%) are "less engaged" and 1 (or 0.3%) is "not engaged" in mathematics.

Table 5

Mathematics Engagement of Grade-7 Students Taken as an Entire Group

Mathematics Engagement	F	%
Very Highly Engaged	1	0.3
Highly Engaged	62	20.9
Moderately Engaged	171	57.6
Less Engaged	62	20.9
Not Engaged	1	0.3
Total	297	100
Mean	3.00	
Standard Deviation	0.50	
Description	Moderately Engaged	

As to Variables. When classified according to sex, both male and female Grade 7 students are "moderately engaged" in mathematics (mean = 3.02, SD = 0.49; and mean = 2.98, SD = 0.51, respectively). The data are shown in Table 6.

Classified according to type of school, the Grade-7 students who are enrolled in private and public high school are likewise "moderately engaged" in mathematics (mean = 3.03, SD = 0.53; and mean = 2.98, SD = 0.48, respectively). Table 6 also reveals the data.

As regards the mathematics engagement of students classified according to learning style, the Grade-7 students who have visual, auditory, tactile, and multi-modal styles of learning are "moderately engaged" (mean = 3.03, SD = 0.52; mean = 3.01, SD = 0.48; mean = 2.88, SD = 0.55; and mean = 2.97, SD = 0.49, respectively).

Data in Table 6 also reveals the mathematics engagement of students classified according to ICT use. Both the occasional and frequent users of ICT are "moderately engaged" in mathematics (mean = 2.90, SD = 0.44; and mean = 3.09, SD = 0.54, respectively).

Classified according the teacher's teaching style, the Grade-7 students whose teachers are expert, personal model, facilitator, and delegator are "moderately engaged" in mathematics (mean = 2.91, SD = 0.51; mean = 3.03, SD = 0.46; mean = 3.08, SD = 0.52; and mean = 2.99, SD = 0.49, respectively).

The data are shown in Table 6.

Table 6

Mathematics Engagement of Grade-7 Students Classified According to Variables

Variables	Mean	SD	Description
Sex			
Male	3.02	0.49	Moderately Engaged
Female	2.98	0.51	Moderately Engaged
Type of School			
Private	3.03	0.53	Moderately Engaged
Public	2.98	0.48	Moderately Engaged
Learning Style			
Visual	3.03	0.52	Moderately Engaged
Auditory	3.01	0.48	Moderately Engaged
Tactile	2.88	0.55	Moderately Engaged
Multi-modal	2.97	0.49	Moderately Engaged
ICT Use			
Occasional User	2.90	0.44	Moderately Engaged
Frequent User	3.09	0.54	Moderately Engaged
Teacher's Teaching Style			
Expert	2.91	0.51	Moderately Engaged
Personal Model	3.03	0.46	Moderately Engaged
Facilitator	3.08	0.52	Moderately Engaged
Delegator	2.99	0.45	Moderately Engaged

Differences in the Mathematics Confidence of Grade-7 Students Classified According to Variables

To ascertain the significance of the differences in the level of mathematics confidence of Grade-7 students when they were classified according to sex, type of school and ICT use, the t-test was used. However when they were classified according to their learning style and their teacher's teaching style, one-way ANOVA was used. Alpha level was set at .05.

Sex. As shown in Table 7, the t-result reveals no significant difference in the level of mathematics confidence when students are classified according to sex (t(295)=0.05, p>0.05). The null hypothesis is not rejected. This result implies that Grade-7 students have the same level of mathematics confidence regardless of the sex.

Table 7

t-test Result on the Difference in Mathematics Confidence of Grade-7 Students Classified as to Sex

Sex	Mean	df	t-value	Sig.(2-tailed)
Male	3.09	295	0.05	0.96
Female	3.08			

Type of school. As to type of school, no significant difference existed in the level of mathematics confidence of Grade 7 students. As shown in Table 8, the t-value (1.46) with df = 295 has a 2-tailed significance greater than 0.05. The null hypothesis is not rejected. This result implies that Grade-7 students have the same level of mathematics confidence regardless of the type of school.

Table 8

t-test Result on the Difference in Mathematics Confidence of Grade-7 Students Classified as to Type of School

Type of School	Mean	df	t-value	Sig.(2-tailed)
Private	3.13	295	1.46	0.15
Public	3.06			

Learning Style. As shown in Table 9, the one-way ANOVA result reveals no significant differences in the mathematics confidence of students when classified according to learning style, F=0.45, p>0.05. Thus, the null hypothesis is not rejected. Thus, the Grade-7 students have the same level of mathematics confidence regardless of their learning styles.

