2021

2C-2I-1T Pedagogy: Effect on Pathological Fear and Problem Solving in Mathematics

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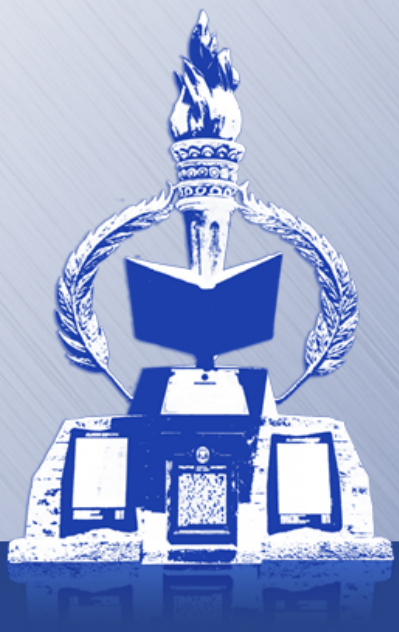

Online Commons Citation

Morano, A. M. B., & Fortes, E. C. (2021)
2C-2I-1T Pedagogy: Effect on Pathological Fear and Problem Solving in Mathematics
(Master's Thesis, Philippine Normal University)
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2C-2I-1R PEDAGOGY: EFFECT ON PATHOLOGICAL FEAR AND PROBLEM SOLVING IN MATHEMATICS

A THESIS

Submitted to
The College of Graduate Studies
and Teacher Education Research
Philippine Normal University

In Partial Fulfilment
of the Requirements for the Degree
Master of Arts in Education with specialization in Mathematics Education

by

Ann Michelle B. Morano

APPROVAL SHEET

This thesis entitled "**2C-2I-1R PEDAGOGY: EFFECT ON PATHOLOGICAL FEAR AND PROBLEM SOLVING IN MATHEMATICS"** prepared and submitted by **ANN MICHELLE B. MORANO** in partial fulfillment of the requirements for the degree of **Master of Arts in Education with Specialization in Mathematics Education**, is hereby recommended for approval and acceptance.

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ACKNOWLEDGEMENT

This part is the most special element of this thesis because of the opportunity to thank all the people who journeyed with the researcher on the road to another milestone. This accomplishment would not have been possible without the help, inspiration, and motivation provided by the following who served as beacon of light. Gratitude is expressed to the following:

First and foremost, to the Almighty God for providing strength and will power to finish this thesis despite the different challenges and obstacles met along the way. God has been ever present, in spite of demotivation and weakness. He is worthy of all the honors and praises for showering blessings that are more than needed;

The beautiful family, Jerson, MJ, and Biboy who serve as a lighthouse during the darkest hours, for always being there in times of needs, for unending love and support that pushed her to pursue goals and believed that she could overcome the different challenges encountered; and

To the thesis adviser, Dr. Erminda Fortes, for the guidance throughout the study, for the suggestions and insights that contributed a lot in the completion of this paper, for the patience and expertise given in editing the drafts. She never failed to accommodate the researcher and gave constructive feedback to improve more the research paper.

To the panelists, Dr. Adonis David, Dr. Rene Belecina, Dr. Rosie Conde and Dr. Arlyne Marasigan, for all the constructive criticisms and for being kind during the oral defense.

Gratitude is the memory of the heart.

AMJ

ABSTRACT

NAME:	Ann Michelle B. Morano
TITLE:	2C – 2I – 1R pedagogy: Effect on pathological fear and problem solving in Mathematics
KEY CONCEPTS:	2C- 2I- 1R pedagogical approaches, pathological fear, problem solving, parental indoctrination, teacher factor, abstract nature
DEGREE:	Master of Arts in Education
SPECIALIZATION:	Mathematics
ADVISER:	Dr Erminda C. Fortes

The main purpose of this study is to determine the effect of 2C-2I-1R pedagogy on pathological fear and problem-solving performance of senior high school students in Mathematics. The study utilized a quasi – experimental design specifically the pretest - posttest comparison-group design. Instruments used were pretest on problem solving, posttest on problem solving, and an adopted questionnaire on pathological fear. Two sections taking General Mathematics for the second grading of the first semester of the SY 2019- 2020 with 20 students each were the participants of the study. Both pretest and posttest on problem solving were developed by the researcher and validated by a panel of experts and were pilot tested. Each test was composed of 10 – item problem solving about General Mathematics. The study was implemented for 10 weeks and was guided by the prepared lesson plans and school calendar. To support the claim that the use of 2C – 2I –

1R pedagogical approaches was better than the regular classroom instruction, the means of the posttest of the experimental and control groups were compared using the analysis of co variance. The result showed significant effect in all outcome variables, revealing that the use of 2C – 2I – 1R pedagogical approaches could improve the performance in problem solving and could lessen the pathological fear of the students.

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THE PROBLEM AND LITERATURE REVIEW

Background of the Study

Transfer of knowledge in Mathematics contains facts, skills, and procedures that range from simple to complex. These knowledge and skills are essential in building concepts used in constructing strategies in solving math problems and developing appreciation towards it (Ernest, 2010). Mathematics started in Egypt and Babylonia, and not considered a formal discipline; rather, it was regarded as a technique in giving solution to the daily problems that people encountered. (Burton, 2007). Overtime, evolution took over Mathematics and it developed and advanced into enormous and broad knowledge, taught without any association to solving real world problems.

With an end goal to give a topnotch training, schools have underlined the inclusion of problem- solving skills into mathematics curriculum. Ongoing ways to deal the instructions emphasized problem-solving that needs critical thinking which is fostered by understanding, discovery of patterns, experimentation, testing of theories, and dynamic looking for arrangements (Adiguzel & Akpinar, 2006). Problem solving that requires critical thinking expects learners to utilized their metacognitive capacities effectively and develop long lasting skills. One of the twin goals of Mathematics in the basic K to 10 curriculum is problem solving (K to 12 Curriculum Guide, 2013). It is one of the 21st century skills that should be developed among the learners. However, based on the experience of the researcher as mathematics teacher, one of the areas where students find difficulties is problem solving. The Common Core Standards in Mathematics emphasized

the significance of conceptual understanding as a vital segment of mathematical ability; however, many students experience failure in this area which is considered essential in solving problems(Wiggins, 2014) .

One of the most powerful weapons a teacher can use is the pedagogical approach employed inside the classroom. As time passes by, new curriculum has been developed, accompanied by the methods and approaches that unleash the maximum potential of the learners. An effective pedagogy, if implemented consistently, foster greater outcomes across the curriculum regardless of age, academic population, and test scores (Entz, 2006).

Furthermore, one of the features of the K to 12 basic curriculum is its framework, supported by different learning principles such as inquiry based learning, cooperative learning and discovery, constructivism, reflective learning, and experiential and situated learning (K to 12 Curriculum Guide, 2013). This feature can be linked to an act known as Enhanced Basic Education Act of 2013, which stated under section 5(e) that, "The curriculum shall use pedagogical approaches that are constructivist, inquiry – based, reflective, collaborative and integrative (2C- 2I- 1R)." The act was supported by Department of Education- CALABARZON through a regional memorandum no. 11 s.2015 which states that the use of 2C – 2I – 1R pedagogical approach should be implemented inside the classroom. This approach helps foster a positive learning environment and helps teachers to find ways on how learners get excited about their learning. Since this approach

promotes a positive learning environment, the fears of the learners in solving mathematics problems tend to decrease.

As observed by Hewson, students have difficulty in performing critical thinking in problem solving due to over procedural thinking; consequently, they find it hard to interpret mathematical meaning in connection to real world situations because they lack the capacity to make approximations or estimations, and there is absence of problem solving skills, training, confidence, and interest (2011).

Another observed characteristic of students is their fear of solving problems in Mathematics or their anxiety. Mathematics anxiety has been identified with negative mentalities towards mathematics, mathematics avoidance, level of mathematics accomplishment, absence of confidence in solving mathematics problems, and negative school encounters (Bursil&Paznokas,2006). Several studies showed that many students have negative attitudes towards mathematics; hence, they considered it as the least liked subject. The fear of Mathematics is an issue in classrooms across nations around the world that compromises both accomplishment and interest of students (Cavanaugh, 2007).

On the other hand, pathology refers to the study and diagnosis of different diseases by examining the organs, tissues, and bodily fluids, whereas fear can be described as emotional response to threats (Tobias,1993). Then pathological fear in mathematics is a behavior disorder in which an individual cannot resist the impulse to fear mathematics (Amazigo, 2000). In addition, the phenomenon of mathematics anxiety is referred as

Mathemophobia or Mathematics Pathological fear in mathematics, an academic disease whose symptoms are expressed always in the faces of learners in mathematics class; it is communicable and usually is distributed to sciences that are mathematics related (Stephen, 2007).Meanwhile, factors such as duration, intensity, and frequency classify such fear as normal, adaptive anxiety, abnormal anxiety, and pathological. When the intensity, duration, and frequency of anxiety become distressful and chronic that it interferes how a person functions, it is referred to as pathological already (Jakofsky, 2015).

Negative impressions and sentiments could be noted as Pathological Fears and may prompt unhappiness, demoralization in students and in the long run influence their academic standing (Ho et al., 2000). One of the primary reasons why students are not good in problem solving is their mathematics pathological fear (Murr, 2001). Pathological fear in students specifically block the value they place on mathematics and their certainty that they can do mathematics; but the implementation of strategies that could prevent or reduce pathological fears on mathematics help improve mathematics achievement for many students (Geist, 2010).

Performance on problem solving is an important matter since past research studies have observed that performance on problem solving is affected by personal efforts, time management, peer interaction, environment, and teaching styles (Sansgirynet,al., 2006). Gravalia (2004) noted that the success of learner's performance relies upon effective studying and motivational strategies.

Furner (2006) revealed that pathological fears in mathematics are major predictors of performance in problem solving; thus, students with lesser degree of pathological fears are able to perform better. Learners are most likely to involve themselves fully in school-based learning activities if they believe in their capacity to perform well and place high value on doing well in school activities (Wigfield et al., 2004).

According to Garderen (2006), numerous learners were struggling to finish mathematics tasks especially in problem solving despite the fact that learning mathematics is important in daily life. One cause of this, as Ashcraft (2002) found out, is fear being one of the main reasons why students do not like mathematics. Struggling in solving problems and manifesting fear when doing so are also some of the observed behaviors of the Grade 11 Senior High School students in Cotta National High School, especially in General Mathematics, one of the core subjects in Senior High School. One important competency of this subject is problem solving. However, based on the result of the division consolidated test results in Lucena City, problem solving was included in the least mastered skills with only 35% of mastery index, needing an additional 40% more to be able to meet the national standards. Consequently, the ability of the teacher to choose the appropriate approaches to connect to the learners and engage them in pursuit of quality education is very much needed (Jacobs, 2006). Since the researcher often observed the tension and fears of the students, she attempted to investigate if the use of 2C-2I-1R pedagogical approach could lead to

higher performance in problem solving to lessen the perceived pathological fears of learners in mathematics.

Literature Review

A thorough review and analysis of existing local and foreign literature and research studies of significance to the topic were done to serve as the foundation of the study. This section purports to elucidate the variables such as 2C 2I 1R Pedagogical Approaches, Pathological Fears, and Problem- Solving Skills. The researcher provided synthesis to provide a clear understanding of the basis and rationale for the development of this research.

On 2C2I1R Pedagogical Approaches

Pedagogy refers to the interaction between teachers, students, learning environment, and the learning tasks. It is manifested by how the teachers and students relate together in the field of instructional approaches used in the classroom. A compelling instructional pedagogy can prompt academic accomplishment, social and emotional improvement, acquisition of specialized abilities, and general capacity to contribute to society (Brook, 2013).

Lavy (2011) likewise averred that the utilization of teaching practices enriching learners with analytical and critical skills had an exceptionally enormous constructive

outcome. The study claimed that conventional and modern teaching practices are not necessary rivals, but can co- exist in the same school if properly focused at learners of varying capacities.

Taking into consideration the different contributions of practitioners, the current study noted the various learning pedagogies useful even in recognizing the limitations and meeting the needs of the learners (Hood, 2017). However, pedagogies are not one-size-fit-all solution to classroom instruction, since the diversity of learners must be taken into account in choosing the approach. Therefore, choosing the right pedagogy to use in the classroom is essential in molding the learners to bring out expected outcomes. Considering that the development of each learner is not constant, several approaches must be employed to make them achieve their full potential and meet success along the way.

For better implementation of the Enhanced Basic Education Curriculum in all grade levels, the 2C-2I-1R Pedagogical Approaches, which stand for collaborative, constructivist, integrative, inquiry –based and reflective, are crafted as prescribed in RA10533 to foster information skills, learning and innovation skills, communication skills, and life and career skills. Said approaches contains five core strategies-- Collaborative, Constructivist, Inquiry Based, Integrative, and Reflective approaches (RM No.233 s 2016) whose description, evaluation, and outcomes are intertwined.

On Collaborative Approach

Collaborative learning is defined as a situation where two or more learners attempt to make new learning together (Chatti et al., 2012). Furthermore, it is an instructive way to deal with educating and discovering that includes groups of students who are cooperating to solve a problem, complete a task, or create a product which depends upon the consensus building through working together by group members, rather than rivalry, in which individuals best other group members.

It has three major elements, which include scales of participation, learning context and methods of collaboration. Scale participation refers to the size of participants, grouped in pair, small group, class, or society. Meanwhile, learning context could be found within a formal context or joint problem solving, in which learning is a side effect that can be measured through the performance that is improved and the knowledge that is gained. Lastly, the methods of collaboration can range from asynchronous communication to synchronous or co–location collaboration that can trigger activities such as explanation, disagreement, and mutual regulation (Laal & Laal, 2012).

Furthermore, cooperative learning method is one of the most effective and systematic ways of enhancing students' achievement by helping secure the retention of knowledge (Tay, 2016). Through this approach, learners collectively improve their performance through the help of their co – learners who share knowledge in order to

complete the required task. In addition, “cooperative learning is considered as the most productive practice in the field of education” (Johnson, 2010). It is realized when learners work hand in hand in order to obtain a common goal.

There are two identified forms of collaborative participation. First is the normal social participation and the second is the new informatics participation. The normal social participation takes place in the classroom setting where learners occupy the similar place and involve in a face to face social interaction. Moreover, mobile devices and gadgets add a new social dimension of participation that does not require a face to face interaction but still requires working together towards a common goal. This is considered as the new informatics participation (Clough, 2009). In addition, collaborative learning is categorized as a form of social interaction in the span of learning process that also provides an extra platform for coordinating formal and informal learning environment during the learning process (Schaper, 2012).

Letting the students work in groups for collaborative learning allows them to share ideas and learning experiences that help promote the learning performance of the group as well as of the individuals (Wang & Hwang, 2012). It is indicated that the group members’ learning styles greatly affect peer interactions in collaborative learning activities (Adan-Coello, 2011).

Collaboration is additionally engaging, since it incorporates a wide range of mediums like video cuts, texts, photographs, music, reenactments, and animations that are traded during shared versatile learning meetings (Kopler, 2009). One significant point of view is improving the mobile environment with multimedia resources like video, audio, images, simulations, and animations. Through the utilization of multimedia inputs, users access artifacts to clarify their perspective effectively and easily in a setting of collaborative learning (Reis, Bonacin,& Martins, 2009). Finally, it is revealed in the study that collaborative learning style is useful to attain success in doing group classwork assignment (Fakomogbon, 2017).

Based on presented studies, the use of collaborative approach brings strong impact to the learning and transfer of knowledge from the teacher to the learners. It can be concluded that this approach could lead to success if properly implemented; however, caution must be observed especially in assigning task to the learners since it involves interaction with others and the degree of responsibility an individual learner can contribute towards the progress of the group task.

On Constructivist Approach

The ultimate goal of education is to make lifelong knowledge useful to the learners. Through provision of meaning to knowledge gained, constructivist approach provides concrete guidance in education to make students learn effectively without merely

memorizing the concepts. Constructivism is a concept which is related closely to epistemology; however, as a theory of teaching, it is the approach that observes how people learn (Arslan, 2007). Individuals who embraced constructivist approach did not think that knowledge is an absolute reality; instead, this is created from within and not taken from external source. As individuals make knowledge themselves, it does not carry any intrinsic accuracy.

The learning environment of constructivism requires students work that is intrinsically motivating to them; learners reaching a certain level of self-directedness; and teachers who provide support (scaffolding), context, relevance, and constant feedback (Hood,2017). Learners are encouraged to build on previous knowledge, critically think and reflect, and cascade the information gained independently and in small groups in a constructivist environment. The teachers' duty is to facilitate and guide as students increase their capacity in becoming responsible for both the content and process of learning. Since grading is changed by self and peer evaluation, it increases the learner's motivation to be self- directed in long term (Furtak, 2012).

This far, evidences presented suggest that constructivist approach makes student engagement in active learning activities increase. It also increases the affectivity of the transfer of knowledge among disciplines, and it encourages the development of long term memory retention (Chinn, 2007).

Constructivism has five basic principles with regard to the teachers' roles. They seek and care about learners' viewpoints, construct lessons that challenge students assumptions, are aware that students need to make addition regarding the curriculum, construct lessons around great ideas, and do not evaluate students' learning separately (Richardson, 2013). Meanwhile, a constructivist lesson involves three well accepted components: students construct meaning on their own; new learning is constructed based on prior knowledge; and learning is summarized through social interaction. These principles must be considered to bring meaningful learning to students' awareness (Unal, 2010). Teachers have important role in the constructivist approach where the core of the system is always the learner (Bryant, 2013). Teachers do not directly involved themselves in the transfer of information to the learners; rather, they only serve as a guide who helps learners in reaching different fragments of information, thus constructing it along the process.Likewise, regulation of academic environment, which is not similar to the traditional classroom environment, is required in a constructivist environment.

In addition, the constructivist environment must be in a relaxed manner without being under any pressure. Learners can use freely their past ideas and experiences acquired through a variety of sources. Learners can work on real life problems through research and interrogations. Learners can teach outside the classroom where they are responsible for their own learning. These result to a positive influence on students' academic achievement; thus, learning is realized in a high level of efficiency and durability (Taspinar, 2012).

The importance of this approach has been well-recognized in the teaching–learning process, showing positive effects of constructivist approach on academic achievement, attitude, scientific process skills, persistence, motivation, and critical thinking, and high effect size on students' academic achievement in different lessons and subject area. This is the reason why constructivist approach is applicable in almost all areas (Aktas, 2013). However, after studying the effect of constructivist approach on students' academic achievement according to educational level, it is determined that the highest effect size was found for college and high school levels (Ayaz, 2015). So, it can be deduced from the following studies that the use of constructivist approach is no longer new.

Also, different studies proved the importance and effectiveness of this approach since the learners involve themselves in constructing and making new learning through the use of their prior knowledge. This is done alongside other approaches since learners can seek the help of their classmates and teachers in making meaning. The use of constructivist approach is not limited with one subject area, as it is proven to improve variety of skills such as critical thinking, scientific, process, and even attitude. Nevertheless, this approach may work best to mature learners because the learners are the ones who are responsible for their own learning.

On Inquiry Based Learning

Inquiry-based learning (IBL) is often associated with the adage, 'Tell me and I forget, show me and I remember, involve me and I understand' (Escalante, 2013). Several

instances showed that the process of IBL is related directly to the steps of the scientific method. It has four different inquiry stages where learners, classified as novice to expert, can accomplish the stages involved--confirmation, structured, guided, and open. Confirmation is for novice problem solvers since it requires maximum teacher guidance. This stage is described as a method rather than a pedagogy. The second stage, which is the structured inquiry, allows for inquiry with unknown results to answer; however, process and questions are often pre-determined by the teacher. In guided inquiry, more agency is offered rather than a process in finding an answer to a pre-determined question. In this stage, teachers continuously guide learning and give feedbacks in the course of inquiry. In the last stage, which is the open inquiry, the method of student processing reaches an expert level where they act like scientist as they derive questions, design and carry out investigations, and communicate the result (Banchi& Bell, 2008). In this approach, learners propose their own question, complete an investigation, and identify the present previously unknown result or answer with the minimal guidance from the teacher.

Furthermore, this is the approach that utilizes the innate curiosity of the learner in exploring new information that is meaningful. In this process, the learners select a topic or question, explore multiple sources of information with the intention of finding a support regarding a certain perspective, share discoveries with other, then finally reflect on the process as a whole. Its nature is a cyclical process. It also enhances the learners' subject knowledge, writing, and motivation to read (Chu, 2011).

In the study conducted by (Smith, 2016), it is revealed that the greater skills in mathematical reasoning can be obtained through inquiry learning. It also becomes the most recommended approach in science education; however. it is not a common practice yet in K – 12 classrooms (Zhou, 2017). Inquiry based teaching has several underlying approaches including student – centered, student – investigation, hands-on activities, and the use of models. It leads to enhancement of students' "metacognition" and argumentation that assist in developing and improving students' positive attitude towards a certain subject area and maintain their motivation and engagement in the subject (Areepattamannil, 2012).

If teachers actively guide the learners in the context of inquiry-based learning, a meta-analysis report confirmed that there is a positive effect on student learning achievement. (Iverson, 2012). In addition, it also demonstrated that learners who use this approach to problem solving achieve higher grades and experience overall success (Hugerat&Kortam, 2014). They also found out that IBL classes had better grades and higher retention in mathematics courses.