Table 9

One-way ANOVA Result on the Differences in Mathematics Confidence of Grade-7 Students Classified as to Learning Style

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig.(2-tailed)
Between Groups	0.20	3	0.07	0.45	0.72
Within Groups	42.57	293	0.15		
Total	42.77	296			

ICT Use. The frequent and occasional users of ICT did not differ significantly in their mathematics confidence. The computed t-value of 1.08, df = 295 has a probability value greater than the set 0.05 alpha level. The null hypothesis is not rejected. This implies that Grade-7 students have the same level of mathematics confidence regardless of the type of school.

Table 10

t-test Result on the Difference in Mathematics Confidence of Grade-7 Students Classified as to ICT Use

ICT Use	Mean	Df	t-value	Sig. (2-tailed)
Occasional User	3.07	295	1.08	0.28
Frequent User	3.11			

Teacher's Teaching Style. The One-Way ANOVA shown in Table 11 reveals that no significant differences existed in the level of mathematics confidence of students when they are classified according to learning style, F=0.384, p>0.05. Thus, the null hypothesis is not rejected. This result implies that Grade-7 students have the same level of mathematics confidence regardless of their teacher's teaching style.

Table 11

One-way ANOVA Result on the Differences in Mathematics Confidence of Grade-7 Students Classified as to Teacher's Teaching Style

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig. (2-tailed)
Between Groups	0.168	3	0.56	0.384	0.764
Within Groups	42.597	293	0.145		
Total	42.764	296			

Differences in the Mathematics Engagement of Grade-7 Students Classified as to Variables

To ascertain the significance of the differences in the level of mathematics engagement of Grade-7 students when they are classified according to sex, type of school and ICT use, the t-test was used while when they were classified according to their learning style and their teacher's teaching style, one-way ANOVA was used. Alpha level was set at 0.05.

Sex. As revealed in Table 12, the t-result reveals no significant difference in the level of mathematics engagement of students when they are classified according to sex, t(295)=0.62, p>.05. This result implies that Grade-7 students have the same mathematics engagement regardless of sex. The null hypothesis is not rejected.

Table 12

t-test Result on the Difference in Mathematics Engagement of Grade-7 Students Classified as to Sex

Sex	Mean	Df	t-value	Sig.(2-tailed)
Male	3.02	295	0.62	0.54
Female	2.98			

Type of school. A difference in the level of mathematics engagement of the students when they are classified according to type of school is not significant. As shown in Table 13, the t-value of 0.92 (df = 295) has a p-value greater than 0.05. This result implies that Grade 7 students have similar mathematics engagement regardless of the type of school.

Table 13

t-test Result on the Difference in Mathematics Engagement of Grade-7 Students Classified as to Type of School

Type of School	Mean	df	t-value	Sig.(2-tailed)
Private	3.03	295	0.92	0.36
Public	2.98			

Learning Style. As shown in Table 14, the One-Way ANOVA result reveals that no significant differences existed in the mathematics engagement of students when they are classified according to learning style, F=0.72, p>0.05. Thus, the null hypothesis is not rejected. This result implies that Grade-7 students have similar engagement in mathematics regardless of the learning style.

Table 14

One-way ANOVA Result on the Differences in Mathematics Engagement of Grade-7 Students Classified as to Learning Style

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig. (2-tailed)
Between Groups	0.55	3	0.18	0.72	0.54
Within Groups	74.22	293	0.15		
Total	74.77	296			

ICT Use. A highly significant difference was noted in the mathematics engagement of Grade-7 students when they were classified according to their ICT use, t(295)=-3.28, p<0.01. Thus, the null hypothesis is rejected. The data are contained in Table 15.

The frequent users of ICT are more engaged in mathematics than the occasional users. Their exposure to ICT enabled them to explore math problems, math funs as well as math games and puzzles. They find using the internet helpful in doing their math tasks. They even resort to math tutorials in the internet for their assignments.

Table 15

t-test Results on the Difference in Mathematics Engagement of Grade-7 Students Classified as to ICT Use

ICT Use	Mean	df	t-value	Sig. (2-tailed)
Occasional User	2.90	295	-3.28*	0.001
Frequent User	3.09			

*p<0.01

Teacher's Teaching Style. As shown in Table 16, the One-Way ANOVA result reveals that no significant difference existed in the mathematics engagement of the students when they are classified according to learning style, F=2.034, p>.05. Thus, the null hypothesis is not rejected. This result implies that regardless of their teacher's teaching style, the Grade-7 students have similar engagement in mathematics.