On Integrative Approach

Integrative learning requires students to blend perspectives (Newell, 2007). It refers to integration of courses across curricula and establishing connection of new knowledge to prior knowledge. It is an instructional design that encourages learners in making connections between curricular content and career expectations, understanding the need to

have an in-depth knowledge from different disciplines, and engaging holistic approach in solving complex problems not only in school but also in daily living (Wingert,2011).

However, according to Wissenschaftskommission(2008), the focus is on the interchange, effective complementation, and change of methods in the sense of an overall concept. Integrative means more than an "enrichment" or "mixture", as the blended learning approach implicitly expresses; but it also entails connecting one field to other aspects so that these connections can attribute to the real world.

Moreover, integrative learning provides a real world example so that learners can examine social aspects further. Learners appreciate active learning though they found it more challenging compared to the regular classroom method that they experienced (Singer, 2015).

Integrative course design places on metacognition, broad content-based composition, embedded skills and strategy instruction, often offered in a "just-in-time" fashion. These methodologies take after practices recognized in writing on top notch postsecondary education and instruction and students in their incorporated formative course had more grounded result and better execution on evaluative measures comparative with peers and stand alone (Bickerstaff, 2017).

On Reflective Approach

Students learned better when lessons are integrated with their own learning process by structuring what they learned (Akyildiz, 2016). This makes reflective teaching play an important role in monitoring learners' own learning processes.

During the reflection interaction, students need a safe avenue where their mistakes would be acknowledged and they can demand help. In that avenue, the irregularities in performances and mindset could be uncovered decisively. However, people perceive themselves by getting coordinated with their own learning cycles and they could help others to do likewise (Larrivee, 2010).

Reflective reasoning is one of the central points of pragmatic philosophy pioneered by Dewey, who believed that reflective thinking is "effective, consistent, and careful thinking of any thought or information and information structure supporting to reach aimed results." Current encounters make learners rearrange or develop this during the time spent in the process of doing so. Thus, meaningful experiences affect realization of subsequent experiences. That interaction starts with the recognizable situation that continuously becomes a cycle because of the enumerated things that can be done about the situation, making future plans for the implementation and explaining what has been done (Başol & EvinGencel, 2013).

There are three types of reflection: reflection in action, reflection on action, and reflection for action. Reflection in action means the reflection process occurring during the execution of the action; while reflection on action means behaviors after finishing the action and reflection process on thoughts; however, reflection for action is explained in a way that individuals think unexpected experiences gained from actions as a new way for new situations (Gencel, 2018). Reflection includes criticizing the assumptions about problem solving or content. One of the barriers in reflective thinking is the perception of habits or behaviors not requiring thinking as reflective instrument.

The reason why an individual behaves the way they are and perceive feelings and thinking that they act upon is because of top level reflection, also referred as main reflection (Kember, 2008). Reflective thinking is associated with self-directed learning because it gives individuals a chance to think over the strategies done before, and ask themselves if they choose the correct action this time.

On Problem Solving

Mathematical problem solving is an essential aspect of the new mathematics curriculum; thus, there is a need to equip the students properly to go on with such problems. However, based on the study conducted by Bradshaw (2016), students' frustrations and serious need to track down a particular answer restrain their ability to investigate completely the problem posed, thus overlooking vital aspects needed to solve the problem

set. One thing that teachers must develop among learners is their passion in solving problems since it gives them freedom and non-routine behavior.

Moreover, learning is not a singular objective one must obtain; rather, it must be developed and broaden to be able to enrich the learners' skills and personality (James, 2011). This must be the perspective in solving problems since it is accepted already that there are different ways in solving; and the more it is practiced, the broader is the knowledge assimilated.

Learners must be able to solve problems because it is part of the development of human competencies (Subahan, 2007). Mathematics is seen as language since it is the basic way to survive in daily life, and the heart of life is problem solving. It is the most important competency that can be derived from this discipline since it is both theoretical and practical in nature.

It is shown that difficulties in mathematics are caused by failure to understand and retrieve concepts, formulas, facts and procedures. Likewise, learners lack the ability to visualize mathematics problems and concepts. Aside from these, error analysis revealed that learners find difficulty in arithmetic and procedure knowledge as a result of weak conceptual understanding (Latha, 2007). Nevertheless, based on the findings of the study conducted, understanding the difficulties faced by the learners in any area could provide a guideline for teachers to plan better approaches and effective teaching methods (Pelajaran, 2010).

Low problem solving scores seem a result of an impeded transfer of subject – specific knowledge and skills characterized by low levels of math – science coherence (Scherer, 2014). To address the issue, different pedagogies are taught to improve the transfer of knowledge to the students. Technique builds student engagement and develops authentic problem – solving skills (Flynn, 2017). Moreover, problem solving is one of the competences that teachers pass on to students in school, especially when dealing with mathematical problems. Hence, when learners encounter a variety of difficulties, teachers find ways to meet their needs in this area by trying out pedagogical approaches proven to work well in the classroom.

Mizell (2015) stressed the need to prepare students with skills for the 21st century. He strongly believed that new skills need to be developed for the students to be ready for global workforce due to the increased globalizations and innovation in technology. Accordingly, the Pacific Policy Research Center reported that some of the 21st-century skills include mathematical literacy, critical thinking, creativity, and problem solving. He contends that mathematics is very important because major public issues all depend on data, projections, inferences, and the kind of systematic thinking that is the crux of quantitative literacy.

On Pathological Fears

People who fear math greatly tend to avoid any elective coursework related to mathematics or any major subject that has something to do with math, and this affects the

future career choice they make (Krause, 2007). There is no defined origin of math fears, although some attribute them to several factors such as parental anxiety and teachers who show anxiety while teaching mathematics (Furner& Duffy, 2002).

Based on the findings of Cadorna (2013), fears and anxiety among students are fostered during the search for the solution of a given math problem, when learners are taking exam, and even when they simply think mathematics. In the investigation about the mathematics anxiety of secondary students, the performance of the students was found to have a bearing on their level of fear. Furthermore, both interest and self-efficiency were found to be correlated significantly with mathematics anxiety.

Math anxiety among students are fostered mostly when learners use conventional curriculum that focuses on the mastery of basic skills than when using non- conventional curriculum that employs real life situations and group work (Swars, 2010).

Alexander (2010) considers fear in mathematics as a feeling of tension that affects students' accomplishment of mathematical tasks especially in solving mathematical problems. This kind of fear manifests itself by worry, high negative emotions, perspiring palms, or an increasing beat of the heart, all symptoms of pathological fear.

Pathology is a scientific study and diagnosis of disease through examination of organs, tissue, bodily fluids, and the whole body, whereas fear is an emotional response to threats and danger. It is a basic survival mechanism occurring in response to a particular

stimulus, which in this study could be mathematics tests or examination, and class discussion (Rossnan, 2006).

Yahya (2012) also found that pathological fear in Mathematics is very real and it frequently occurs among secondary school students. Mostly, these fears develop inside the classroom due to the lack of consideration of the different learning styles of the students. Second, pathological fear is one factor that contributes to the persistent failure in mathematics. It is reiterated that pathological fear develops due to parental indoctrination, abstract nature of mathematics, and teacher's use of inappropriate methodology.

On Parental Indoctrination

Parental expectations and belief about education and curriculum may gain a negative impact in the life of the students, especially when it comes to their views and opinions regarding mathematics (Scarpello, 2007). Often negative parental attitude and beliefs are passed on from parents to children, resulting to poor academic achievement. Rown – Kenyon (2012) further explained that parental support is crucial in improving the self-efficacy of the learners; thus, the lack of support in academic and family setting increases the chance of math anxiety in students.

Some parents indoctrinate their frustrations about difficulties in mathematics and the value that mathematics is not considered a requirement or important for the course they want to do. Some parents tell their children their hatred or fears about mathematics when they were still studying. With those experiences, some learners imitate the behavior fostered by their

parents; thus, they also dislike and develop frustrations towards mathematics. According to Maduabum (2008), parents serve as one of the contributor sin developing fears in mathematics among students. To increase parental support to the learners so that they achieve academic success, several activities are suggested, which include parental education and workshops. In doing so a more positive home environment could strengthen academic support (Gillen-O'Neel, 2011). Parents' mathematics attitude significantly predicts students' attitudes toward mathematics (Schoeder, 2017). Cadorna (2015) seconded this claim, saying that to overcome the fear in math, parental support, encouragement, and motivation are needed by learners. Parents should make room to let their child feel that mathematics is enjoyable and can be applied to everyday life situation.

On Teacher Factor

The importance of teachers in the academic performance of the students is established firmly in the academe. They interact with students through their teaching so they can adopt different teaching strategies. More active teaching approaches, which differ from traditional approaches, may have positive effect on students' progress in math (Bietenbeck, 2014),

However, according to Wadlington (2008), intense feeling of anxiety to understand and do math is the result of a students' previous negative or embarrassing experiences with math or a math teacher. Teachers who struggle personally with fear and anxiety related to

math passed on these fears to their learners (Beilock, 2010) . Thus, teachers can be considered as one of the factors that contribute to students' fear inside the classroom.

Meanwhile, Bekdemeir (2010) explained that majority of math anxious individuals report fear onset and hatred of math to a negative experience with a hostile or inadequate teacher during elementary school. Research findings showed that even teachers must be encouraged to explore their own math anxiety as the first step in creating a stress-free and positive classroom environment. Several studies that assess the impact of different teaching styles on students' learning in mathematics could provide insights about teachers' own fears in mathematics. For example, one study concluded that one cause of avoidance of mathematics was having a teacher who conveyed a high demand for correctness in the subject. Malooney (2015) said that fear in learning mathematics may be transmitted. Since students can influence the opinion of others as regards fear in mathematics, they can persuade others to share the same fear they have experienced.

Nevertheless, the teachers can do a lot in helping the students overcome their fear of the subject. Varied ways can be implemented to boost the learners' interest in class, establish the confidence of their students, and make math easier to understand. Also, teachers may apply suitable teaching strategies where students can learn most effectively (Cardona, 2015).

On Abstract Nature of Mathematics

Math curriculum that does not provide conceptual understanding but focuses on the acquisition of superficial knowledge and computational skills results to learners who easily forget what they learn and feel frustration continuously (Geist, 2010) because of the absence of their capacity to understand the reason behind doing mathematics. If traditional mathematics curriculum is replaced with different interventions and activities such as group work, open discussion, real life application, and group or peer assessment, the anxiety provoked in the classroom environment could lessen (Willis, 2010). Likewise, concrete examples provided through proper abstraction can make both teachers and students improve how they concretize different abstract ideas of the students. Experimentation provides a great help to make students become familiar on how they can solidify their abstract concepts (The Conversation, 2018).

The exact point where math jumps off the track is when concrete things grow to the entirely abstract manipulation of symbols that correspond to nothing that can be touched—or even conjured in the mind—is where math anxiety and failure begin. At this point, the connection between mathematics and real life scenario lose its linkage to the eyes of the learners. Mathematics becomes a mere procedure and memorization of formulas that make this subject a common area of failure (Brenner, 2011).

Synthesis

Pedagogies and techniques employed inside the classroom are methods used to transfer learning to students. There are different types of learners who also are in their own phase when it comes to understanding. So, these should be considered by the teachers in choosing the right pedagogy to use.

On the other hand, another important consideration in choosing the best pedagogy is the topic, instruction, or area to be delivered. Based on the different studies cited, problem solving is one of the aspects where students struggle. A large number of learners experience frustrations when facing a problem set. Aside from that, there are other factors why students dislike problem solving even though they have not tried it yet. Problem solving is one of the 21st century skills expected to be developed to the learners; it is also one of the twin goals of mathematics curriculum; yet, this is also the area in which most students fail due to several factors, such as pathological fear.

Literature in this study cited parental indoctrination, teacher, and abstract nature of math as the causes of the students' pathological fear, which has a bearing on the performance of the students. Since pedagogy plays an important role in the learning of the students, the use of 2C2I1R pedagogical approach was proposed. Individually, collaborative, constructivist, inquiry-based, integrative, and reflective approach shows positive result to the performance of the students. However, a gap between the relationship

of 2C2I1R and performance on problem solving, and 2C2I1R and pathological fear was discovered and needed further investigation.

In this study the relationship among the three variables, which are 2C2I1R pedagogical approach, performance in problem solving, and pathological fears, was investigated to determine how the pedagogical approach employed inside the classroom could affect the performance on problem solving and perception on pathological fear.

Conceptual Framework

Motivating students to exert efforts in accomplishing different tasks in school has been one of the concerns of the educators in different levels. For them to be able to do so, an environment where students feel safe and secure and a place where they can enrich themselves are provided. One of the most challenging areas on how to establish this kind of situation is in Mathematics, particularly in problem solving (Rudd, 2010).

Educational leaders must use various instructional strategies that help in achieving a greater rate in mastery in mathematics (Rasmussen &Marrongelle, 2006). Considering students' needs and comprehension of higher-order mathematical knowledge, instructional design provides a systematic process and a framework for analytically planning, developing, and adapting mathematics instruction (Saritas, 2004). Instructional design is an effective way to address different issues in the curriculum. It is also a linking science,- a body of knowledge that prescribes instructional actions to optimize desired instructional outcomes, such as achievement and effect.

Solving problems is a mental process that involves the use of metacognition, prior knowledge, reasoning, and strategies. Because of this, the majority of math content should be taught using a problem- solving approach. If connection between prior knowledge and learning is established and is created by the learners, researchers believed that greater problem -solving skills are enriched (Owen &Sweller, 2009).

Based on the study conducted by Samsudin (2016), the constructivist approach provides a method where educators can transfer their knowledge and skills to the learners in such a manner that a positive perception is established, in which learners show interest in the process.

Moreover, based on the findings of the research conducted by Bingham (2011), students enjoyed learning Mathematics more using collaborative approach. Meanwhile, Tagvhayi (2012) added that integrative approach was more effective than traditional approach in teaching Mathematics. Furthermore, Abdi (2014) revealed that using inquiry-based approach produced a more positive result in learning.

The five pedagogical approaches in 2C2I1R are all grounded from constructivist learning theory, since according to Roselli (2016), collaborative approach is considered a part of the theory because it promotes participation and exchange of ideas in order to build a shared cognition. On the other hand, Pappu (2014) stated that inquiry-based approach involves investigation of scenarios and problem to satisfy curiosity, broaden knowledge, and develop skills which are also the features of constructivist learning theory. One of the

roots of integrative learning theory is constructivism, since the approach helps the students in making connections across curricula. (Regional Memorandum No.233 s.2016). Lastly, in reflective approach, the students are taught to develop and evaluate experience that may result to lifelong learning (Navaneedhan, 2011). Thus, constructivist learning theory is regarded as an active process in such a way that learners construct new ideas and concept depending upon their past or current knowledge; in doing so, they make decisions by constructing hypotheses and selecting and transforming information.

Learners also rely on cognitive structure such as schema and mental models to provide meaning and organization to experiences that allow the individual to go beyond the information given (Bruner, 1973). In addition, this theory is based on observation and scientific study of how people learn. It is also a learning theory where the learners construct their own understanding and knowledge through experience and reflection of those experiences (Bereiter, 1994).

The use of instructional design does not equate to higher achievement. It is also noteworthy to look at the different educational leaders who perform and design different activities where learners are affected so that they can fill the gaps between their goals and performances. These actions help in satisfying the needed resources such as time, money, and energy (Libienski&Gutierrez, 2008).

However, Kumar (2013) listed the causes of math fear of students. First on the list is the abstract nature of mathematics. Students develop fear because they cannot see math;

it does not have shape. They need proper visualization to solve problems involving math. Visualization comes from experience and relating with it accompanies an excellent trainer. Another one in the list is poor trainers; that is, sometimes teachers do not possess the mastery in teaching the area.

Hacker(2015) enumerated how parents contribute fears in learning mathematics. First is because of the math confidence trap, wherein parents always say, "I am useless at math." It is harmful since parents play a great influence in the lives of their child; so whenever children hear their parents saying this, they might think that it is okay to be useless at math before they reach their potential. Second is the unfamiliar new method. Since math education constantly changes over the past 30 years, it makes their generation feel bit out of loop. Third is the new curriculum topics. One thing that unsettles some parents about helping with Math is new topics that they did not study at school before. Lastly, the learning plan is difficult for parents since knowing what to teach, when, and in what order are things not within their experiences as parents.

Teachers have important role in reduction and especially in the prevention of students' pathological fear. Learning requires a safe environment where students are secure in taking risks and where their thinking is respected (Haylock & Thangata, 2007). In addition, Newton(2015) stated that teachers are the primary contributor of fears among the students since they are the ones who have the biggest influence to them. There are lots of obstacle teachers face inside the classroom such as a wide range in abilities, lack of support

or resources, large class sizes, and time constraints. Sometimes they have the tendency to scare the students using the grades in math.

Pathological fear in math is a widespread scenario, experienced from different levels in elementary or secondary schools (Perry, 2004). Some researchers believed that the reason behind disliking mathematics and avoiding all the activities related to it is their fears (Ashcraft, 2002).

The research determined the effect of the 2C-2I-1R pedagogical approach to the problem-solving performance and perceptions on the cause of pathological fears of the learners. In order to do so, the researcher chose two sections of Grade 11 learners enrolled in Cotta National High School taking General Mathematics as one of their core subjects. One section was considered as the control group and another section was considered as experimental group. The experimental group was taught using the 2C2I1R pedagogical approach, wherein the constructivist, collaborative, integrative, inquiry- based, and reflective approaches were employed in every lesson; however, the control group was taught using the regular classroom instruction.

The five major approaches were all anchored from constructivist learning theory . It is assumed that these five approaches, if used together in one lesson, yields a more efficient and suitable learning environment; thus, it may improve the performance of Grade 11 students in problem solving. These approaches are believed to lead to a more positive

and enjoyable classroom setting; thus, it is assumed that it can lessen the pathological fears of the students.

As shown Figure 1, 2C – 2I – 1R pedagogical approach could yield a positive relationship with the performance on problem solving, which is represented by a solid arrow line between 2C – 2I- 1R pedagogical approach and performance on problem solving. On the other hand, it is assumed that the approach could lessen the perceived pathological fears of the students, shown by a dashed arrow line connecting 2C – 2I – 1R pedagogical approach and pathological fear.

Figure 1 summarizes the conceptual framework of the study.

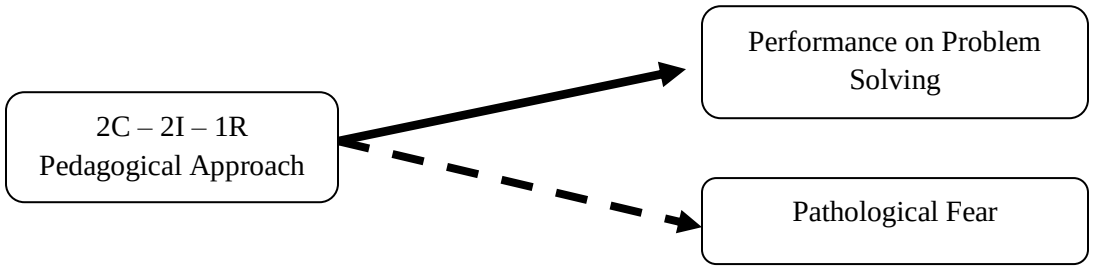

Figure 1

Conceptual Framework

Research Problems

The purpose of this study was to determine the effects of the 2C – 2I – 1R Pedagogical Approach on pathological fear and performance in problem solving in General Mathematics of Grade 11 students.

Specifically, this study sought to answer the following questions:

1. What is the problem solving performance of the control and experimental groups prior to and after exposure to the 2C-2I-1R pedagogical approach?

2. Is there a significant difference between the problem solving performance of the control and experimental groups after exposure to the 2C – 2I -1R approach?

3. What is the assessed pathological fear of the control and experimental groups prior to and after exposure to the 2C – 2I – 1R pedagogical approach?

4. Is there a significant difference between the students' assessed Pathological fear after exposure to the 2C – 2I – 1R approach?

Null Hypothesis

The following were the null hypotheses tested in this study.

1. There is no significant difference between the problem solving performance of the control and experimental groups after the exposure to the 2C – 2I – 1R approach.
2. There is no significant difference between the students' assessed Pathological fears after exposure to the 2C – 2I – 1R approach.

Significance of the Study

This study looked into the effect of 2C-2I-1R Pedagogical approach on pathological fear and performance on problem solving. The use of 2C-2I-1R pedagogical approach

could alleviate their perception about pathological fears in terms of parental indoctrination, abstract nature of mathematics, and teacher factors.

The teachers who use 2C-2I-1R Pedagogical approach in teaching senior high school students can see better effect on the performance on problem solving and lessen their pathological fears in mathematics. Sample detailed lesson plan can show how the 2C-2I-1R is applied in the lesson. Further, they can generate other activities also that are aligned with this approach.

For school administrators, this could help them in designing and planning School Learning Action Cell (SLAC) sessions to explore the different strategies that are essential for improving the learners' performance.

The future researchers can use the findings of this study to serve as an empirical data to examine if a better effect on pathological fears in mathematics could be expected if the 2C-2I-1R pedagogical approach is used in teaching the learners.

Definition of Terms

For a better understanding of this study, the following terms are defined conceptually and operationally.

2C-2I-1R Pedagogical Approach–This contains five core strategies which are constructivist, collaborative, inquiry- based, integrative, and reflective-- recommended for

use by teachers in finding ways to help learners get excited about learning (Implementation of the Pedagogical Approaches Mandated by RA 10533, RM No. 233 s. 2016). In this study, it refers to the use of constructivist, collaborative, inquiry-based, integrative, and reflective to carry out the lessons by the teachers.

Constructivist Approach –This approach shows learners to be active in the process of constructing meaning and knowledge rather than passive in receiving information. It fosters critical thinking and provides learners with a learning environment that helps them make connections with their learning. Learners are the makers of meaning and knowledge (Implementation of the Pedagogical Approaches Mandated by RA 10533, RM No. 233 s. 2016). In this study, it is the approach used by the teacher in leading students to construct knowledge.

Collaborative Approach – This approach requires learners to work together towards a common goal. Learners engage in a common task in which each individual depends on and is accountable to each other (Implementation of the Pedagogical Approaches Mandated by RA 10533, RM No. 233 s. 2016). In this study, it is the approach used by the teacher requiring group activity or students working together to finish a task.

Inquiry Based Approach –This is an approach of acquiring or obtaining information through investigation carried out by the learners to know the phenomenon in question (Implementation of the Pedagogical Approaches Mandated by RA 10533, RM No. 233 s.

2016). In this study, it refers to the approach that involves activity requiring an investigation to answer the problem.

Integrative Approach –It is a learning theory that describes a movement toward integrated lessons helping students make connections across curricula, making connections with a major between curriculum, co–curriculum, or between academic knowledge and practice (Implementation of the Pedagogical Approaches Mandated by RA 10533, RM No. 233 s. 2016). In this study, it refers to the approach used by the teacher where students relate or make connections to the topics discussed from other fields or across other curricula.

Reflective Approach –It is looking at what the teacher and learners do in the classroom, thinking about why they do, and analyzing if it works (Implementation of the Pedagogical Approaches Mandated by RA 10533, RM No. 233 s. 2016). In this study, it refers to the approach where students internalize their learning and its application to real life.

Pathological Fears in Mathematics –This refers to a behavioral disorder where a person immediately struggles because of the effect of fear in the subject. It is an abnormal and insistent anxiety of mathematics(Cadorna et al., 2015). In this study, it is the result of the survey on Pathological Fears in Mathematics.

Parental Indoctrination – It is the process when parents inculcate their child with ideas, attitudes, cognitive strategies, and professional methodologies (Razor, 2014). In this study, it is the result of Parental Indoctrination portion from the survey on Pathological Fears in Mathematics.

Abstract Nature of Mathematics – It is the underlying essence of mathematical concept (The Conversation, 2018). In this study, it is the result of Abstract Nature of Mathematics portion from the survey on Pathological Fears in Mathematics.

Teacher Factor – It is a function of decision made by teachers, including instructional strategies, classroom management, and classroom curriculum design (Marzano, 2003). In this study, it is the result of Teacher Factor portion from the survey on Pathological Fears in Mathematics.

Problem Solving – It is the process of working through details of a problem to reach a solution (Mendelman, 2007). In this study, it refers to the scores of students on the given test in problem solving.

CHAPTER II

METHODS

This chapter presents the research design, population and sample, research instruments, data gathering procedure, and statistical treatment of data used in this study.

Research Design

Quasi-experimental studies attempt to examine the effects of an intervention on a specific population. It aims to determine whether an intervention has the intended effect on study's participants (NCTI, 2015). This study used this design for it involves selecting groups without any random pre-selection process, specifically the Pretest – Posttest Comparison-Group Design where two homogenous classes were assigned randomly to two different teaching methods: use of 2C-2I-1R pedagogical approaches for experimental group, and use of regular classroom instruction for the control group. Further, this particular design was deemed useful in generating general results. Figure 2 illustrates the research design of this study.

$O_1\ O_2$ x $O_2\ O_3$

$O_1\ O_2$ O_2O_3

Figure 2. Pretest – Posttest Comparison-Group Design

Where:

x = instruction using the 2C-2I-1R Pedagogical Approach

O_1 = Pretest on Problem Solving

O_2 = Survey Questionnaire on Causes on Pathological Fears on Mathematics

O_3 =Posttest on Problem Solving

Sampling and Participants

Four sections with 25 students each from academic strand (2 from Accountancy and Business Management, and 2 from Humanities and Social Sciences) enrolled in General Mathematics for the first semester of A. Y. 2019 – 2020 were requested from the School Division Superintendent through the principal of Cotta National High School (see Appendix A.2). These four sections were given a survey questionnaire on causes of pathological fear and the result of the first periodic test was consolidated. The results of the survey questionnaire and the scores in the first periodic test summarized in Table 1 were compared. The two sections (HUMSS A and HUMSS B) whose means were the closest were selected to ensure that the two groups were statistically equivalent in terms of mathematical ability and level of perceived causes of pathological fear. This was done to address the issue of participant selection which is a threat to internal validity. From the selected two sections, the lottery method was used to assign the experimental group (HUMSS A) and the control group (HUMSS B) to avoid selection bias, a threat to internal validity. Further, students who already took General Mathematics were removed from the participants, reducing it to 20 participants from each section. It was done to reduce the

issue on testing response, a threat to internal validity. The equality of the group mean scores was tested using the t – test for independent samples. The result obtained a p –value of p = 0.49 for the first periodic test in mathematics and p = 1.41 for the perceived causes of pathological fears. This implies that the level of perceived causes of pathological fear and mathematics ability before the experimentation process of two groups did not differ significantly. Therefore, they were comparable in terms of perceived causes of pathological fear and mathematics performance.

Table 1

Mean Scores in Pathological Fears and Performance in General Mathematics

Section	Pathological Fears			Performance in General Mathematics		
	Mean	Standard Deviation	Interpretation	Mean	Standard Deviation	Interpretation
ABM – A	3.53	0.53	Very High	29.63	6.12	Nearing mastery
ABM – B	3.32	0.48	Very High	28.52	3.74	Nearing mastery
HUMSS-A	3.04	0.45	High	31.71	1.98	Nearing mastery
HUMSS-B	3.02	0.33	High	31.55	1.82	Nearing mastery

Research Instruments

The instruments used in the study were pre- and posttests on problem solving. These were open-ended tests, scored using a scoring rubric and a survey questionnaire on pathological fears on mathematics.

Problem Solving Performance Test

The tests on problem solving were teacher- made pretest and posttest. The tests were ensured to be parallel and were validated by a panel of experts (see Appendix A and Appendix B.) For content validation, the instruments were forwarded to five authorities for consultation on further corrections, comments, and suggestions for improvement (see Appendix B). The validators are professionals with Masters' Degree and /or Doctorate Degree in line with Mathematics. The questionnaires were presented once again to the adviser with the copy of evaluators' comments, corrections, and suggestions. Furthermore, to make sure that the threat to internal validity on instrumentation shall be addressed, parallelism of the pre- and posttests was ensured. Each of the items in the pretest was initially paired with an item in the posttest in terms of the researcher's judgment on content and level of difficulty to solve. The pairings done were initially validated by the adviser and comments were incorporated. Further, during the content validation of the validators, their evaluation on parallelism in terms of content and level of difficulty were also sought. Consequently, favorable responses of all validators were obtained.

Each test is a 10 – item word problem test developed by the researcher, comprising the competencies in General Mathematics for second grading covering the topics solving problems involving simple interest, compound interest, simple and general annuities, future value and present value of simple and general annuities, present value and period of deferrals of deferred annuities, business and consumer loan (See Appendix D.1 and Appendix D.2). Moreover, the tests were pilot tested to 30 Grade 12 students who already took General Mathematics and obtained a reliability value of $\alpha = 0.79$. The pre- and post-tests served as an effective basis for evaluating the problem solving skills of the learners. Scoring rubrics were used to assess the skills of the learners in problem solving. The mean score for this tool was interpreted based on this scale:

32 – 40	Master
24 – 31	Expert
16 – 23	Proficient
8 – 15	Competent
0- 7	Novice

Rubrics were used to evaluate program courses and individual student's performance. It was used also to assess the higher order thinking skills (Pierce, 2006). The scoring rubric presented in Table 1 was based on Szetela's (1993) descriptive criteria for various levels of critical thinking.

Table 2.

Scoring Rubric

Scores	Description
0	The student makes no attempts which is indicated by a blank response.
1	The student attempts to answer the question, but the response is illogical or irrelevant.
2	The student understands the question and addresses it with a pertinent comment, but the response is incomplete or confused.
3	The student understands the question and addresses most relevant aspects with correct and logical observations and inferences, or the students addresses all relevant aspects with minor flaws.
4	The student understands the question and addresses all relevant aspects with completely correct logical observations and inferences.

Pathological Fears in Mathematics Questionnaire (PFMATQ)

Another means of gathering data was through survey questionnaire adopted from the Pathological Fears in Mathematics Questionnaire (PFMATQ) of Yahya and Fassasi (2012). This instrument had undergone validation and pilot tested, obtaining a reliability coefficient of 0.90 using Cronbach Alpha. It is a fifteen-item questionnaire dealing with

the student's pathological fears on mathematics. The mean score for this tool was interpreted based on the following scale:

3.25 – 4.00	Very High
2.50 – 3.24	High
1.75 – 2.49	Low
1.00 – 1.74	Very Low

Responses were analyzed with quantitative methods by assigning numerical values to Likert-type scales. The essence of survey method can be explained as "questioning individuals on a topic or topics and then describing their responses" (Jackson, 2011).

The abovementioned instruments were constructed and adopted to determine the effects of 2C - 2I - 1R pedagogical approaches on pathological fears and performance on problem solving.

Data Gathering Procedure

The study followed two phases in gathering data, which specifically included preparatory stage and integration of teaching strategies.

Phase I – Preparatory Stage and Development of Instrument

A. Giving of Letter Seeking Permission

After using random sampling to determine the participants of the study, the researcher sent letter of permission (see Appendix A.2) to conduct the study to the Schools Division Superintendent of Lucena City through the principal of Cotta National High School. An informed consent (see Appendix A. 3) was sent to the respondents who are 18 years old and above. However, for the respondents whose ages are below 18, a child assent form (see Appendix A.4) was given and parental consent (see Appendix A.5) was sent to their parents or guardians to make them aware that they would take part in the experimentation process. They were oriented that they have the freedom to refuse if they do not want participate, or to discontinue from participating at any given time. Before the conduct of the study, the researcher collected the informed consent, assent, and parental consent first to ensure that the students and their guardian voluntarily agreed to take part in the study.

B. Development and Validation of Instrument

Two tests on problem solving, a pretest and a posttest, were developed and validated. Each test was formulated using a table of specification, and both were based on the topics covered for the period of implementation of the study. The tests were parallel based on content validation by a panel of experts in the field. Moreover, the following suggestions were obtained during the validation: (a) Observe the proper use of pronouns in the problem, and (b) The term deposited must be used instead of invested in problems (1) & (2) in the posttest. The suggestions were resolved before it was pilot tested to a group of

students. The pretest was composed of 10 problems. It was scored using a rubric created to evaluate the performance of the students. The posttest was developed based on the concepts covered in the pretest; however, the context for the problem was made different to reduce bias associated with learning effect.

Further, a Questionnaire on Pathological Fear was adopted from the study of Yahya and Fasasi (2012).

C. Preparation of lesson plans

The researcher prepared lesson plans for every meeting to show the use of 2C – 2I – 1R pedagogical approach to the experimental group, and the regular classroom instruction to the control group. There were 8 lesson plans developed, which included: 1) simple interest taught for 2 days; compound interest taught for 4 days; 2) simple annuity taught for 4 days; 3) general annuity taught for 4 days; 4) deferred annuity taught for 4 days; 5) fair market value; and 6) cash flow taught for 4 days; 7) business and consumer loans taught for 1 day; and 8) solving problems involving business and consumer loans taught for 4 days.

The lesson plans for the experimental and control groups were composed of 3 parts: the objectives, content, and procedure. The objective part contains content standard, performance standard and learning competency that needs to be developed. The performance standard, content standard and learning competencies were from the

curriculum guide as prescribed by the Department of Education. The content pertains to the topic covered by the lesson plan and all the references used in developing it. However, the procedure contains the different parts of the of the lesson and it is where the difference between 2C – 2I – 1R pedagogy and regular teaching method was being reflected. For the lesson plan using the regular classroom teaching the procedure contains 6 subparts which are: presenting the new lesson, presenting examples/instances of the lesson, discussing new concepts and practicing new skills, developing mastery, making generalization and abstraction about the lesson, and evaluating learning. For the lesson plan using 2C-2I-1R pedagogy the procedure contains 7 sub-parts: presenting the new lesson, presenting examples/instances of the lesson, discussing new concepts and practicing new skills, developing mastery, finding practical applications of concepts and skills in daily living, making generalization and abstraction about the lesson, and evaluating learning.

The first part of the lesson plan under procedures is presenting the new lesson. Using the regular teaching method, it involves introducing the new lesson in a form of review of the different concepts and skills that are needed or pre requisite to it. It involves giving of definition of those concepts. Meanwhile in the lesson plan where 2C – 2I – 1R pedagogy was reflected it is where the new lesson was being introduced in a form of a problem or situation guided by a series of instructions or questions than can be solved using their pre requisite skills. It is the part that will serve as the springboard to the new lesson. This is where the inquiry – based approach can be applied since the activity involved

requires an investigation to be able to solve the problem. Other pedagogical approaches can be applied in this part as well such as collaborative if they will be instructed to do it by groups.

The second part of the procedures is presenting examples/instances of the lesson this is the part where identification of which aspect of the previous activity are needed to the new lesson. In the regular classroom teaching the teacher will give an example where the previously reviewed concepts will be applied. However, using the 2C-2I-1R pedagogy process questions regarding the previous activity that will prompt the learners in constructing new knowledge which they will use for the new lesson will be included. This part involved the use of constructivist approach since it involves an activity which lead the students in constructing knowledge.

Under procedures, the third sub part is discussing new concepts and practicing new skills. It is the part where the teacher presents the new material to the class it is the time where explanations, modeling, demonstrations and illustrations of concepts, ideas and skills will be internalized by the learners. In the regular classroom scenario, it required an attentive listening from the learners while in the 2C – 2I – 1R environment an active participation from the learners are expected. It involves discussion of new concepts where questions are given to the learners and clarification can also be made. In this part constructivist approach can be applied.

The fourth part of the procedures is developing mastery this is the part where the learners apply the learned concepts and skills in a form of practice exercises. The performance of the learners in this section is not yet graded since it is considered formative assessment. The lesson plan for regular classroom teaching involves an individual activity wherein a problem set are given to the learners and requires them to answer it on their notebook. On the other hand, collaborative approach is employed on the 2C-2I-1R environment wherein the same set of problems are asked to be answered by the learners who are working together to be able achieve a common goal.

In making the fifth part of the lesson plan which is finding practical applications of concepts and skills in daily living in 2C – 2I- 1R pedagogy the integrative approach was being employed this is the part where a learning environment is provided to the learners to help them in making connections across the curricula. However, this part is not evident on the lesson plan of the regular classroom teaching.

The sixth part of the procedure in the lesson plan where 2C – 2I – 1R is reflected is generalization. Usually this is the part where the reflective approach is employed since this is where they can internalize their learning and realize its application to real life different strategies such as journal writing, think and share and elbow partner can be applied. Meanwhile generalization is the fifth part of the lesson plan where the regular classroom teaching is applied. It is the portion where the learners generalized what they learned through the guidance of the teacher. This is done using the question and answer method.

The last part of the procedure is evaluating learning where in this will check the knowledge of the learners after the lesson. In the lesson plan using 2C – 2I – 1R pedagogy this may be done individually, by pair or by group where different pedagogies such as collaborative, reflective, inquiry based or constructivist approach can be applied. On the other hand, for the lesson plan using the regular classroom teaching this is an individual activity.

Phase II – Integration of Teaching Strategies

A. Orientation

On the first meeting of class, orientation was given. In addition, the students were given 30 minutes to answer the pre-survey on pathological fears .The following meeting, they were given a pretest on problem solving to know the degree of the perceived causes of pathological fears and the performance on problem solving of both the control and experimental groups.

B. Experimentation Process

The teacher had a well – established schedules, procedures, and assessment, which were not altered for the study. The concepts taught were based on the strand in the K to 12 curriculum for Grade 11 General Mathematics. The experimentation period lasted for 10 weeks, equivalent to one grading period (second grading). Both control and experimental

groups underwent the same duration of the study so this addressed the issue of maturation since the two matured at the same time. The topics covered were solving problems involving simple interest, compound interest, simple and general annuities, future value and present value of simple and general annuities, present value and period of deferrals of deferred annuities, and business and consumer loans.

Both the control and experimental groups were taught by the same teacher. To control the extraneous variables, the teacher was observed by a master teacher at least twice a month. The class schedules of both the experimental and control groups in taking General Mathematics were consecutive. This means that right after one group was taught, the other group was taught immediately as well. The experimental group was taught using 2C – 2I – 1R pedagogical approaches (see appendix B.2) with every lesson implemented with a combination of collaborative, constructivist, inquiry- based, integrative, and reflective approach. However, the control group was taught using the regular classroom instruction (see Appendix B.1), which employed discussion, lecture, exercises, and assignment. All the activities performed in the class were guided by the prepared lesson plans.

The experimental group where 2C – 2I -1R pedagogy was employed was started by giving the learners a situation or a problem guided by questions to answer. This is where prior knowledge can be applied. To be able to carry out the task prescribed in the problem the learners may use tables or models. This activity was under presenting the new lesson and it is where the inquiry – based approach is seen. This part usually involves

investigations performed by the learners. This is done individually or by group and at the end of the activity the learners will be able to derive a new knowledge that they will be able to use to establish a connection between their prior knowledge and the new lesson.

After accomplishing the activity, questions will be given to the learners. It pertains to the experiences they encountered in the prior activity. The questions will guide them in formulating new knowledge that will be used to carry out the new lesson. This portion guide the learners in creating a mathematical model or formula that will be essential to the new lesson. Constructivist approach is applied on this part. This approach is also applicable on the proceeding part of the lesson which is discussing new concepts and practicing new skills. This is where the constructed mathematical model or formula is applied on a problem. Learners also gain knowledge on how to manipulate the working formula to be able to address what is asked in the problem.

Collaborative approach can be applied on the fifth part of the procedure which is developing mastery. This is where the learners were grouped to be able to work on the given problem. Each member of the group was assigned by different tasks such as one leader, one monitor, one time keeper, one secretary and one reporter. The manner of grouping the learners vary per lesson it can be done randomly or by learning styles. This is where the learners were given a mathematical problem to solve and they will work together to accomplish the task. After doing so the reporter explain the group's answer.

Once all the group were done in presenting their answers and the teacher wrap up all the clarifications and questions that arose during the activity. It will move on to the next part of the lesson which is finding practical applications of concepts and skills in daily living. This part will employ the use of integrative approach this can be done by presenting clips or videos, reading an article, or showing situations where the topic is directly related. It is followed by giving the learners processing questions which will made them connect their learnings to other areas such as business, Science, English and others.

Wrapping up the lesson through generalization followed, this part is done by letting the learners realized what are their gains in the lesson. In this portion reflective approach will be used since activities such as journal writing, using elbow partners and answering reflective questions. To facilitate this portion questions were asked to the learners and they were allowed to reflect on their own. This aids them in realizing their insights on the lesson that they had, what other strategies that they employ to be able to perform better in the lesson and the weaknesses or difficulties they encounter in solving the problems.

Lastly is the evaluation. This part served as the assessment to determine whether the learners have mastered the lesson or not. One to two problems will be given to the learners to answer.

On the other hand, the control group who were taught using the regular classroom method started with the review or recall of the different concepts or skills needed to the

new lesson. The learners were asked about the definition of those concepts and its application. It was followed by presenting the relationship between the reviewed concepts and the new lesson which was done by the teacher. After establishing the connection between the prescribed skills and the new lesson, discussion of the new lesson followed. Several problems were provided and the teacher discuss how to solve it. Formative assessment followed, this was done by giving the learners a problem set and letting them answer it individually. Once the learners finished answering the given problems volunteers were asked to show the solution on the board and the teacher check whether the answer is right or wrong. After giving feedback to the learners, the lesson was wrapped up by asking the learners what they learn. It will be followed by an assessment where in one or two problems were given for them to solve.

Table 2shows a sample lesson with the parts of the lesson, how it is done using the 2C-2I-1R approach and the regular classroom teaching and the discussion/explanation on the difference between those two teaching approaches.

Table 3.

Comparison of the 2C – 2I – 1R Pedagogy and Regular Classroom Teaching

<table>
<tr><th>Parts of The Lesson Plan</th><th>Using the 2C – 2I – 1R Pedagogy</th><th>Regular Classroom Teaching</th><th>Differences</th></tr>
<tr>
<td>Presenting the new lesson</td>
<td>Inquiry – Based Approach

Miguel saved Php 5000 in a bank that earned a 5% interest per year.

1. How much is the initial investment?
Php 5000
2. Fill in the table below:

<table>
<tr><th>Year</th><th>Investment</th><th>Rate</th><th>Interest</th></tr>
<tr><td>1</td><td>5000</td><td>5%</td><td></td></tr>
<tr><td>2</td><td>5000</td><td>5%</td><td></td></tr>
<tr><td>3</td><td>5000</td><td>5%</td><td></td></tr>
<tr><td>4</td><td>5000</td><td>5%</td><td></td></tr>
<tr><td>5</td><td>5000</td><td>5%</td><td></td></tr>
</table>
3. How much is the interest in the first year of investment?

4. How much is the total interest after 5 years?</td>
<td>A. Recall the following concepts:
1. Base
2. Rate
3. Percentage
B. How do you get the percentage?</td>
<td>Presentation of new lesson in 2C – 2I – 1R is through the use of inquiry – based approach wherein a situation that needs to be investigated in order to answer the guide questions is given. In the sample lesson plan the situation provided is “Miguel saved Php 5000 in a bank that earned 5% interest in a year”.