Table 16

One-way ANOVA Results on the Differences in Mathematics Engagement of Grade-7 Students Classified as to Teacher's Teaching Style

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Sig. (2-tailed)
Between Groups	1.525	3	0.508	2.034	0.109
Within Groups	73.246	293	0.250		
Total	74.771	296			

Relationship Between Mathematics Confidence and Mathematics Engagement of Grade 7 Students

This investigation likewise ascertained the relationship between the mathematics confidence and engagement of the Grade 7 students.

Result of Pearson r revealed a highly significant positive relationship between the students' mathematics confidence and engagement (r=.447, p<0.01). The null hypothesis is rejected. Table 17 presents the data.

This result implies that students who are more confident about mathematics showed better opportunities and involvement in doing mathematics related activities.

Table 17

Pearson r – Result on the Correlation Between Students' Mathematics Confidence and Engagement

	Mathematics Engagement	
	r-value	Sig. (2-tailed)
Mathematics Confidence	.447**	0.000

** p<0.01

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

This section presents the summary of findings, conclusions and recommendations of the study.

Summary of Findings

The findings of the study are summarized as follows:

1. The Grade 7 students are "moderately confident" about Mathematics when they were taken as an entire group and when they were classified according to sex, type of school, learning style, ICT use and teachers' teaching style.

2. Taken as an entire group and when they were classified according to sex, type of school, learning style, ICT use and teachers' teaching style, the Grade-7 students are "moderately engaged" in Mathematics.

3. No significant difference existed in the mathematics confidence of Grade-7 students classified according to sex, type of school, learning style, ICT use and teachers' teaching style.

4. A significant difference was noted in the Grade-7 students' level of mathematics engagement when they were classified according to ICT use. However, no significant difference existed in the mathematics engagement of the students classified according to sex, type of school, learning style and teachers' teaching style.

5. A highly significant positive relationship existed between mathematics confidence and engagement of Grade 7 students.

Conclusions

In view of the foregoing findings, the following conclusions were drawn:

1. Mathematics seems not so easy. Much of the respondents' worries are centered on Mathematics than any other subject and they feel less naturally good at it. They are less comfortable doing mathematics that even if they worked hard, they still find learning new things in Mathematics difficult.

2. The Grade 7 students sometimes get involved in mathematics related activities like math contests and joining math organization in school and math camp. From time to time, they consult the internet for some math assignments and make notes to help them understand and remember when studying mathematics. Their participation in classroom discussion is somewhat limited.

3. Regardless of sex, type of school, learning style, ICT use and teachers' teaching style, students exhibit the same level of confidence in mathematics.

4. The Grade-7 students who are frequent ICT users are more engaged in mathematics than those students who are occasional ICT users.

Sex, type of school, learning style and teachers' teaching style do not influence the students' mathematics engagement. Students, regardless of sex, type of school, learning style and teachers' teaching style, exhibit the same level of engagement in mathematics.

5. The students' engagement in mathematics is dependent on their mathematics confidence. The more confident they are about mathematics, the more engaged they become in performing math-related tasks and activities.

Recommendations

Based on the findings and conclusions drawn, the following are some recommendations:

1. Inasmuch as students' confidence and engagement in mathematics are at a moderate level, school administrators should be highly supportive of the needs of their teachers. Training programs may be designed and conducted to strengthen mathematics teachers' skills and competence in order to provide an environment that encourages attentiveness and participation.

2. Mathematics teachers should develop confident learners who are able to work independently by acknowledging all students' contributions positively, encouraging learning from their mistakes, welcoming students' wrong answers as springboard to new understanding, and encouraging independent and small group discussions.

3. It is likewise recommended that mathematics teachers should develop other strategies that could work to engage students. They should foster a supportive environment in which students work together, discuss ideas and turn to each other for help. They should present problems based on real life and value the students' varied solving-problem approaches and strategies.

4. Parents should endeavor to create a wholesome family relationship at home so that children experience a sense of relatedness which they can carry over to their relationships with teachers and other students in the classroom.

5. A similar study may be conducted to validate and strengthen the findings of the present investigation.

6. There is a need for research on how students' engagement and confidence in mathematics relate to their performance.

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