Meanwhile, in the lesson plan using.the regular classroom teaching</td>
</tr>
</table>

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
			it involves recalling of concepts and skills that were pre requisite for the new lesson. I was shown in the sample lesson plan by recalling what base, rate and percentage is
Presenting examples/ instances of the lesson	*Constructivist Approach* What are the elements needed to determine the interest? What is/are the operation used to find the interest in each year for five years? Without using a table, how will you find the interest for five years? *Such interest charged to the borrower or lender for the full term of the investment or loan is called simple interest.*	The process of getting the percentage is similar to the lesson which is solving problems involving simple interest	Using the lesson plan where 2C – 2I – 1R pedagogy was employed, constructivist approach was being used. This is where the learners construct the formula in finding the simple interest by answering prompt questions. On the other hand, this part is usually done by the teacher in the regular classroom teaching by simply stating the connection of the recalled concepts to the new lesson

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
Discussing new concepts and Practicing new skills	*Constructivist Approach* What is the formula that can be used to find the simple interest? *The formula I = Prt is used to find the simple interest.* What is Principal in simple interest? *The sum of the money that someone borrows or lends* How will you define the rate? *The rate is the percentage of the principal amount which represent the cost or fee for borrowing or lending money* What is the use of time in simple interest? *The time or loan period is the agreed date or time when the loan will be paid in full and it should be expressed in years* Let us take the following for instance: Suppose you want to borrow money from your friend to buy a concert ticket for your favorite band. Since you prefer a front row seat, the cost of the concert ticket you need to buy is Php 10, 000. Your friend agreed to lend you Php 10, 000 payable in 2 years and with an interest rate of 5% per annum. How much will be the interest that you have to pay your friend? How much is the total	The formula I = Prt is used to find the simple interest. The sum of the money that someone borrows or lends The rate is the percentage of the principal amount which represent the cost or fee for borrowing or lending money The time or loan period is the agreed date or time when the loan will be paid in full and it should be expressed in years Let us take the following for instance: Suppose you want to borrow money from your friend to buy a concert ticket for your favorite band. Since you prefer a front row seat, the cost of the concert ticket you need to buy is Php 10, 000. Your friend agreed to lend you	In the 2C – 2I – 1R pedagogy this involved discussion on the different components of simple interest and sample problem to be solved while in the regular classroom teaching after presenting the definition of the different components of simple interest problems given were solved.

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
	amount you need to pay your friend at the end of 2 years? What are asked in the problem? *The amount of interest to be paid and the total amount to be paid at the end of two years* What are the given facts? *P = Php 10, 000, r = 5%, t= 2 years* How do you find the simple interest? *Use the formula I = Prt* What is the simple interest? *I = Php 1, 000* How much is the total amount to be paid? *Php 11, 000* How do we find the total amount to be paid? *Add the interest and the principal* If we translate this to equation what do we obtain? *A = Prt + P* Factoring out the common factor, what do we obtain? *A= 1(rt + 1)*	Php 10, 000 payable in 2 years and with an interest rate of 5% per annum. How much will be the interest that you have to pay your friend? How much is the total amount you need to pay your friend at the end of 2 years? What are asked in the problem? *The amount of interest to be paid and the total amount to be paid at the end of two years* What are the given facts? *P = Php 10, 000, r = 5%, t= 2 years* How do you find the simple interest? *Use the formula I = Prt* What is the simple interest? *I = Php 1, 000*	

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
		How much is the total amount to be paid? *Php 11, 000* How do we find the total amount to be paid? *Add the interest and the principal* If we translate this to equation what do we obtain? *A = Prt + P* Factoring out the common factor, what do we obtain? *A= 1(rt + 1)*	
Developing mastery (Leads to Formative Assessment)	*Collaborative Approach* The students will be grouped into four and each group will be assigned to solve one problem. The groups will be given 5 minutes to answer the problem then one representative per group will present their solution. Group 1 At what rate did Simon invest his money amounting to Php 175, 000 if he received Php 2, 843.75 worth of interest after 6 months?	Let us take the following examples: 1. At what rate did Simon invest his money amounting to Php 175, 000 if he received Php 2, 843.75 worth of interest after 6 months? *r= 3.25%*	In this part of the lesson in 2C – 2I – 1R, collaborative approach was applied wherein each group were asked to solve 1 problem. Each member of the group had their own duties such as, leader, time keeper, monitor,

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
	r= 3.25% Group 2 How long will it take for an investment of Php 250, 000 to double itself if it is invested at the rate of 8%? *t=12.5 years* Group 3 You are planning to invest in a low – risk unit investment trust fund (UITF) of Bank E which will give you 5% per annum in 5 years. You target to earn a total future value of Php 320 000. How much should you invest in UITF now? *P = Php256, 000* Group 4 You are planning to invest in a security deposit account with your money amounting to Php 100, 000 in 7 years. You target to earn a total future value of Php200, 000. What should be the annual interest rate so you can achieve you investment goal? r = 14. 2%	2. How long will it take for an investment of Php 250, 000 to double itself if it is invested at the rate of 8%? *t=12.5 years* 3. You are planning to invest in a low – risk unit investment trust fund (UITF) of Bank E which will give you 5% per annum in 5 years. You target to earn a total future value of Php 320 000. How much should you invest in UITF now? *P = Php256, 000* 4. You are planning to invest in a security deposit account with your money amounting to Php 100, 000 in 7 years. You target to earn a total future value of Php200, 000. What should be the annual interest rate so you can achieve you investment goal?	secretary and reporter. After all groups answered the problem on a given time the reporter show their solution and discuss it. On the other hand in regular classroom method learners were asked to answer the problems individually. After answering all the problems volunteers will be called to show their solution on the board. The problems given to experimental and control groups were the same

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
Finding practical applications of concepts and skills in daily living	*Integrative Approach* A short video about "Iponaryo tips" will be shown to the students at https://m.youtube.com/watch?v=sYkwm3cJrYl (5minutes) What is meant by savings? What is the importance of savings? What are the different forms of savings? Which is more practical way of savings using coin banks or saving in banks? Why? How do you compute the total amount of savings in bank? How do you call the amount being added to the money that you save in the bank?	r = 14. 2%	This part is not present in the regular classroom teaching. However, using 2C – 2I – 1R the integrative approach was being utilized by letting the learners to watch a video about tips on saving money. After that they were asked several questions to be able to relate the lesson to Business and Values Education
Making Generalization and Abstraction about the Lesson	*Reflective Approach* Journal Writing! The students will answer the following questions in 1-3 sentences in their journal notebook 1. What part of the lesson is interesting? 2. What part of the lesson is confusing for me? 3. What help do I need to be able to address my difficulties? 4. To whom will I ask for help in addressing my difficulties?	How do you solve problems involving simple interest?	Reflective approach was utilized in the lesson plan of the experimental group where they were asked to write their reflections guided by some questions. After writing their

Parts of The Lesson Plan	Using the 2C – 2I – 1R Pedagogy	Regular Classroom Teaching	Differences
Evaluating Learning	Individual Activity Telco A has tie – up promotion with Bank B in its latest smartphone offering bundled with their postpaid plan. The smartphone costs Php 30, 000. Credit card holders of Bank B can avail of the promo of reduced installment interest rate from 5% to 3% per month if they avail of the 24 – month installment plan. If you will avail of the promo, how much will be your equal monthly installment payment payable to Bank B using the simple interest method? *I = Php 1800* *A = Php 31, 800* *Monthly Installment = Php 1325 per month*	Telco A has tie – up promotion with Bank B in its latest smartphone offering bundled with their postpaid plan. The smartphone costs Php 30, 000. Credit card holders of Bank B can avail of the promo of reduced installment interest rate from 5% to 3% per month if they avail of the 24 – month installment plan. If you will avail of the promo, how much will be your equal monthly installment payment payable to Bank B using the simple interest method? *I = Php 1800* *A = Php 31, 800* *Monthly Installment = Php 1325 per month*	reflections can be shared to theclass. Meanwhile questions that sum up the lesson will be given to the students of the control group and they answer it orally. Evaluation of learning is done individually to both groups and the problem given to both group is the same.

After the period of experimentation, both groups answered the post-survey on pathological fears and posttest on problem solving. The test on problem solving was checked by two experts in the field and by the teacher using the scoring rubrics to avoid bias.

Data Analysis

The following statistical techniques were used in this study, and all were evaluated at $\alpha = 0.05$. The values were obtained using SPSS 21 (see Appendix J.)

1. Independent t – test was used to determine significant difference between the performance in Mathematics and the pathological fear in Mathematics to ensure the comparability of the control and experimental groups and to determine if there is significant difference between the posttests and post survey of the control and experimental groups.

2. Cronbach Coefficient Alpha was utilized to determine the reliability of research of the test on problem solving.

3. Weighted mean was computed to determine the performance in problem solving of the participants and the degree of the perceived causes of pathological fears.

4. Dependent t – test was used to determine if there is significant difference between the pretest and posttest of both the control and experimental groups

5. Cohen's d was calculated using the effect size calculator to ascertain the practical significance or effect size of 2C – 2I – 1R pedagogical approach on the experimental group and the regular classroom teaching on the control group.

Ethical Considerations

Ethical Issues encountered in research are inevitable. They may make or break the validity and reliability of the research results. Ethical issues bring systems of morality and principles into conflict, that is why they must be anticipated and considered. Some potential issues may be inevitable, but plausible solutions can be at hand.

In doing the research, the respondents were informed about their involvement in the experiment. Each was given a consent form and the option to withdraw from the experiment if they wished to. The safety of the respondents during the conduct of the study was ensured by the researcher. Only the researcher had access to the data gathered and to ensure the confidentiality, the consumed survey forms were kept in a safe place accessible only to the researcher, and ready for disposal after five years. The researcher also clarified to the respondents that no honorarium would be given for participating in the study. The involvement of the respondents was kept confidential through the use of alias in case of data presentation. At the end of the conduct of the study, the result would be disseminated to proper authorities to utilize the result effectively. It would be presented to fellow colleagues through School Learning Action Cell and to ensure a wider scope of dissemination, the result would be forwarded to the Division Research Council.

CHAPTER III
RESULTS AND DISCUSSION

This chapter presents the analysis and interpretation of results based on the research questions. It discusses the effect of the 2C-2I-1R pedagogical approach on students' perception on the cause of pathological fear and problem solving performance.

Problem1. What is the problem solving performance of the control and experimental groups prior to and after exposure to the 2C – 2I – 1R pedagogical approach?

Table 4 displays the mean scores of the experimental and control groups in terms of problem solving performance prior to and after the experimentation process.

Table 4.

Problem Solving Performance in Pretest and Posttest of the Experimental and Control Groups

Group	**Mean**		**Sd**		**Interpretation**		**t**	**p-value**
	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post test		
Experimental	4.1	23.75	4.54	1.01	Novice	Proficient	-19.79	$p<0.05$
Control	3.65	19.15	8.88	1.98	Novice	Proficient	-7.58	$P<0.05$

It reveals that the performance of both groups was considered novice during the pretest, having means of 4.1 and 3.65for experimental and control groups, respectively. This could be because the topics covered on the test were not yet discussed. Both groups improved their performance in the posttest, considering that both were already proficient,

having mean scores of 23.75 for the experimental group and 19.15 for control group. However, the performance of the experimental group was slightly higher as compared with the control group during the pretest. It is noticeable though that the gap between the two groups became wider during the posttest, from a 0.46 difference in the pretest to 4.6 in the posttest. On the other hand, the scores obtained by the control group were more dispersed than the experimental group's score, as shown in the standard deviations which were 8.88 and 4.54in the pretest. Moreover, in the posttest, a bit higher variation was observed in the control group as compared with the experimental group.

According to McCarthy, Mc Court, Ikutegbe and Zhou (2018), a positive result would be fostered when the learners received a high- end teaching, focused on age-appropriate, challenging content, and a healthy relationship with their teachers. The experimental group underwent different approaches in learning various competencies in General Mathematics. This experience perhaps enabled them to widen their horizon in solving problems using different techniques such as seeking the help of their fellow learners, making reflections on what they learned, using different models to arrive at sound conclusions, and other strategies that helped them in constructing meaning. However, the control group underwent routine activities such as attending discussions and doing exercises in solving problems, which followed a fixed process. Both experimental and control groups showed a positive result after the experimentation process; only that the mean score of the experimental group had a higher increase compared to the mean score of the control group.

Moreover, table 3 reveals that the mean of the pretest (4.1) and the posttest (19.15) of the control group has a significant difference having a p – value of 0.000. Furthermore, a significant difference between the mean of the pretest and the mean of the posttest is observed with a t – value of -19.79 and a p – value of 0.000. Specifically, the mean values were 3.65 and 23.75 for the pretest and posttest respectively.

Thus, the findings support the claims of Armbruster (2017) who stated that traditional lecture course may also improve and maybe effective in delivering a particular content to students even though it promotes passive learning however, student centered pedagogy that focused on active learning led to significant improvement in satisfaction and academic performance. This was evident with the manner how the learners answered the problem solving activity. It was observed that learners from the control group shows confidence in answering problems especially if they were able follow the pattern set by teacher. In working on the problem learners applied the formulas learned during the discussion. In the process of using the pattern set by teacher in working on problems they were able to get the correct result most of the times. However, once they were confronted to a new type of problem, they found difficulties in solving so most often they passed their papers without answer. On the other hand, for the experimental group where 2C – 2I – 1R pedagogy was employed, the researcher observed that the students were able to solve problems using different methods such as trial and error, using tables and illustrations and through counter examples. In the process of doing so they developed their own methods apart from what the teacher taught and as a result, they were able to solve some problems that had different pattern as to what the teacher showed in the discussion. The new methods help them in performing better on the posttest.

Problem 2. Is there a significant difference between the problem solving performance of the control and experimental groups after exposure to the 2C – 2I – 1R approach?

Table 5 shows the comparison of the mean scores of the posttest of experimental and control groups in terms of problem solving performance.

Table 5.

Comparison of the Mean Scores of Control and Experimental Groups on the Posttest on Problem Solving using t-test

Group	Mean	Sd	df	t	p-value	Interpretation	Effect Size	Interpretation
Experimental	23.75	3.99	38	-2.198	0.001	Significant	0.70	Medium
Control	19.15	8.46						

As presented in Table 5, a highly significant difference between the means of experimental and comparison groups in terms of problem -solving performance was observed with a p – value of 0.001, which was less than the significant level of 0.05. Specifically, the mean values were 23.75 and 19.15 for experimental and control groups respectively. This implies that those students exposed with the 2C – 2I – 1R pedagogical approach had higher performance compared to the other group. Considering that the variation in the scores were significant it was possible to identify the magnitude of the effect, in order to do so an effect size or Cohen's d test was used. According to Fritz (2012) the effect size allows researchers to focus on quantitative description to be more interpretable and comparable. In determining the magnitude of the differences (effect size) d =0.70 was obtained, this value was more than the threshold of 0.50 for medium effect size and marginally short of 0.8 for large effect size (Cohen, 1988). This indicated that the learning gains of the experimental group in problem solving were more than those of the control group. Therefore, the difference in the problem solving performance of the control and experimental groups is not only significant but also important.

This result can be attributed to the claims of Persuad (2019) who stated that through the use of appropriate pedagogy, learners expand their knowledge and understanding how this knowledge is used in authentic and relevant real-world scenarios. This also leads to the development of active learning that helps in developing concept and builds mental

models. It may be noted that in the learning environment of the 2C-2I-1R approach, while using the constructivist, integrative, collaborative and reflective components, learners were encouraged to build on previous knowledge, think critically, integrate the topic learned to real-life context, reflect, and transfer the lesson learned in a small group.

Further, in using the inquiry-based component, the teacher continuously guided learning and gave feedback in the course of inquiry (Banchi & Bell, 2008). For instance, in the presentation of the lesson on simple interest, the teacher allowed the students to work in small groups and to use their own strategy in solving the real-life problem presented as a springboard. The lesson was discussed thoroughly by the teacher, with maximum participation of the class, allowing student-inquiries along the teaching-learning process. Then the students were asked to reflect on the effectiveness of the strategy they used and the errors, if any, in their solutions.

Thus, going back to the results, the highly significant difference and the moderate effect size in the performance of the two groups in favor of the experimental group could be attributed to the combination of several approaches used in the teaching-learning process. This could mean that being actively involved in learning with the help of their classmates while being exposed to real-life situations could show a more lasting and authentic learning experience as reflected in their tasks. It was observed that learners who underwent 2C-2I-1R pedagogical approaches could relate mathematical situations easily to real – life scenarios; thus, they showed more meaningful and relevant solutions in their outputs. Chinn (2007) claimed that the constructivist approach made students' engagement in active learning activities to increase. It also increased the affectivity of knowledge transfer between disciplines and promoted long-term memory retention. Further, it supported the claim of Singer (2015) who pointed out that learners appreciated active learning in an integrative-based environment even though they found the task more challenging compared to the regular classroom method that they experienced. Akyildiz (2016) echoed the same observation, stressing that in using the reflective approach,

students learned better when they were integrated with their own learning process by reflecting about what they learned.

On the other hand, since the control group was involved in routine activities, they had the tendency to avoid solving problems that were new to them. Learners usually rely on the things that was only taught to them and they find it hard to exert effort in working out with problems that was not given in the example. They simply were more passive and they learned through spoon-feeding. This situation supported the claims of Welch(2017)who noted that understanding the different pedagogical method helps both teacher and learner in attaining goals that bridge the gap between where the learner is and where he/she needs to be.

In view of this finding, the study shows that the learners in the experimental group manifested a more authentic learning; and the teacher's use of pedagogy is seemingly one of the key factors in doing a transfer of information to the learners.

Problem 3. What is the assessed pathological fear of the control and experimental group prior to and after exposure to the 2C – 2I – 1 pedagogical approach ?

Table 6 summarizes the assessed pathological fear of the control caused by Abstract Nature of Mathematics.

Table 6.

Assessed Pathological Fear in Terms of Abstract Nature of Mathematics on Pre-survey and Post-survey of Control Group

Pathological Fears	**Presurvey**		**Post-survey**	
Statements	**Mean**	**Interpretation**	**Mean**	**Interpretation**
A. Abstract Nature of Mathematics				
1. I am afraid that I cannot use mathematics if my field of interest is not directly related to it.	3.00	High	2.15	Low
2. I found it difficult to relate mathematics knowledge into real life situation because some topics are not seen in our locality	3.10	High	2.70	High
3. The nature of mathematics demands a lot of thinking and I do not have the patience to deal with it.	3.05	High	2.40	Low
4. I worry that I will not be able to use mathematics in my future career when needed	2.95	High	2.30	Low
5. I worry that I do not know enough mathematics to do well in future mathematics courses	3.35	High	2.35	Low
General Average	3.09	High	2.38	Low

It shows that before the study, the highest mean value obtained was 3.35 when '*they worry about failing to learn concepts and topics that are essential to the course related to Mathematics;'* and the lowest mean value obtained was 2.95 when '*they worry that they will not learn mathematics that is used in future mathematics courses*.'

It can be observed that before the experimentation process, the learners perceived a high level of fear with regard to abstract nature of mathematics. As observed by the researcher, since the learners were enrolled in Humanities and Social Sciences strand, most of their interests were not related directly to mathematics; so they viewed this subject area as a vague subject. Moreover, their lack of awareness in the real – life application of the competencies included in this area added to their fears in learning math. This supported the claims of Betiku (2016) that mathematics is a highly structured subject.

However, after exposure to the traditional classroom method, the highest mean value computed was 2.70 ‘when *they found it hard to relate mathematics into real life situation*.’ Meanwhile, the lowest mean value during the posttest is 2.15 ‘*when they feel afraid that they cannot use mathematics if their field of interest is not related to it*.’ The computed means further revealed that the degree of perception with the cause of pathological fear during the pretest differed with the posttest. Notably, from a mean of 3.09 on the pretest, interpreted as high, it decreased to 2.38 on the posttest, interpreted as low.

According to Casinillo (2019), motivation and study habits are factors in resolving math avoidance. This is in consonance with the observed behavior of the learners who were exposed to the traditional teaching method where they developed a system and process of studying since a pattern in completing task was observed. Because of a routine set of activities regularly presented to the control group, learners already knew what to expect and what likely would happen in class; thus, their fears lessened.

Table 7 reveals the assessed pathological fear of the control group caused by Teacher Factor.

Table 7.

Assessed Pathological Fear in Terms of Teacher Factor on Pre-survey and Post-survey of Control Group

Perceived Causes of Pathological Fears	Presurvey		Postsurvey	
Statements	**Mean**	**Interpretation**	**Mean**	**Interpretation**
B. Teacher Factor				
1. I feared mathematics because my teacher kept on saying that the exercises, seat works, activities and tests are hard	3.25	Very High	2.10	Low
2. I feel stressed listening to my teacher's discussion because he/she kept on using the same method	3.10	High	2.50	High
3. I worry that my teacher will give me negative feedbacks if I answered wrong during recitations	3.20	High	2.30	Low
4. I feel scared to raise my hand during math class to ask question	2.95	High	2.30	Low
5. I worry that I will not understand the lesson discussed by my teacher because of the strategy he/she is using	3.05	High	2.45	Low
Overall Mean	3.11	High	2.33	Low

It can be seen in Table 7 that the control group felt the situation that might lead to pathological fears in terms of teacher factor during the pre-survey when '*the teacher kept on saying that the exercises, seatworks and tests are hard*.' The group acquired a mean value of 3.25, interpreted as very high. However,'*raising their hand during math class to ask questions'* garnered a mean value of 2.95, making it the lowest mean value during the pre-survey, although it was still interpreted as high. The statement '*the students feel stressed listening to the teacher's discussion because of using the same method*' made the group feel more fear in Mathematics, leading them to get a mean value of 2.50, still interpreted as high.

On the other hand, the highest mean value during the pre-survey became the lowest mean value on the post-survey, when the group obtained a value of 2.10, interpreted as low. The general mean value for teacher factor during the pre-survey was 3.11, interpreted as high; while during the post-survey, the obtained general mean value was 2.33, interpreted as low.

As observed, teachers play a very important role in the learners' perception regarding fears. On the first day of class during the orientation process, the students' fears were fostered when a run through of the curriculum guide was explained to them. Also, troubled faces were seen when different requirements and expectations were enumerated. However, during the experimentation process when they get used to the pattern followed in learning each competency, they seemed relax in completing their task. Some of them even volunteered to show their answers in a given task. These observations are related to the findings of Acharya (2017) where a positive direction for students in gaining master in mathematics rooted from the positive attitude of the teacher.

Table 8 presents the assessed pathological fear of the control group in caused by Parental Indoctrination.

Table 8.

Assessed Pathological Fear in terms of Parental Indoctrination on Pre-survey and Post-survey of the Control Group

Perceived Causes of Pathological Fears	Pre-survey		Post-survey	
Statements	**Mean**	**Interpretation**	**Mean**	**Interpretation**
C. Parental Indoctrination				
1. I am afraid that I will not understand mathematics because my parents kept on saying that it is hard	3.25	Very High	2.20	Low
2. I worry that I will not catch up to the lessons since my parents kept on saying that it is far more advanced comparing to theirs	3.15	High	2.40	Low
3. I worry that I will not be able to get the correct answer because when my parents support me with my homework they felt anxious	3.30	Very High	2.30	Low
4. I am not confident answering difficult questions because according to my parents I will be embarrassed if I get wrong answers	3.15	High	2.35	Low
5. I feel nervous answering math problems because when I seek the help of my parents they say that those stuff made them nervous	3.10	High	2.30	Low
Overall Mean	3.19	High	2.31	Low

As presented in Table 8, the leading cause of pathological fear in terms of parental indoctrination of the control group was when '*they worry that their answer in their homework is incorrect due to the anxiousness shown by their parents when they sought help.*' The least cause of pathological fear manifest by the group was 'when *the nervousness felt by their parents was transferred to them every time they ask them to solve math related problems*.' The mean values of these two areas were 3.30 and 3.10, respectively, during the pre-survey.

On the other hand, the result of the post-survey greatly differed from the pre-survey wherein the highest mean value obtained was 2.40 when '*they worry catching up with the lesson since their parents keep on saying that it is more advanced compare to them*.' The lowest mean value obtained in the posttest was 2.20 when *they 'feel afraid that they will not understand mathematics because their parents keep on saying that it is hard*.' Comparing the general mean values of the pre-survey and post survey, it can be seen that the value obtained in the pre-survey was greater than the post-survey, which were 3.19 and 2.31 respectively. The mean value for the pre-survey was interpreted as high and the mean value obtained for the post-survey was considered low.

It was observed that majority of the learners did not rely on their parents in completing the task required to them. It could either be that they lacked home facilitators or their parents kept on saying that they could not be of great help since they did not know the topics being discussed. At first, the learners believed what their parents said, since their pre-survey result indicated that their perceived fear was high. However, when the study was conducted and they were able to experience the actual process in doing the activities required in General Mathematics, they started to be more confident in doing it on their own. Also, they were able to consult their parents since the competencies covered could apply to real life scenarios such as interest and consumer loans. This made their perception to fear on the post-survey low. These findings supported the claims of Rossnan (2016) that

a positive result would be expected if parents actively involve themselves in encouraging their child to include math in their daily living.

Meanwhile, Table 9 displays the level of pre-survey and post-survey results of experimental group on perceived cause of pathological fears in terms of abstract nature of mathematics.

Table 9.

Assessed Pathological Fears in terms of Abstract Nature of Mathematics on Pre-survey and Post-survey of Experimental Group

Perceived Causes of Pathological Fears	**Pre Survey**		**Post Survey**	
Statements	**Mean**	**Interpretation**	**Mean**	**Interpretation**
A. Abstract Nature of Mathematics				
1. I am afraid that I cannot use mathematics if my field of interest is not directly related to it.	3.25	Very High	1.90	Low
2. I found it difficult to relate mathematics knowledge into real life situation because some topics are not seen in our locality	3.00	High	2.40	Low
3. The nature of mathematics demands a lot of thinking and I do not have the patience to deal with it.	3.30	Very High	2.25	Low

4.	I worry that I will not be able to use mathematics in my future career when needed	3.40	Very High	2.10	Low
5.	I worry that I do not know enough mathematics to do well in future mathematics courses	3.45	Very High	2.20	Low
	Overall Mean	3.28	Very High	2.17	Low

The result shows that the experimental group's leading cause of pathological fear was when they '*worry that they do not know enough topics in mathematics that will help them in the course that is related to it.* The result was in consonance with the observation of the researcher with regard to the strand the learners are enrolled in. Since the respondents are Humanities and Social Science students, they had the tendency to think that this subject area had nothing to do with the future course that they would take. The mean value obtained for this area was 3.45, interpreted as very high.

The area that has the least mean value was the '*difficulties they encountered in relating mathematics into real life situations'* with a value of 3.00. Another observed behavior from the learners before the study was conducted was their inability to relate some mathematical concepts to real life scenarios. They failed to see the connections and how this knowledge could be applied to their daily activities.

On the other hand, during the post-survey, the values obtained were lower than the pre- survey. Hence, the highest mean value obtained was 2.40in the area, wherein the group obtained the least mean value during the pre-survey. This means that after the experimentation process, the perception of the learners in general mathematics changed. They now established a connection between this topic and their area of interest. However, the value obtained was 1.90, when '*they feel afraid that they cannot use mathematics in*

their area of interest.' In addition, the general mean values during the pre-survey and post-survey were different; that is, from 3.28, it decreased to 2.17. This means that the cause of fear of the group at the end of the experimentation process was less. Thus, the result of this study supported the prior claims of Ralhan (2019) that in order to get rid of math phobia, one must apply math in real life.

Meanwhile, Table 10 reveals the result of pre-survey and post-survey of experimental group on the assessed cause of pathological fears in terms of teacher factor.

Table 10.

Assessed Pathological Fear in Terms of Teacher Factor on Pre-survey and Post-survey of Experimental Group

Perceived Causes of Pathological Fears	**Pre survey**		**Post Survey**	
Statements	**Mean**	**Interpretation**	**Mean**	**Interpretation**
B. Teacher Factor				
1.I feared mathematics because my teacher kept on saying that the exercises, seat works, activities and tests are hard	3.50	Very High	1.85	Low
2. I feel stressed listening to my teacher's discussion because he/she kept on using the same method	3.20	High	2.40	Low
3. I worry that my teacher will give me negative feedbacks if	3.30	Very High	2.20	Low

	I answered wrong during recitations				
4.	I feel scared to raise my hand during math class to ask question	3.10	High	2.05	Low
5.	I worry that I will not understand the lesson discussed by my teacher because of the strategy he/she is using	3.05	High	2.15	Low
	Overall Mean	3.23	High	2.13	Low

It reveals that learners from the experimental group perceived a high level of fear during the pre-survey, obtaining a general mean of 3.23. Further, it shows that the leading cause of fear was when '*the teacher kept on saying that the activities are hard,'* with a mean value of 3.50 and interpreted as very high. Meanwhile, during the post-survey, the learners perceived a low level of fears in all aspects. The highest mean obtained was when '*they feel tired when listening to the teacher's discussion because of using the same method of teaching'* with a mean value of 2.40. However, the lowest mean value obtained was 1.85 when '*they fear mathematics because the teachers kept on saying that the exercises and different activities are hard*.'

Based on the findings, it is seen that teachers play a very important role on how learners deal with fears. They believed what the teachers said even before having an actual experience with regard to the topics. Yet, as the study progressed and learners started to tackle the different competencies in General Mathematics, they began to feel at ease, which was fostered by actively engaging themselves in different tasks. They were no longer afraid to show their solution to the teacher even though they were unsure of the outcomes. Also, learners became more assertive in trying different techniques to arrive at the answer.

Alexander (2010) considered pathological fear in mathematics as a feeling of tension that affects students' accomplishment of mathematical tasks especially in problem solving. Yahya)2012) pointed out that pathological fear in Mathematics is very real and mostly developed inside the classroom due to lack of consideration of different learning styles of the students. Thus, it can be inferred that using the combination of the inquiry-based, collaborative, and integrative components of the 2C-2I-1R approach seems to lessen the pathological fear of students in mathematics. As stressed by Cardona (2015), teachers may apply suitable teaching strategies where students can learn most effectively. As pointed out by Willis (2010), if traditional mathematics curriculum would be replaced by different interventions and students' tasks such as working in groups, applications of concepts to real-life problems, and group or peer involvement, the fears provoked in classroom environments may be lessened.

The observations and findings of the researcher in the study are similar to the findings of Rossnan (2016), who claims that the different cultures found inside the classroom contributes to the success in reducing fears and anxiety of the different learners. Moreover, it greatly affects the manner of asking questions, exploration of different ideas, and the way a learner thinks to give sense to a particular idea.

Moreover, the use of the 2C – 2I – 1R pedagogical approach promoted an active learning and helped students to become more engaged in the different tasks and activities inside the classroom, thus helping them lessen their perceived pathological fears especially on teacher factor area. Likewise, the study of Jones (2014) expressed the same idea which claimed that the strategies applied by the teachers toward the students give them opportunity to engage, produce and feel better, consequently helping them to overcome their fears.

Table 11 shows the result of pre-survey and post-survey of experimental group on the assessed pathological fears cause by parental indoctrination.

Table 11.

Assessed Pathological Fear in Terms of Parental Indoctrination on Pre-survey and Post-survey of Experimental Group

Perceived Causes of Pathological Fears	Pre Survey		Post Survey	
Statements	**Mean**	**Interpretation**	**Mean**	**Interpretation**
C.Parental Indoctrination				
1. I am afraid that I will not understand mathematics because my parents kept on saying that it is hard	3.25	Very High	1.90	Low
2. I worry that I will not catch up to the lessons since my parents kept on saying that it is far more advanced comparing to theirs	3.15	High	2.20	Low
3. I worry that I will not be able to get the correct answer because when my parents support me with my homework they felt anxious	3.30	Very High	2.15	Low
4. I am not confident answering difficult questions because according to my parents I will be embarrassed if I get wrong answers	3.15	High	2.10	Low
5. I feel nervous answering math problems because when I seek the help of my parents they say that those stuff made them nervous	3.10	High	2.10	Low
Overall Mean	3.19	High	2.09	Low

Table 11 presents the result of pre-survey and post-survey of the experimental group on perceived causes of pathological fears in terms of parental indoctrination. It

shows that learners from the experimental group perceived a high level of fear during the pre-survey. The highest mean value obtained was 3.30, interpreted as very high. This was when '*they worry that they will not get the correct answer because when their parents support them they sense their anxiousness*.' The lowest mean value obtained during the pre-survey was 3.10interpreted as high; and this was when '*they feel nervous answering mathematics problems because when they seek the help of their parents, they say that those stuff makes them nervous as well*.'

It was observed that the learners mostly do their task without the help of their parents because according to them, their parents were not confident to teach them the lesson. Moreover, it was observed that the competencies discussed in General Mathematics required different formulas that even their parents perceived the difficulty. Since their parents considered this area as difficult, learners assumed that perceiving this area as difficult subject would just be all right. This finding was in line with the claim of Maduabum (2016) that parents are considered contributor of fears in Mathematics.

However, the learners from the experimental group obtained a mean value of 2.09 interpreted as low during the post-survey. The highest mean value obtained during the post survey was 2.20 interpreted as low when '*they worry that they will not catch up from the lesson because their parents kept on saying that it is far more advanced comparing to their lessons*.' The lowest mean value obtained was 1.90 interpreted as low, and this was when '*they feel afraid that they will not understand the lesson because their parents kept on saying that it is hard*.' This was evident in the outputs shown by the learners when they became more confident in completing their tasks. They even continued working on difficult tasks even though their parents kept on saying that those topics were hard. Thus, the findings of this study supported the previous research that shows an effective technique removing fear in the classroom, thus turning these to confidence that made learning take place (Ostrowski, 2015).

Table 12.

Summary of the Pre-survey and Post-survey Mean Scores of the Assessed Pathological Fear

Pathological Fears in Mathematics	**Experimental Group**				**Control Group**			
	Pre survey	**Interpretation**	**Post survey**	**Interpretation**	**Pre survey**	**Interpretation**	**Postsurvey**	**Interpretation**
Abstract Nature of Mathematics	3.28	Very High	2.17	Low	3.09	High	2.38	Low
Teacher Factor	3.23	High	2.13	Low	3.11	High	2.33	Low
Parental Indoctrination	3.19	High	2.09	Low	3.19	High	2.31	Low
Overall Mean	3.23	High	2.13	Low	3.13	High	2.34	Low

Based on the survey, both the experimental and control groups perceived a high level of fear during the pre-survey. Among the three perceived causes, abstract nature of mathematics obtained the highest mean value of 3.28 interpreted as very high for the experimental group. This supported the claims of Estonato (2019) that one of the major causes of anxiety of the learners is the abstract mathematical nature of a particular subject area. On the other hand, the control group obtained the highest mean value of 3.19 for parental indoctrination. This result was related to the findings of the study of Roberts (2018) where parental involvement served a positive or negative influence on academic achievement. The general mean obtained by the experimental group for the pre survey was slightly higher than the control group.

However, both mean values of the control and experimental groups were interpreted low in the post-survey. The abstract nature of mathematics obtained the highest mean value for both groups, with 2.17 obtained by the experimental group, and 2.38 by the

control group. The general means obtained by both groups were both interpreted low; but the experimental group's mean value was slightly lower than the control group.

The findings of the study supported the claims of Yahyah and Fassasi (2012) that the use of different strategies in presenting mathematics lessons in a variety of ways can reduce the pathological fears. After undergoing the research, both groups lessened their pathological fears using the regular classroom instruction and the 2C – 2I – 1R pedagogical approach. However, the use of the 2C – 2I – 1R pedagogical approach resulted to a lesser perceived fears on the part of the learners.

Table 13 displays the comparison between the presurvey and postsurvey of the control and experimental groups.

Table 13.

Comparison of the Assessed Pathological Fear in Presurvey and Postsurvey of the Experimental and Control Groups

Group	Mean		Interpretation		T	p- value
	Pre survey	Post survey	Pre survey	Post survey		
Experimental	3.23	2.13	High	Low	22.44	$p<0.05$
Control	3.13	2.34	High	Low	9.06	$p<0.05$

The table reveals that there is a high significant difference between the means of presurvey and post survey of the control group., Similarly, there is also a significant difference between the means of the presurvey and post survey of the experimental group. During the presurvey both experimental and control groups considered their pathological fears high; however, after the experimentation process both groups had low pathological fears.

This support the claims of Hargreaves (2017), that once children exercise independence, fears maybe reduced since the constant surveillance from different people

such as family and teachers contribute to their fear. The use of different pedagogies that can give the learners the capacity to work on their own and face different tasks with the help of their peers and classmates help them to realized that some tasks were not that difficult. This was fostered by the learners from control and experimental groups wherein they were given freedom to accomplish tasks independently. It was observed that at first when mathematical problems were given to them, they were usually silent and unresponsive. They showed their fears by avoiding questions of the teacher and looking down whenever the teacher looks for volunteer to answer. However, as the experimentation went on were learners from the control group were given time to independently perform their task after discussion gradually their fears were being eliminated which was fostered by raising their hands whenever volunteers were called to show their answers on the board. They even approach the teacher to ask if they obtain the correct answer or their solution is in the right track whenever they are working independently. On the other hand, learners from the experimental group reduced their fears due to different strategies such as self-realization where in it is reflected through journal writing or answering some reflective questions. This is the part where they realized in which area they experienced difficulties, how can they overcome such difficulties and who can help them. The support given their groupmates also help them in overcoming their fears since they were be able to share common experiences and problems and come up with ways on how to resolve it. Due to these strategies learners were able to recognize, communicate and addressed their fears. This was evident during discussions wherein that signs of fears they show at the beginning of the experimentation process such as avoiding eye contact with the teacher, looking down when questions were asked and avoiding board work was reduced.

Problem 4. Is there a significant difference between the students' assessed pathological fear after exposure to the 2C – 2I – 1R approaches?

Table 14 shows the comparison of the mean values of the post-survey of both groups in terms of perceived causes of pathological fears in mathematics.

Table 14.

Comparison of the Means of Postsurvey of Control and Experimental Groups on the Assessed Pathological Fear

Group	Mean	Sd	Df	t	p-value	Interpretation	Effect Size	Interpretation
Experimental	2.13	0.15	38	3.03	0.024	Significant	0.93	Large
Control	2.34	0.28						

Table 11 reveals that the means of the control (2.34) and experimental (2.13) group on the post survey about their perception on the cause of pathological fears after the experiment were significantly different since the p- value obtained (0.024) was less than the significant value which was 0.05. Therefore, there was a significant difference between the students' perception on the cause of pathological fears after exposure to the 2C – 2I – 1R pedagogical approach. Moreover, to ascertain the size of the difference in effect, Cohen's d was computed to determine the magnitude of differences in the means and obtained $d = 0.93$ which indicated a large effect size since it is greater than Cohen's (1988) threshold of 0.8. This means that the pathological fear of the experimental group was greatly lessen as compared to the pathological fear of the control group.

Both learners from control and experimental groups had low perceived fears after the experimentation process; however, learners from the experimental group had lower perceived fears compared to the control group. Also, it was observed that the learners from both groups lessened their tension in attending math classes as the study progressed since they were able to concretize the concepts presented. But learners exposed to the 2C – 2I – 1R pedagogical approach were observed to have lesser fear since they were given more

freedom in trying out to solve and make mathematical tasks. In addition, despite the pathological fears in mathematics that could have been developed by parental indoctrination, learners who were taught using the 2C – 2I – 1R pedagogical approach became more confident in class. Because few restrictions were imposed, they were able to construct meaning with the help of their classmates by relating the concepts to real – life situations. This supported the claims of O'Brien (2018) that there are pedagogical practices that enable the development and dispositions of the students in their learning environment upon reaching their learning goals; upon doing so, positive cognition, emotions, and experiences are developed as well. Moreover, the findings of the study can be parallel to the findings of Buchler (2013),indicating that the choice of the right strategies or combination of strategies could help the learners in controlling their fears when facing situations that trigger their fears.

Moreover, based from the observations of the researcher the fears showed by the learners at the beginning of the study which was manifested by different actions such as avoiding to answer mathematical problems, looking down when questions were asked, fear to raise their hands when answering questions and failure to express themselves whenever they are asked to explain were lessened towards the end of the study. However, due to the different pedagogical approaches employed to the experimental group different opportunities were given to them to lessen their fear such as working with their classmates in group which give them an avenue to share common experiences and resolve it together, involving themselves with self – reflection that made them realize their fears and find ways on how to overcome them and realizing on how to concretized mathematics concepts and be able to relate it with different areas of their interest. The experiences of experimental group made them lessen their fears more as compared to the control group who were given fewer opportunities which was shown by only letting them work independently and involving them in the discussion. After the experimentation process it was observed that the learners from the experimental group show lesser pathological fears which was

reflected by their confidence to raise their hands to give their answer, trying to show solutions to the problems given even though they were unsure whether it is correct or not, volunteer to do board works and explain their answers and ask questions whenever there were unclear to them. Meanwhile, the control group also manifest lesser fears by being more confident in answering questions, doing board work and asking the teacher on how to answer, but there were times that they still avoid solving some problems.

From the data gathered. it can be concluded that the use of 2C- 2I- 1R pedagogical approaches can lessen the learners' perceived pathological fears in Mathematics attributed to the abstract nature of mathematics, teacher factor, and parental indoctrination.

CHAPTER IV
SUMMARY, CONCLUSION, AND RECOMMENDATION

This chapter discusses the findings of the study, conclusions derived from the findings, and the corresponding recommendations.

Summary of the Study

This study aimed to determine the effects of the 2C-2I-1R pedagogical approachto the perceptions on pathological fears and performance on problem solving of Grade 11 students in General Mathematics. It utilized a Pretest- Posttest Comparison Group Design to test the effect of 2C-2I-1R pedagogy on the pathological fears and performance on problem solving of students. Twenty (20) students from each section of HUMSS 11- A and HUMSS 11-B who are comparable in terms of pathological fears and mathematics performance and taking General Mathematics for the First Semester of S.Y 2019-2020 from Cotta National High School participated in the study.

A 4 – point survey questionnaire adopted from Pathological Fears in Mathematics Questionnaire (PFMATQ) of Yahyah and Fassasi (2012) determined the l pathological fears of the students. The second instrument tested problem-solving performance of the students. It was a 10 – item researcher made pretest and posttest which were parallel, validated by a panel of experts, and pilot tested to a set of students that obtained a reliability value of $\alpha = 0.79$. This was used to determine the problem solving performance of the students in General Mathematics.

Summary of Results

The following are the results of the study:

1. Prior to the experimentation process, the performance of experimental and control groups were considered novice. However, after the experimentation process, the performance of both groups increased and interpreted as proficient; yet the increase of the mean score of the experimental group was much better than the control group.
2. There is a significant difference between the problem- solving performance of the control and experimental group after exposure to 2C – 2I – 1R pedagogical approaches. The experimental group obtained higher mean than the control group in the posttest and the effect size between the two groups is medium.
3. Before the experimentation process, both groups had a high level of perceived causes of pathological fears. After the experimentation process, both had low level of perceived cause of pathological fears. The mean values of the control and experimental groups in the perceived pathological fears in mathematics decreased; but the mean value of the experimental group was lower than the control group.
4. There is a significant difference between the student's pathological fears of the control and experimental groups after the study and there is a large effect size between the two groups. Thus, the experimental group taught using 2C-2I-1R pedagogy obtained a lower mean than the control group taught using the regular classroom method.

Limitation of the Study

The study aimed to determine the effects of 2C- 2I- 1R pedagogy on pathological fear and performance on problem solving in General Mathematics of Senior High School students. To determine the problem solving performance of Grade 11 students, a teacher-

made test composed of 10 problems was used. The most common causes of pathological fear as experienced by the respondents were identified using the Pathological Fear in Mathematics Questionnaire (PFMAT Q) of Yahya and Fassasi (2012).

Two sections with thirty students each enrolled in General Mathematics for the first semester of academic year 2019 – 2020 from Cotta National High School were the participants of the study, where one section was taught using the 2C-2I-1R pedagogical approach and the other section with the traditional method.

Conclusion

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

The 2C-2I-1R approach can be used as an alternative pedagogical approach that can be used to improve the problem solving performance and reduce the pathological fears in mathematics of students. Both approaches have positive effect to problem solving performance and pathological fears in mathematics however the use of 2C – 2I – 1R pedagogical approach has a better result in improving the problem solving performance and reducing pathological fears.

Recommendations

Based on the findings of the study and the conclusion drawn, the following are recommended:

1. Teaching mathematics following the 2C – 2I – 1R pedagogy is recommended to alleviate the students' perceived cause of pathological fears in mathematics and

improve their problem- solving performance in mathematics. Other forms of suited activities that may fall under Constructivist, Collaborative, Inquiry –based, Integrative, and Reflective approach may be developed to provide a variety of options for teachers to apply inside the classroom.

2. Lesson plans and/or other instructional materials using the 2C-2I-1R approach may be designed by experts/designers that could serve as models to enable teachers to design their own that they can use in their classes. Similarly, teachers maybe given proper trainings on how to design lesson plans using the 2C – 2I – 1R pedagogy and how to implement them inside mathematics classes and classes in other learning areas.
3. Researchers can investigate the effect of 2C -2I – 1R pedagogy on the perceived causes of pathological fears and performance in other learning areas and in other levels. Findings of which can serve as baseline data to enhance instruction.
4. Researcher can investigate deeper on the three perceived causes of pathological fears and can look at the other causes of pathological fears and their effect on students' performance in mathematics.

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APPENDICES

Appendix A

Letters

Appendix A.1 Cover Letter

August 20, 2019

Dear Sir/Ma'am:

Greetings of Peace!

I am Miss Ann Michelle B. Morano, a student of Master of Arts in Education Specializing in Mathematics at Philippine Normal University who is working on my thesis entitled **"THE EFFECTS OF 2C2I1R PEDAGOGICAL APPROACHES ON PERCEIVED CAUSES OF PATHOLOGICAL FEAR AND PROBLEM SOLVING PERFORMANCE IN GENERAL MATHEMATICS OF SENIOR HIGH SCHOOL STUDENTS".** The study aims to determine the effects of using together the Collaborative, Constructivist, Inquiry based, Integrative and Reflective approaches in one lesson or the 2C2I1R pedagogical approaches on the pathological fears or the abnormal and insistent anxiety of mathematics and the problem solving performance.

In this regard, I would like to request for your help as an expert to validate my research instruments using the attached Validation Form For Experts. I also attached the Pretest on Problem Solving, Posttest on Problem Solving, Table of Specifications (with the learning competencies that serve as the basis in constructing the test on problem solving) and the key answers to the test on problem solving.

Thank you very much!

Respectfully yours,

ANN MICHELLE B. MORANO

Student, MAED – Math

Appendix A.2

Letter to the Superintendent

August 15, 2019

DR. ANIANO M. OGAYON
Schools Division Superintendent
Lucena City

Thru: **RITCHELDA D. ABADILLA**
Principal
Cotta Natinal High School

Dear Sir:

Greetings of Peace!

I am one of the faculty members of Cotta National High School Senior High School Department. Currently I am a graduate student of Philippine Normal University – Manila. As part of the requirements to complete the degree in Master of Arts in Education specializing Mathematics, I will be conducting a research entitled: **"THE EFFECTS OF 2C2I1R PEDAGOGICAL APPROACHES ON PERCEIVED CAUSES OF PATHOLOGICAL FEAR AND PROBLEM SOLVING PERFORMANCE IN GENERAL MATHEMATICS OF SENIOR HIGH SCHOOL STUDENTS"**

In this regard, your approval to allow me to handle four (4) sections of General Mathematics from Grade 11 on first semester of the School Year 2019 – 2020 is very significant.

I am looking forward for your positive reply on this matter. Thank you very much.

Very respectfully yours,

ANN MICHELLE B. MORANO
Student, MAED – Math

Appendix A. 3

Informed Consent

In signing this document, I, ***(Name of Respondent)***, am giving my consent to answer the survey questionnaire on pathological fears and pretest and posttest on problem solving of ***Ms. Ann Michelle M. Jolo***from***Cotta National High School*** I understand that I will be part of the research***The Effects of 2C2I1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students***with the purpose of determining the effects of 2C2I1R pedagogical approaches on pathological fear and performance in problem solving in Mathematics of Grade 11 students.

I understand that I will answer the test and questionnaire at a place and time convenient to me and that the researcher may contact me for more information in the future.

I understand that I was selected to participate in this study because I am a Grade 11 student taking General Mathematicsat***Cotta National High School.***

This data gathering was granted freely. I have been informed that the data collection process is entirely voluntary, and that even after it begins I can refuse to answer any specific questions or decide to terminate the procedure at any point. I have been told that my answers to questions will not be given to anyone else and no reports of this study will ever identify me in any way. I have also been informed that my participation or nonparticipation or my refusal to answer questions will have no effect on the services I or any member of the family may receive from education services providers.

I hereby give the program implementer permission to use my data and information for the purpose of this research. Rest assured that the information obtained from the questionnaire/ survey/ interview/ focus group discussion/ observation shall be used in accordance to research policies and standards. Furthermore, I agree and consent to the extent required by law, the researcher may collect, use and process my personal information in accordance with the Data Privacy Act of 2012. I understand data privacy, its scope and limitation, thus I put my trust and confidence to the researcher/s and program implementers.

I understand that the results of this research will be given to me if I ask for them and that the researcher, ***Ms. Ann Michelle B. Morano*** is the person to contact if I have any question about the study or about my right as a study participant. The researcher can be reached through mobile number at ***09999708421*** or through email at: ***annmichelle.morano@deped.gov.ph***

Date

Respondent's Signature

Researcher's Signature

Appendix A. 4

Child Assent Form

I amMs. Ann Michelle B. Morano from Cotta National High School. I am doing a study entitled ***The Effects of 2C2I1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students*** with the purpose of determining the effects of 2C2I1R pedagogical approaches on pathological fear and performance in problem solving in Mathematics of Grade 11 students. We are asking you to take part in the research study becauseyou are Grade 11 student taking General Mathematics at Cotta National High School.

For this research, I will ask you to answer a questionnaire on pathological fears and test on problem solving. I will keep all your answers confidential and your safety will be ensured in doing this study.

You should know that:

- You do not have to be in this study if you do not want to. Your participation or non participation or refusal to answer the questions will not affect you in any way.
- You may stop being in the study at any time.
- Your parent(s)/guardian(s) were asked if it is OK for you to be in this study. Even if they say it's OK, it is still your choice whether or not to take part.
- You can ask any questions you have, now or later. If you think of a question later, you or your parents can contact me at *09999708421* or email meat*annmichelle.morano@deped.gov.ph*

Sign this form only if you:

- have understood what you will be doing for this study,
- have had all your questions answered,
- have talked to your parent(s)/legal guardian about this project, and
- agree to take part in this research

_____

Your Signature Printed Name Date

_____

Name of Parent(s) or Legal Guardian(s)

_____

Researcher explaining study
Signature Printed Name Date

Appendix A. 5

Parental Consent

In signing this document, I, ***(Name of Respondent's Parent/ Guardian)***, am giving my consent to my child, ***(Name of Respondent)***, to answer the survey questionnaire on pathological fears and pretest and posttest on problem solving of***Ms. Ann Michelle B. Morano***from***Cotta National High School.*** I understand that my child will be part of the research***The Effects of 2C2I1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students***with the purpose of determining the effects of 2C2I1R pedagogical approaches on pathological fear and performance in problem solving in Mathematics of Grade 11 students.I understand that my child will answer a questionnaire or survey/ be interviewed/ be observed at a place and time convenient to him/ her and that the researcher may contact us for more information in the future.

I understand that my child was selected to participate in this study because he/ she is a Grade 11 learner taking general MathematicsatCotta National High School

This data gatheringprocess was granted freely. I have been informed that the data collection is entirely voluntary, and that even after it begins my child can refuse to answer any specific questions or decide to terminate the procedure at any point. I have been told that my child's answers to questions will not be given to anyone else and no reports of this study will ever identify him/ her in any way. I have also been informed that my child's participation or nonparticipation or his/ her refusal to answer questions will have no effect on the services he/ she or any member of our family may receive from education services providers.

I hereby give the program implementer permission to use my child's data and information for the purpose of this research. Rest assured that the information obtained from the test and questionnaire shall be used in accordance to research policies and standards. Furthermore, I agree and consent my child to the extent required by law, the researcher may collect, use and process my child's personal information in accordance with the Data Privacy Act of 2012. I understand data privacy, its scope and limitation, thus I put my trust and confidence to the researcher/s and program implementers.

I understand that the results of this research will be given to us if we ask for them and that the researcher, ***Ms. Ann Michelle B. Morano*** is the person to contact if we have any question about the study or about my right as a study participant. The researcher can be reached through mobile number at ***09999708421*** or through email at: ***annmichelle.morano@deped.gov.ph***

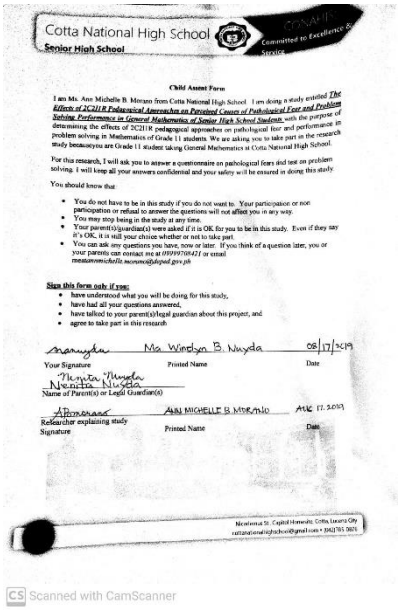
_____
Date

_____
Parent/ Guardian of Respondent's Signature

_____
Researcher's Signature

Appendix A.6

Sample of Signed Informed Consent, Parental Consent and Child Assent Form



Cotta National High School
Senior High School

Child Assent Form

I am Ms. Ann Michelle B. Morano from Cotta National High School. I am doing a study entitled ***The Effects of 2C2I1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students***, with the purpose of determining the effects of 2C2I1R pedagogical approaches on pathological fear and performance in problem solving in Mathematics of Grade 11 students. We are asking you to take part in the research study because you are Grade 11 student taking General Mathematics at Cotta National High School.

For this research, I will ask you to answer a questionnaire on pathological fears and test on problem solving. I will keep all your answers confidential and your safety will be ensured in doing this study.

You should know that:

- You do not have to be in this study if you do not want to. Your participation or non participation or refusal to answer the questions will not affect you in any way.
- You may stop being in the study at any time.
- Your parent(s)/guardian(s) were asked if it is OK for you to be in this study. Even if they say it's OK, it is still your choice whether or not to take part.
- You can ask any questions you have, now or later. If you think of a question later, you or your parents can contact me at *09999708421* or email *annannmichelle.morano@deped.gov.ph*

Sign this form only if you:

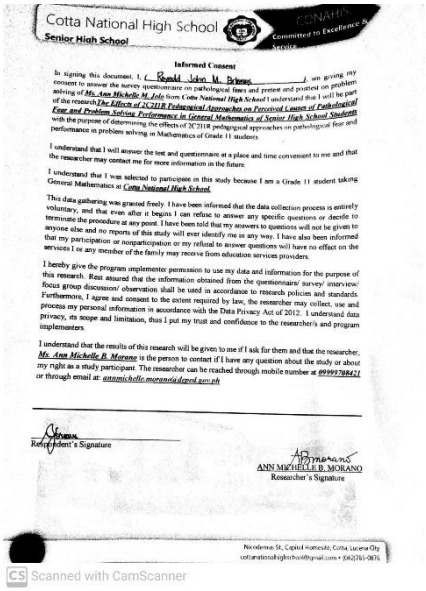
- have understood what you will be doing for this study,
- have had all your questions answered,
- have talked to your parent(s)/legal guardian about this project, and
- agree to take part in this research

Your Signature — Ms. Wirdyn B. Nuyda (Printed Name) — 08/17/2019 (Date)

Mirdyn Nuyda
Name of Parent(s) or Legal Guardian(s)

Researcher explaining study Signature — ANN MICHELLE B. MORANO (Printed Name) — AUG 17, 2019 (Date)

Nicodemus St., Capitol Homesite, Cotta, Lucena City
cottanationalhighschool@gmail.com • (042)785-3876



Cotta National High School
Senior High School

Informed Consent

In signing this document, I, (Ronald John M. Briones), am giving my consent to answer the survey questionnaire on pathological fears and pretest and posttest on problem solving of ***Ms. Ann Michelle M. Jolo*** from ***Cotta National High School*** I understand that I will be part of the research ***The Effects of 2C2I1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students*** with the purpose of determining the effects of 2C2I1R pedagogical approaches on pathological fear and performance in problem solving in Mathematics of Grade 11 students.

I understand that I will answer the test and questionnaire at a place and time convenient to me and that the researcher may contact me for more information in the future.

I understand that I was selected to participate in this study because I am a Grade 11 student taking General Mathematics at ***Cotta National High School***.

This data gathering was granted freely. I have been informed that the data collection process is entirely voluntary, and that even after it begins I can refuse to answer any specific questions or decide to terminate the procedure at any point. I have been told that my answers to questions will not be given to anyone else and no reports of this study will ever identify me in any way. I have also been informed that my participation or nonparticipation or my refusal to answer questions will have no effect on the services I or any member of the family may receive from education services providers.

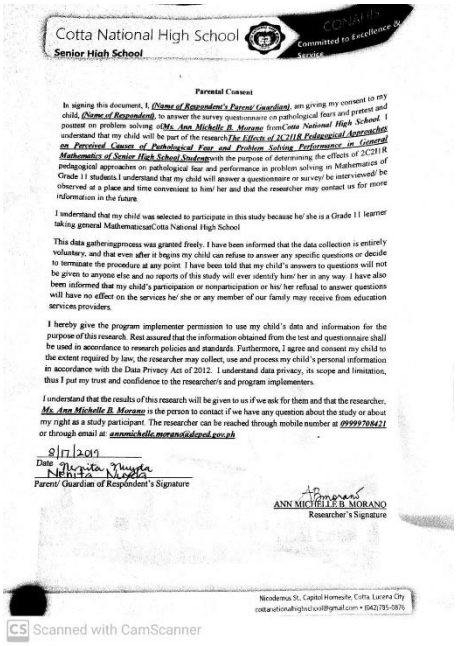
I hereby give the program implementer permission to use my data and information for the purpose of this research. Rest assured that the information obtained from the questionnaire/ survey/ interview/ focus group discussion/ observation shall be used in accordance to research policies and standards. Furthermore, I agree and consent to the extent required by law, the researcher may collect, use and process my personal information in accordance with the Data Privacy Act of 2012. I understand data privacy, its scope and limitation, thus I put my trust and confidence to the researcher/s and program implementers.

I understand that the results of this research will be given to me if I ask for them and that the researcher, ***Ms. Ann Michelle B. Morano*** is the person to contact if I have any question about the study or about my right as a study participant. The researcher can be reached through mobile number at ***09999708421*** or through email at: ***annmichelle.morano@deped.gov.ph***

Respondent's Signature

ANN MICHELLE B. MORANO
Researcher's Signature

Nicodemus St., Capitol Homesite, Cotta, Lucena City
cottanationalhighschool@gmail.com • (042)785-0876



Cotta National High School
Senior High School

Parental Consent

In signing this document, I, ***(Name of Respondent's Parent/ Guardian)***, am giving my consent to my child, ***(Name of Respondent)***, to answer the survey questionnaire on pathological fears and pretest and posttest on problem solving of ***Ms. Ann Michelle B. Morano*** from ***Cotta National High School***. I understand that my child will be part of the research ***The Effects of 2C2I1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students*** with the purpose of determining the effects of 2C2I1R pedagogical approaches on pathological fear and performance in problem solving in Mathematics of Grade 11 students. I understand that my child will answer a questionnaire or survey/ be interviewed/ be observed at a place and time convenient to him/ her and that the researcher may contact us for more information in the future.

I understand that my child was selected to participate in this study because he/ she is a Grade 11 learner taking general MathematicsatCotta National High School

This data gatheringprocess was granted freely. I have been informed that the data collection is entirely voluntary, and that even after it begins my child can refuse to answer any specific questions or decide to terminate the procedure at any point. I have been told that my child's answers to questions will not be given to anyone else and no reports of this study will ever identify him/ her in any way. I have also been informed that my child's participation or nonparticipation or his/ her refusal to answer questions will have no effect on the services he/ she or any member of our family may receive from education services providers.

I hereby give the program implementer permission to use my child's data and information for the purpose of this research. Rest assured that the information obtained from the test and questionnaire shall be used in accordance to research policies and standards. Furthermore, I agree and consent my child to the extent required by law, the researcher may collect, use and process my child's personal information in accordance with the Data Privacy Act of 2012. I understand data privacy, its scope and limitation, thus I put my trust and confidence to the researcher/s and program implementers.

I understand that the results of this research will be given to us if we ask for them and that the researcher, ***Ms. Ann Michelle B. Morano*** is the person to contact if we have any question about the study or about my right as a study participant. The researcher can be reached through mobile number at ***09999708421*** or through email at: ***annmichelle.morano@deped.gov.ph***

8/17/2019
Date
Nenita Nuyda
Parent/ Guardian of Respondent's Signature

ANN MICHELLE B. MORANO
Researcher's Signature

Nicodemus St., Capitol Homesite, Cotta, Lucena City
cottanationalhighschool@gmail.com • (042)785-0876

Appendix B

Validation Form for Experts

Name

(Optional):_____

Office Address:

_____

Designation:

_____

Years of Teaching Experience:

_____

	Course	School	Highest grade/level/units earned (if not graduated)
Post graduate			
Graduate			
Undergraduate			

General Instructions:

Ten (10) word problems for the pretest and another ten (10) word problems for the posttest in General Mathematics will be subjected to validation based on five (5) criteria to determine the validity of the questions.

Code	Criteria
C1	The degree of difficulty is appropriate to the students
C2	The term used are mathematically correct
C3	The problem can cover a wide range of mathematical abilities
C4	The problem is congruent with the learning competencies needed (please see attached Table of Specification for the learning competencies for each problem)

Please write the total number of criteria met and the corresponding code(s) in the second column of the table. Once a problem failed to meet a certain criterion please write your comments or suggestions on the third column to ensure that the criteria will be met.

Word Problems for Pretest	Number of Criteria Met	Comments/Suggestions
1. Miguel deposited Php 10, 000 in a bank that offers a simple interest rate of 2.5%. How much is the interest if he invested the money for 5 years?		
2. What is the compound amount and interest at the end of 6 years if GJ borrows Php3000 at 6% compounded quarterly?		
3. Your auntie decided to join a cooperative and agreed to contribute Php 1,000 per month beginning in January 2019 which will earn 3% compounded monthly. How much will be the future value of her contribution at the end of April 2019?		
4. Mr. Enriquez decided to get a life insurance from *Better Life* because it offers a flexible policy that include a payout as soon as the target period is achieved or upon contingency (death or accident). His contribution per year is Php 20, 000 that earns 6% compounded monthly for 20 years. How much will be his paid out after 20 years?		
5. Jen wanted to withdraw Php 18,000 every 3 months		

for 25 years starting 3 months after she retires. How much must Jenny deposit at retirement at 6% per year compounded quarterly for the annuity?		
6. Mr. dela Cruz bought a brand new car for Php 500, 000 down payment and Php 20 000 every first day of each month for 3 years. If payment are based on 8% compounded semi-annually, what is the present value of the car?		
7. Dennise borrows Php 400, 000 at an interest rate of 4% per year compounded semi – annually. She agreed to settle her loan by making 12 semi – annual payments at the end of each six months. If the first payment is made at the end of 2 years, compute for the periodic payment.		
8. A new mom wants to establish a trust fund that will serve as their savings fund for their future family. The trust fund will pay Php 50, 000 per year for 20 years after being deferred for 10 years. It will earn 4% interest compounded quarterly and is to be paid out quarterly. How much is		

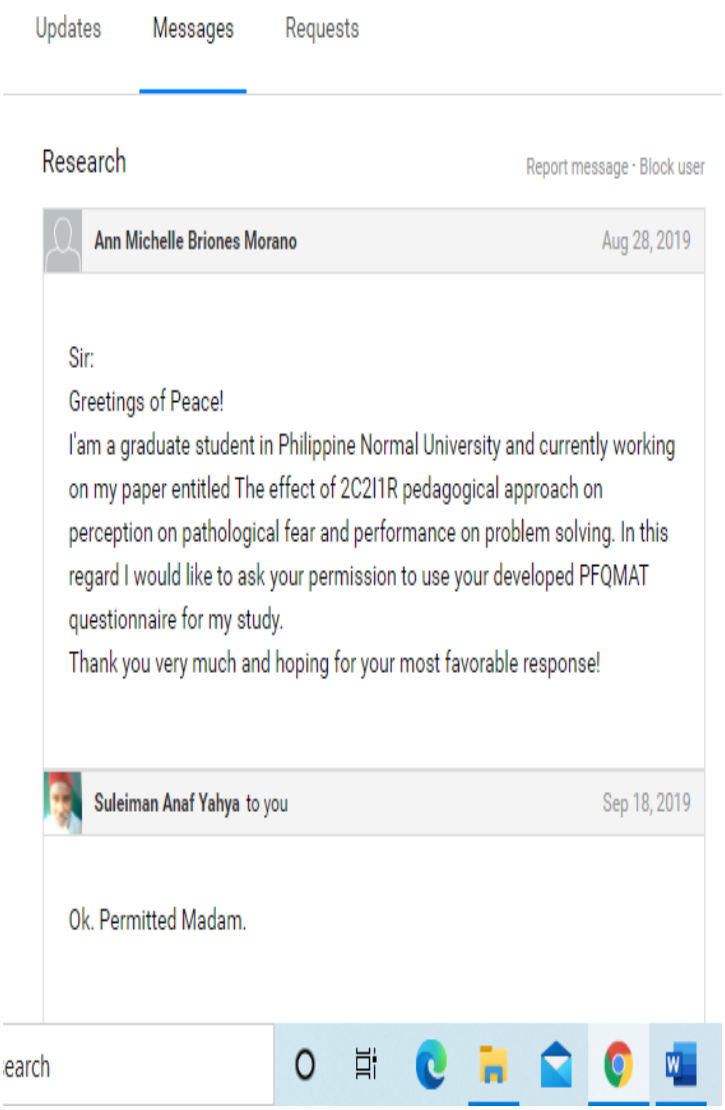
the present value of this trust fund?		
9. If a mortgaged is amortized over 5 years at an interest rate of 6% and monthly payments of Php 2, 500, what is the original value of the mortgage?		
10. LucenaDevelop[ment Bank's credit card zero – percent instalment price of a led tv was Php 38, 000 for a 12-month loan. If a Php 5000 down payment was made, find the instalment payment		
Word Problems for Posttest	Number of Criteria Met	Comments/ Suggestions
1. Daniel invested Php 15, 000 in a company that offers a simple interest rate of 2.2%. How much is the interest if he invested the money for 10 years?		
2. MJ invested Php 6000 in a bank at 4% compounded semi annually. How much is the compound amount and interest at the end of 10 years?		
3. Mrs. Lazada decided to join a cooperative and agreed to contribute Php 1,000 per month beginning in January 2019 which will earn 3% compounded monthly. How much will be the future value of her		

contribution at the end of April 2019?		
4. Mr. San Jose decided to get a life insurance from Better Living because it offers a flexible policy that include a payout as soon as the target period is achieved or upon contingency (death or accident). His contribution per year is Php 30, 000 that earns 5% compounded monthly for 15 years. How much will be paid out after 15 years?		
5. Jenny wanted to secure her future by withdrawing Php 36, 000 every 3 months for 20 years starting 3 months after she retires. How much must Jenny deposit at retirement at 12% per year compounded quarterly for the annuity?		
6. Jaime bought a van for Php 600, 000 down payment and Php 20 000 every first day of each month for 3 years. If payments are based on 7% compounded semi-annually, what is the present value of the car?		
7. Mr. Marquez borrows Php 300, 000 at an interest rate of 3% per year compounded semi –		

annually. She agreed to settle her loan by making 12 semi – annual payments at the end of each six months. If the first payment is made at the end of 3 years, compute for the periodic payment.		
8. A newly wed couple wants to establish a trust fund that will serve as their savings fund for their future family. The trust fund will pay Php 100, 000 per year for 20 years after being deferred for 12 years. It will earn 6% interest compounded semi annually and is to be paid out semi annually. How much is the present value of this trust fund?		
9. If a mortgaged amortized over 10 years at an interest rate of 12% and monthly payments of Php 2, 500, what is the original value of the mortgage?		
10. Maika wanted to avail the promo in a certain mall offering a 0% instalment price of a laptop amounting to Php 79, 000. If she will make a Php 15, 000 downpayment and settle the balance for 8 months, how much is the instalment payment?		

Appendix C

Letter Asking Permission to Use the Adopted Instrument



Appendix D

Data Gathering Instruments

Appendix D.1 – PRE TEST ON PROBLEM SOLVING

DIRECTION: Answer the following questions completely and write legibly.

1. Miguel deposited Php 10, 000 in a bank that offers a simple interest rate of 2.5%. How much is the interest if he invested the money for 5 years?

2. What is the compound amount and interest at the end of 6 years if GJ borrows Php 3000 at 6% compounded quarterly?

3. Your auntie decided to join a cooperative and agreed to contribute Php 1,000 per month beginning in January 2019 which will earn 3% compounded monthly. How much will be the future value of her contribution at the end of April 2019?

4. Mr. Enriquez decided to get a life insurance from *Better Life* because it offers a flexible policy that include a payout as soon as the target period is achieved or upon contingency (death or accident). His contribution per year is Php 20, 000 that earns 6% compounded monthly for 20 years. How much will be his payout after 20 years?

5. Jen wanted to withdraw Php 18,000 every 3 months for 25 years starting 3 months after she retires. How much must Jenny deposit at retirement at 6% per year compounded quarterly for the annuity?

6. Mr. dela Cruz bought a brand new car for Php 500, 000 down payment and Php 20 000 every first day of each month for 3 years. If payment are based on 8% compounded semi-annually, what is the present value of the car?

7.Dennise borrows Php 400, 000 at an interest rate of 4% per year compounded semi – annually. She agreed to settle her loan by making 12 semi – annual payments at the end of each six months. If the first payment is made at the end of 2 years, compute for the periodic payment.

8. A new mom wants to establish a trust fund that will serve as their savings fund for their future family. The trust fund will pay Php 50, 000 per year for 20 years after being deferred for 10 years. It will earn 4% interest compounded quarterly and is to be paid out quarterly. How much is the present value of this trust fund?

9.If a mortgaged is amortized over 5 years at an interest rate of 6% and monthly payments of Php 2, 500, what is the original value of the mortgage?

10. Lucena Development Bank's credit card zero-percent instalment price of a led tv was Php38,000 for a 12-month loan. If a Php 5000 down payment was made, find the instalment payment

Appendix D.2
POST TEST ON PROBLEM SOLVING

DIRECTION: Answer the following questions completely and write legibly.

1. Daniel invested Php 15, 000 in a company that offers a simple interest rate of 2.2%. How much is the interest if he invested the money for 10 years?

2. Mj invested Php6000 in a bank at 4% compounded semi annually. How much is the compound amount and interest at the end of 10 years?

3. Mrs. Lazada decided to join a cooperative and agreed to contribute Php 3,000 per month beginning in January 2019 which will earn 3% compounded monthly. How much will be the future value of her contribution at the end of April 2019?

4. Mr. San Jose decided to get a life insurance from *Better Living* because it offers a flexible policy that include a payout as soon as the target period is achieved or upon contingency (death or accident). His contribution per year is Php 30, 000 that earns 5% compounded monthly for 15 years. How much will be paid out after 15 years?

5. Jenny wanted to secure her future by withdrawing Php 36,000 every 3 months for 20 years starting 3 months after she retires. How much must Jennydeposit at retirement at 12% per year compounded quarterly for the annuity?

6. Jaime bought a van for Php 600, 000 down payment and Php 20 000 every first day of each month for 3 years. If payments are based on 7% compounded semi- annually, what is the present value of the car?

7. Mr. Marquez borrows Php 300, 000 at an interest rate of 3% per year compounded semi – annually. She agreed to settle her loan by making 12 semi – annual payments at the end of each six months. If the first payment is made at the end of 3 years, compute for the periodic payment.

8. A newlywed couple wants to establish a trust fund that will serve as their savings fund for their future family. The trust fund will pay Php 100, 000 per year for 20 years after being deferred for 12 years. It will earn 6% interest compounded semi annually and is to be paid out semi annually. How much is the present value of this trust fund?

9. If a mortgaged is amortized over 10 years at an interest rate of 12% and monthly payments of Php 2, 500, what is the original value of the mortgage?

10. Maika wanted to avail the promo in a certain mall offering a 0% instalment price of a laptop amounting to Php 79, 000. If she will make a Php 15, 000 downpayment and settle the balance for 8 months, how much is the instalment payment?

Appendix D.3

Data Gathering Instruments

SURVEY QUESTIONNAIRE ON PATHOLOGICAL FEARS

Directions: Below are situations related to your fears in mathematics. Read each item carefully and indicate how much fear or uneasiness you feel while thinking about each situation. Put (/) below the number that corresponds to your answer. This is not a test. There is no correct or wrong answers. Your answer to this scale will not affect your grade.

4 – very much
3 – much
2 – a little
1 – not at all

	RATING SCALES			
	4 Very much	**3 Much**	**2 A little**	**1 Not at all**
A. Abstract Nature of Mathematics				
1. I am afraid that I cannot use mathematics if my field of interest is not directly related to it.				
2. I found it difficult to relate mathematics knowledge into real life situation because some topics are not seen in our locality				

3. The nature of mathematics demands a lot of thinking and I do not have the patience to deal with it.				
4. I worry that I will not be able to use mathematics in my future career when needed				
5. I worry that I do not know enough mathematics to do well in future mathematics courses				
B. Teacher Factor				
1. I feared mathematics because my teacher kept on saying that the exercises, seat works, activities and tests are hard				
2. I feel stressed listening to my teacher's discussion because he/she kept on using the same method				
3. I worry that my teacher will give me negative feedbacks if I answered wrong during recitations				
4. I feel scared to raise my hand during math class to ask question				
5. I worry that I will not understand the lesson discussed by my teacher because of the strategy he/she is using				
6. Parental Indoctrination				

1. I am afraid that I will not understand mathematics because my parents kept on saying that it is hard				
2. I worry that I will not catch up to the lessons since my parents kept on saying that it is far more advanced comparing to theirs				
2. I worry that I will not be able to get the correct answer because when my parents support me with my homework they felt anxious				
3. I am not confident answering difficult questions because according to my parents I will be embarrassed if I get wrong answers				
4. I feel nervous answering math problems because when I seek the help of my parents they say that those stuff made them nervous				

Appendix E

Table of Specification

No.	Learning Competencies	No. of Days	No. of Items	Item Placement
1	Solves problems involving simple interest	3	1	1
2	Solves problems involving compound interest	5	1	2
3	Solves problems involving simple annuities	3	1	3
4	Solves problems involving general annuities	5	1	4
5	Solves problems involving future value and present value of simple annuities	5	1	5
6	Solves problems involving future value and present value of general annuities	5	1	6
7	Solves problems involving the present value and period of deferral of deferred annuities	8	2	7,8
8	Solves problems involving business and consumer loans (amortization, mortgage)	6	2	9,10
	TOTAL NO. OF ITEMS	40	10	

Appendix F. 1

Sample Lesson Planin General Mathematics (Using the Regular Classroom Teaching)

I. OBJECTIVES	
A. Content Standard	The learner demonstrates understanding of key concepts of simple and compound interests, and simple and general annuities.
B. Performance standard	The learner is able to investigate, analyze and solve problems involving simple and compound interests and simple and general annuities using appropriate business and financial instruments.
C. Learning Competencies/ Objectives. Write the Learning Competencies Code for each	Learning Competency: The learner will be able to solve problems involving simple interest At the end of 60 – minute period students should be able to: 1. Determine the important given facts to be used in solving problems 2. Identify the formula to be used in solving what is required in the problem 3. Solve problems related to simple interest with accuracy and precision
II. CONTENT	Solving Problems Involving Simple Interest
A. References	
1. Teacher's Guide pages	
2. Learner's Materials pages	General Mathematics Learners Materials Department of Education
3. Textbook pages	Next Century Mathematics General Mathematics
4. Additional Materials from Learning Resource (LR) Portal	

B. Other Learning Resources	Visual Aids, Metacards, Board Chalk
III. PROCEDURES	
A. Presenting the new lesson	A. Recall the following concepts: 1. Base 2. Rate 3. Percentage B. How do you get the percentage?
B. Presenting examples/instances of the lesson	The process of getting the percentage is similar to the lesson which is solving problems involving simple interest
C. Discussing new concepts and Practicing new skills #1 /.	.What is the formula that can be used to find the simple interest? *The formula I = Prt is used to find the simple interest.* What is Principal in simple interest? *The sum of the money that someone borrows or lends* How will you define the rate? *The rate is the percentage of the principal amount which represent the cost or fee for borrowing or lending money* What is the use of time in simple interest? *The time or loan period is the agreed date or time when the loan will be paid in full and it should be expressed in years* Let us take the following for instance: Suppose you want to borrow money from your friend to buy a concert ticket for your favorite band. Since you prefer a front row seat, the cost of the concert ticket you need to buy is Php 10, 000. Your friend agreed to lend you Php 10, 000 payable in 2 years and with an interest rate of 5% per annum. How much will be the interest that you have to pay your friend? How much is the total amount you need to pay your friend at the end of 2 years?

	What are asked in the problem? *The amount of interest to be paid and the total amount to be paid at the end of two years* What are the given facts? *P = Php 10, 000, r = 5%, t= 2 years* How do you find the simple interest? *Use the formula I = Prt* What is the simple interest? *I = Php 1, 000* How much is the total amount to be paid? *Php 11, 000* How do we find the total amount to be paid? *Add the interest and the principal* If we translate this to equation what do we obtain? *A = Prt + P* Factoring out the common factor, what do we obtain? *A= 1(rt + 1)*
D. Developing mastery (Leads to Formative Assessment 3)	Let us take the following examples: 1. At what rate did Simon invest his money amounting to Php 175, 000 if he received Php 2, 843.75 worth of interest after 6 months? *r= 3.25%* 2. How long will it take for an investment of Php 250, 000 to double itself if it is invested at the rate of 8%?

	t=12.5 years 3. You are planning to invest in a low – risk unit investment trust fund (UITF) of Bank E which will give you 5% per annum in 5 years. You target to earn a total future value of Php 320 000. How much should you invest in UITF now? *P = Php256, 000* 4. You are planning to invest in a security deposit account with your money amounting to Php 100, 000 in 7 years. You target to earn a total future value of Php200, 000. What should be the annual interest rate so you can achieve you investment goal? r = 14. 2%
F. Making generalizations and abstractions about the lesson	How do you solve problems involving simple interest?
G. Evaluating learning	Telco A has tie – up promotion with Bank B in its latest smartphone offering bundled with their postpaid plan. The smartphone costs Php 30, 000. Credit card holders of Bank B can avail of the promo of reduced installment interest rate from 5% to 3% per month if they avail of the 24 – month installment plan. If you will avail of the promo, how much will be your equal monthly installment payment payable to Bank B using the simple interest method? *I = Php 1800* *A = Php 31, 800* *Monthly Installment = Php 1325 per month*

Appendix F. 2

Sample Lesson Plan in General Mathematics (Using 2C – 2I – 1R Pedagogical Approaches)

I. OBJECTIVES	
A. Content Standard	The learner demonstrates understanding of key concepts of simple and compound interests, and simple and general annuities.
B. Performance standard	The learner is able to investigate, analyze and solve problems involving simple and compound interests and simple and general annuities using appropriate business and financial instruments.
C. Learning Competencies/ Objectives. Write the Learning Competencies Code for each	Learning Competency: The learner will be able to solve problems involving simple interest At the end of 60 – minute period students should be able to: 1. Determine the important given facts to be used in solving problems 2. Identify the formula to be used in solving what is required in the problem 3. Solve problems related to simple interest with accuracy and precision
II. CONTENT	Solving Problems Involving Simple Interest
A. References	
1. Teacher's Guide pages	
2. Learner's Materials pages	General Mathematics Learners Materials Department of Education
3. Textbook pages	Next Century Mathematics General Mathematics
4. Additional Materials from Learning Resource (LR) Portal	

<table>
<tr><td>B. Other Learning Resources</td><td>Visual Aids, Metacards, Board Chalk</td></tr>
<tr><td>III. PROCEDURES</td><td></td></tr>
<tr><td>B. Presenting the new lesson</td><td>Inquiry – Based Approach
(5 minutes)
Miguel saved Php 5000 in a bank that earned a 5% interest per year.
1. How much is the initial investment? Php 5000
2. Fill in the table below:<table><tr><td>Year</td><td>Investment</td><td>Rate</td><td>Interes</td></tr><tr><td>1</td><td>5000</td><td>5%</td><td></td></tr><tr><td>2</td><td>5000</td><td>5%</td><td></td></tr><tr><td>3</td><td>5000</td><td>5%</td><td></td></tr><tr><td>4</td><td>5000</td><td>5%</td><td></td></tr><tr><td>5</td><td>5000</td><td>5%</td><td></td></tr></table>3. How much is the interest in the first year of investment?
4. How much is the total interest after 5 years?</td></tr>
<tr><td>C. Presenting examples/instances of the lesson</td><td>Constructivist Approach
(3 minutes)
What are the elements needed to determine the interest?
What is/are the operation used to find the interest in each year for five years?
Without using a table, how will you find the interest for five years?
Such interest charged to the borrower or lender for the full term of the investment or loan is called simple interest.</td></tr>
<tr><td>D. Discussing new concepts and Practicing new skills #1</td><td>Constructivist Approach
(17 minutes)</td></tr>
</table>

	.What is the formula that can be used to find the simple interest? *The formula I = Prt is used to find the simple interest.* What is Principal in simple interest? *The sum of the money that someone borrows or lends* How will you define the rate? *The rate is the percentage of the principal amount which represent the cost or fee for borrowing or lending money* What is the use of time in simple interest? *The time or loan period is the agreed date or time when the loan will be paid in full and it should be expressed in years* Let us take the following for instance: Suppose you want to borrow money from your friend to buy a concert ticket for your favorite band. Since you prefer a front row seat, the cost of the concert ticket you need to buy is Php 10, 000. Your friend agreed to lend you Php 10, 000 payable in 2 years and with an interest rate of 5% per annum. How much will be the interest that you have to pay your friend? How much is the total amount you need to pay your friend at the end of 2 years? What are asked in the problem? *The amount of interest to be paid and the total amount to be paid at the end of two years* What are the given facts? *P = Php 10, 000, r = 5%, t= 2 years* How do you find the simple interest? *Use the formula I = Prt*

	What is the simple interest? *I = Php 1, 000* How much is the total amount to be paid? *Php 11, 000* How do we find the total amount to be paid? *Add the interest and the principal* If we translate this to equation what do we obtain? *A = Prt + P* Factoring out the common factor, what do we obtain? *A= 1(rt + 1)*
D. Developing mastery (Leads to Formative Assessment 3)	*Collaborative Approach* (15minutes) The students will be grouped into four and each group will be assigned to solve one problem. The groups will be given 5 minutes to answer the problem then one representative per group will present their solution. Group 1 At what rate did Simon invest his money amounting to Php 175, 000 if he received Php 2, 843.75 worth of interest after 6 months? *r= 3.25%* Group 2 How long will it take for an investment of Php 250, 000 to double itself if it is invested at the rate of 8%? *t=12.5 years*

	Group 3 You are planning to invest in a low – risk unit investment trust fund (UITF) of Bank E which will give you 5% per annum in 5 years. You target to earn a total future value of Php 320 000. How much should you invest in UITF now? *P = Php256, 000* Group 4 You are planning to invest in a security deposit account with your money amounting to Php 100, 000 in 7 years. You target to earn a total future value of Php200, 000. What should be the annual interest rate so you can achieve you investment goal? r = 14. 2%
E. Finding Practical applications of concepts and skills in daily living	*Integrative Approach* A short video about "Iponaryo tips" will be shown to the students at https://m.youtube.com/watch?v=sYkwm3cJrYI (5minutes) What is meant by savings? What is the importance of savings? What are the different forms of savings? Which is more practical way of savings using coin banks or saving in banks? Why? How do you compute the total amount of savings in bank? How do you call the amount being added to the money that you save in the bank?
F. Making generalizations and abstractions about the lesson	*Reflective Approach* (5 minutes) Elbow Partner! Question will be given to the students and they will tell their answers to their seatmates. Afterwards volunteers will be asked to share the answer to the big group.

	How do you solve problems involving simple interest?
G. Evaluating learning	Individual Activity (10 minutes) Telco A has tie – up promotion with Bank B in its latest smartphone offering bundled with their postpaid plan. The smartphone costs Php 30, 000. Credit card holders of Bank B can avail of the promo of reduced installment interest rate from 5% to 3% per month if they avail of the 24 – month installment plan. If you will avail of the promo, how much will be your equal monthly installment payment payable to Bank B using the simple interest method? *I = Php 1800* *A = Php 31, 800* *Monthly Installment = Php 1325 per month*

Appendix G. 1

KEY TO CORRECTION (PRE TEST)

1. P = Php10, 000

r = 2.5%

t = 5 years

I = Prt

I = (10, 000) (0.025)(5)

I = Php 1, 250

2. P = Php 30, 000

j = 6%

m = 4

t = 6

$F = P\left(1 + \frac{j}{m}\right)^{mt}$

$F = 3000\left(1 + \frac{0.06}{4}\right)^{4(6)}$

F= Php 42, 885.08

3. P = Php 4, 000

Downpayment+Present Value

$i = \frac{r}{k} = \frac{0.03}{12} = 0.0025$

t=3

n=4 mos. (Jan- Apr)

c=6, p=1

4. $C = \frac{no.of\ interest\ per\ year}{no.of\ payment\ per\ year}$

$C = \frac{12}{1} = 12$

I2 = $(1 + i)^c - 1$

I2 = 0.06167

$FV = 1{,}666.67\left[\frac{(1+0.06)^{12(20)}-1}{0.005}\right]$

FV = Php 770, 000

5. P = 18, 000

$i = \frac{r}{k} = \frac{0.06}{4} = 0.015$

m = $t \cdot k$ = 25(4)=100

$PV = \frac{P[1-(1+i)^{-n}]}{i}$

$PV = \frac{18{,}000[1-(1+0.15)^{-100}]}{0.015}$

PV = Php 929, 244.67

6. Total Cash Price =

DP = 500, 000 P=20, 000

k = 2 n=t· k=3(2)=6

FV = P· $\frac{(1+i)^n-1}{i}$

FV = 1000· $\frac{(1+0.0025)^4-1}{0.0025}$

FV = Php 4, 015

$i = \frac{r}{k} = \frac{.08}{2} = 0.04 b = \frac{p}{c} = \frac{1}{6}$

$PV = P\left[\frac{1-(1+i)^{-n}}{i}\right]\left[\frac{i}{(1+i)^{b}-1}+i\right]$

PV= 643, 654.45

Total Cash Price = Php50, 000

+643,654.45

Total Cash Price= Php1,143, 654.45

7. r=3, A= Php 400, 000 j= 4% n=12

$R = \frac{A\cdot i}{(1+i)^{-r}-(1+i)^{-(n+r)}} = \frac{400{,}000\cdot\frac{0.04}{2}}{\left(1+\frac{0.04}{2}\right)^{-3}-\left(1+\frac{0.04}{2}\right)^{-15}} = Php40,138.96$

8. $R = \frac{50{,}000}{4} = 12500$ $I = \frac{4\%}{4} = 1\%$ K = 10· 4= 40

$P = 12,500\left[\frac{1-(1+1\%)^{-80}}{1\%(1+1\%)^{-80}}\right]$

P=Php 460, 809.99

9. Monthly rate = (1 + annual rate)$^{1/12}$-1

= (1+ 0.06)$^{1/12}$-1

= 0.00487

$$A = \frac{P\cdot i}{1-1+j)^{-n}}$$

$$2500 = \frac{P(0.00487)}{1-(1+0.00487)^{-5}}$$

P = 12, 319.43

10. Installment Price = Total Installment Payments + Downpayment

Total Installment Payments = Installment Price – Downpayment

Total Installment Payments = 38, 000 – 5000

Total Installment Payment (per month) = $\frac{33,000}{12} = Php\ 2750$

Appendix G. 2

KEY TO CORRECTION (POST TEST)

1. P = Php15, 000

r = 2.2%

t = 10 years

I = Prt

I = (15, 000) (0.022)(10)

I = Php 3, 300

2. P = Php 6, 000

j = 4%

m = 2

t = 10

$F = P\left(1 + \frac{j}{m}\right)^{mt}$

$F = 6000\left(1 + \frac{0.04}{2}\right)^{2(10)}$

F= Php 8915.68

I = F-P,I=8915.68-6000=2915.68

3. R = Php 3, 000

$I = \frac{r}{k} = \frac{0.05}{4} = 0.0125$

t=3

n=4 mos. (Jan- Apr)

c=6, p=1

4. $C = \frac{no.of\ interest\ per\ year}{no.of\ payment\ per\ year}$

$C = \frac{12}{1} = 12$

I2 = $(1 + i)^c - 1$

I2 = 0.06167

$FV = 1{,}666.67\left[\frac{(1+0.06)^{12(20)}-1}{0.005}\right]$

FV = Php 770, 000

5. P = 36, 000

$i = \frac{r}{k} = \frac{0.12}{4} = 0.03$

m = $t \cdot k$ = 20(4)=80

$PV = \frac{P[1-(1+i)^{-n}]}{i}$

$PV = \frac{18{,}000[1-(1+0.03)^{-80}]}{0.03}$

PV = Php1,087,227.49

6. Total Cash Price =

Downpayment+Present Value

DP = 500, 000 P=20, 000

k = 2 n=t· k=3(2)=6

FV = P· $\frac{(1+i)^n-1}{i}$

FV = 3000· $\frac{(1+0.0125)^4-1}{0.0125}$

FV = Php 12,226.88

$i = \frac{r}{k} = \frac{.08}{2} = 0.04 b = \frac{p}{c} = \frac{1}{6}$

$PV = P\left[\frac{1-(1+i)^{-n}}{i}\right]\left[\frac{i}{(1+i)^b-1}+i\right]$

PV= 643, 654.45

Total Cash Price = Php50, 000

+643,654.45

Total Cash Price= Php1,143, 654.45

7. r=3, A= Php 400, 000 j= 4% n=12

$R = \frac{A\cdot i}{(1+i)^{-r}-(1+i)^{-(n+r)}} = \frac{400{,}000\cdot\frac{0.04}{2}}{\left(1+\frac{0.04}{2}\right)^{-3}-\left(1+\frac{0.04}{2}\right)^{-15}} = Php40,138.96$

8. $R = \frac{100{,}000}{2} = 50000$ $I = \frac{3\%}{2} = 0.015$ K = 12· 2= 24

$P = 50{,}000\left[\frac{1-(1+0.45)^{-40}}{0.45(1+0.015)^{-24}}\right]$

P=Php 1,046,372

9. Monthly rate = (1 + annual rate)$^{1/12}$-1

= (1+ 0.06)$^{1/12}$-1

= 0.00487

$$A = \frac{P\cdot i}{1-1+j)^{-n}}$$

$$2500 = \frac{P(0.00487)}{1-(1+0.00487)^{-5}}$$

P = 12, 319.43

10. Installment Price = Total Installment Payments + Downpayment

Total Installment Payments = Installment Price – Downpayment

Total Installment Payments = 79,000 – 15000

Total Installment Payment (per month) = $\frac{64,000}{12} = Php\ 5333.33$

Appendix H.1

Item Analysis for Test on Problem Solving (Pre Test)

Item	Difficulty Index	Description	Discrimination Index	Description	Decision
No. 1	0.77	Easy	0.17	Marginal	Revised
No. 2	0.52	Average	0.22	Reasonably	Retain
No. 3	0.50	Average	0.28	Reasonably	Retain
No. 4	0.71	Average	0.31	Good	Retain
No. 5	0.36	Average	0.24	Reasonably	Retain
No. 6	0.43	Average	0.26	Reasonably	Retain
No. 7	0.23	Difficult	0.18	Marginal	Revised
No. 8	0.36	Average	0.24	Reasonably	Retain
No. 9	0.43	Average	0.23	Reasonably	Retain
No. 10	0.52	Average	0.22	Reasonably	Retain

Appendix H.2

Item Analysis for Test on Problem Solving (Post Test)

Item	Difficulty Index	Description	Discrimination Index	Description	Decision
No. 1	0.56	Average	0.25	Reasonably	Revised
No. 2	0.52	Average	0.22	Reasonably	Retain
No. 3	0.50	Average	0.28	Reasonably	Retain
No. 4	0.71	Average	0.31	Good	Retain
No. 5	0.36	Average	0.24	Reasonably	Retain
No. 6	0.43	Average	0.26	Reasonably	Retain
No. 7	0.23	Difficult	0.18	Marginal	Revised
No. 8	0.36	Average	0.24	Reasonably	Retain
No. 9	0.43	Average	0.23	Reasonably	Retain
No. 10	0.52	Average	0.22	Reasonably	Retain

Appendix I.1

PRE TEST RESULTS

Student	Experimental Group		Control Group	
	Problem Solving Performance	Survey on Pathological Fears	Problem Solving Performance	Survey on Pathological Fears
1	3	3.33	5	2.87
2	2	3.13	2	2.93
3	5	3.40	5	2.67
4	3	3.13	3	3.00
5	3	3.33	3	3.33
6	5	3.27	5	3.47
7	2	3.00	2	3.67
8	7	2.67	7	3.40
9	3	3.33	3	3.80
10	4	3.07	4	3.33
11	6	3.47	2	3.27
12	4	3.53	4	3.20
13	5	3.33	5	2.93
14	6	3.33	4	3.13
15	6	3.27	4	2.93
16	6	2.87	3	2.80
17	4	3.20	4	2.40
18	3	3.27	3	2.87
19	3	3.20	3	3.00
20	2	3.20	2	3.00

Appendix I.2

POST TEST RESULTS

Student	Experimental Group		Control Group	
	Problem Solving Performance	Survey on Pathological Fears	Problem Solving Performance	Survey on Pathological Fears
1	19	2.07	25	2.27
2	19	2.07	10	2.33
3	18	2.00	18	2.20
4	19	2.00	17	2.40
5	21	2.07	17	2.07
6	20	2.13	18	2.40
7	25	2.20	25	2.20
8	23	1.93	21	2.27
9	33	1.93	27	2.33
10	24	2.13	15	2.33
11	26	2.33	15	2.67
12	28	2.27	18	2.60
13	25	2.13	17	2.53
14	23	2.27	17	2.53
15	24	2.20	19	2.27
16	25	2.47	20	2.73
17	23	2.27	19	2.27
18	22	2.20	23	2.20
19	31	2.00	19	2.07
20	27	1.93	23	2.14

Appendix J

SPSS OUTPUT

Independent T – Test (Posttest)
T-Test

Group Statistics

	Respondents	N	Mean	Std. Deviation	Std. Error Mean
Posttest	Control	20	19.1500	8.46214	1.89219
	Experimental	20	23.7500	3.99835	.89406

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Posttest	Equal variances assumed	12.973	.001	-2.198	38	.034	-4.60000	2.09278	-8.83662	-.36338
	Equal variances not assumed			-2.198	27.081	.037	-4.60000	2.09278	-8.89343	-.30657

Independent T – Test (Post Survey)
T-Test

Group Statistics

	Respondents	N	Mean	Std. Deviation	Std. Error Mean
PostSurvey	Control	20	2.3405	.27565	.06164
	Experimental	20	2.1300	.14701	.03287

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PostSurvey	Equal variances assumed	5.498	.024	3.013	38	.005	.21050	.06986	.06909	.35191
	Equal variances not assumed			3.013	28.999	.005	.21050	.06986	.06763	.35337

T-Test

Group Statistics

	Respondents	N	Mean	Std. Deviation	Std. Error Mean
Pretest	Control	20	3.8000	1.50787	.33717
	Experimental	20	4.1000	1.55259	.34717

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pretest	Equal variances assumed	.216	.645	-.620	38	.539	-.30000	.48395	-1.27971	.67971
	Equal variances not assumed			-.620	37.968	.539	-.30000	.48395	-1.27974	.67974

T-Test

Group Statistics

	Respondents	N	Mean	Std. Deviation	Std. Error Mean
PreSurvey	Control	20	3.1290	.29944	.06696
	Experimental	20	3.2325	.19339	.04324

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper

PreSurvey	Equal variances assumed	3.343	.075	-1.299	38	.202	-.10350	.07971	-.26486	.05786
	Equal variances not assumed			-1.299	32.501	.203	-.10350	.07971	-.26576	.05876

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PretestContro	4.1000	20	1.55259	.34717
	PosttestControl	19.1500	20	8.46214	1.89219
Pair 2	PretestExperimental	3.6500	20	1.30888	.29267
	PosttestExperimental	23.7500	20	3.99835	.89406
Pair 3	PresurveyControl	3.1290	20	.29944	.06696
	PostsurveyControl	2.3405	20	.27565	.06164
Pair 4	PresurveyExperimental	3.2325	20	.19339	.04324
	PostsurveyExperimental	2.1300	20	.14701	.03287

Paired Samples Correlations

	N	Correlation	Sig.

Pair 1	PretestContro&PosttestControl	20	-.181	.444
Pair 2	PretestExperimental&PosttestExperimental	20	-.279	.233
Pair 3	PresurveyControl&PostsurveyControl	20	.085	.722
Pair 4	PresurveyExperimental&PostsurveyExperimental	20	.189	.425

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PretestContro - PosttestControl	-15.05000	8.87620	1.98478	-19.20419	-10.89581	-7.583	19	.000
Pair 2	PretestExperimental - PosttestExperimental	-20.10000	4.54104	1.01541	-22.22527	-17.97473	-19.795	19	.000
Pair 3	PresurveyControl - PostsurveyControl	.78850	.38940	.08707	.60625	.97075	9.056	19	.000
Pair 4	PresurveyExperimental - PostsurveyExperimental	1.10250	.21969	.04912	.99968	1.20532	22.444	19	.000

APPENDIX K

EFFECT SIZE CALCULATOR OUTPUT

Group 1		*Group 2*	
Mean (*M*):	23.75	Mean (*M*):	19.15
Standard deviation (*s*):	3.99	Standard deviation (*s*):	8.46
Sample size (*n*):	20	Sample size (*n*):	20

Calculate Reset

Success!

Cohen's *d* = (19.15 - 23.75)/6.614065 = 0.695488.

Glass's *delta* = (19.15 - 23.75)/3.99 = 1.152882.

Hedges' *g* = (19.15 - 23.75)/6.614065 = 0.695488.

Group 1		*Group 2*	
Mean (*M*):	2.13	Mean (*M*):	2.34
Standard deviation (*s*):	0.15	Standard deviation (*s*):	0.28
Sample size (*n*):	20	Sample size (*n*):	20

Calculate Reset

Success!

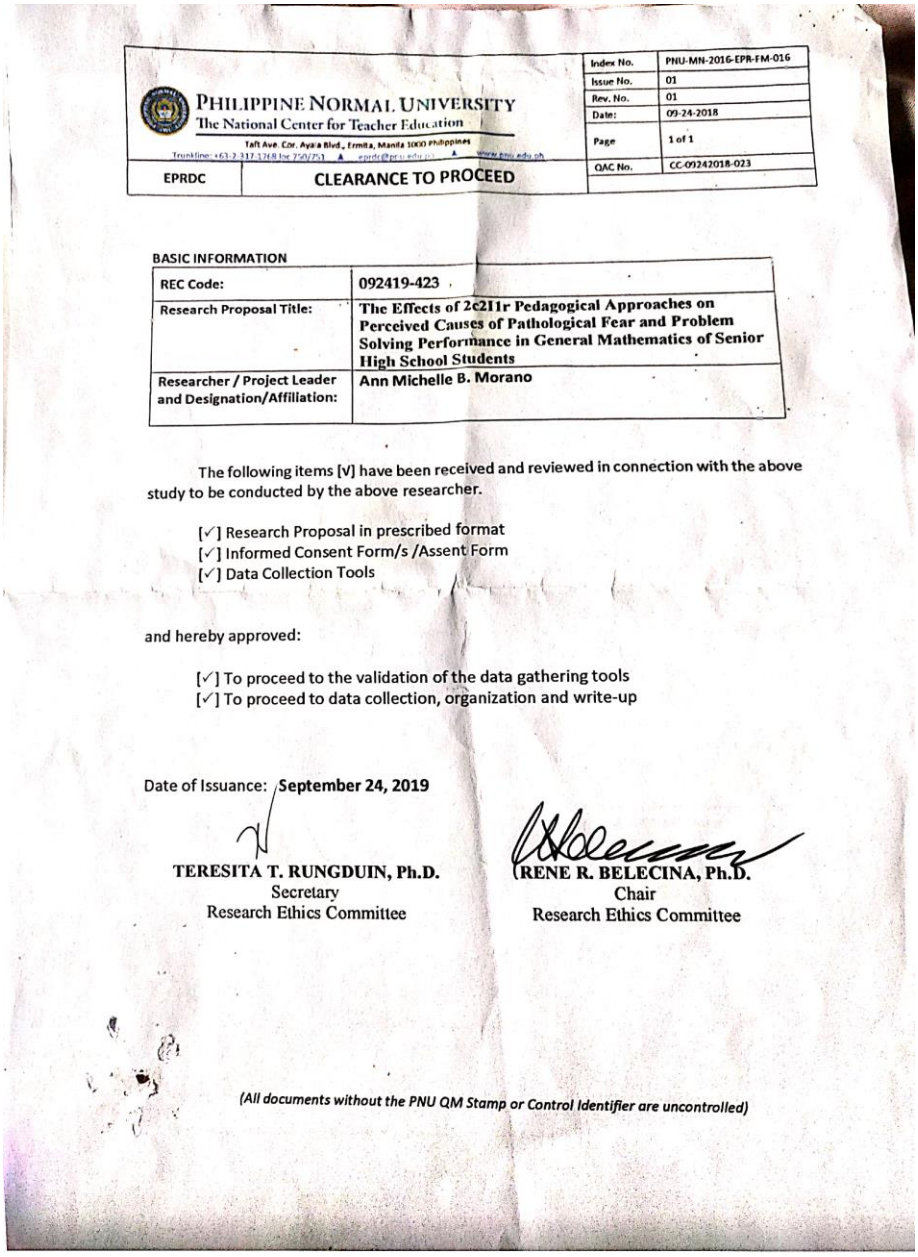
Cohen's *d* = (2.34 - 2.13)/0.224611 = 0.934951.

Glass's *delta* = (2.34 - 2.13)/0.15 = 1.4.

Hedges' *g* = (2.34 - 2.13)/0.224611 = 0.934951.

APPENDIX L

CLEARANCE TO PROCEED



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Index No.	PNU-MN-2016-EPR-FM-016
Issue No.	01
Rev. No.	01
Date:	09-24-2018
Page	1 of 1
QAC No.	CC-09242018-023

EPRDC

CLEARANCE TO PROCEED

BASIC INFORMATION

REC Code:	092419-423
Research Proposal Title:	The Effects of 2c2l1r Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students
Researcher / Project Leader and Designation/Affiliation:	Ann Michelle B. Morano

The following items [V] have been received and reviewed in connection with the above study to be conducted by the above researcher.

[✓] Research Proposal in prescribed format
[✓] Informed Consent Form/s /Assent Form
[✓] Data Collection Tools

and hereby approved:

[✓] To proceed to the validation of the data gathering tools
[✓] To proceed to data collection, organization and write-up

Date of Issuance: **September 24, 2019**

TERESITA T. RUNGDUIN, Ph.D.
Secretary
Research Ethics Committee

RENE R. BELECINA, Ph.D.
Chair
Research Ethics Committee

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APPENDIX M

COMPLIANCE CERTIFICATE

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Index No.	PNU-MN-2016-EPR-FM-020
Issue No.	01
Rev. No.	01
Date:	09-24-2018
Page	1 of 1
QAC No.	CC-09242018-027

EPR | **CERTIFICATE OF COMPLIANCE**

BASIC INFORMATION

REC Code:	**03302021-46**
Title of the Research Project/Thesis/Dissertation:	**The Effects of 2c-2I-1R pedagogical approaches on perceived causes of pathological fear and problem-solving performance in General Mathematics of senior high school students**
Researcher/Project Leader and Designation/Affiliation:	**Ann Michelle B. Morano**

The following items [√] have been received and reviewed in connection with the above study conducted by the above researcher/principal investigator:

[√] Thesis

[ ] Dissertation

[ ] Research Article in APA Format

And hereby certified that it has fully complied with the PNU Code of Research Ethics and Guidelines for Review as stipulated in the BOR Resolution No. U-2303 s. 2015.

Date of Issuance: March 30, 2021

Dr. TERESITA T. RUNG-DUIN
Secretary
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APPENDIX N

CERTIFICATE OF LANGUAGE EDITING

Philippine Normal University
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Taft Avenue, Manila

30 April 2021

C E R T I F I C A T I O N

This certifies that I have language edited the thesis titled "The Effects of 2C-2I-1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem- Solving Performance in General Mathematics of Senior High School Students**"**by **Ann Michelle B. Morano,** a candidate for the degree Master of Artsin Education in Mathematics.

(SGD)

MERRY RUTH MORAUDA GUTIERREZ
CGSTER Faculty

APPENDIX O

CERTIFICATE OF AUTHENTICITY

Philippine Normal University
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PUBLICATION OFFICE
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AUTHENTICITY RESULT

Date of Release:	April 6, 2021
Result Code:	2021-0765
Submission ID:	1551520741
Title of Output:	The Effects of 2C-2I-1R Pedagogical Approaches on Perceived Causes of Pathological Fear and Problem Solving Performance in General Mathematics of Senior High School Students
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Director

PNU-MN-2016-PUB-QM-001
Revision No.: 01

Effective Date: August 10, 2017

CURRICULUM VITAE

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Elementary Grade Teacher I	Lucena East VII Elementary School
2015 – 2018	LucenaCity
High School Mathematics Teacher	St. Bridget College
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	August 24, 2007

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1993 - 1999	San Jose, Batangas