# Gradual Release Of Responsibility Instructional Model: Its Effects On Students' Mathematics Performance And Self-Efficacy

Ian Paul B. Saligumba, Denis A. Tan

**Abstract**: The study assessed the mathematics performance and self-efficacy of Grade 9 students in a Gradual Release of Responsibility Instructional Model (GRRIM) at Central Mindanao University Laboratory High School (CMULHS). It aimed to a) ascertain the performance level of students exposed to GRRIM and those exposed to non-GRRIM in terms of pretest, posttest, and retention test; b) determine the self-efficacy level of the students exposed to GRRIM and those exposed to non-GRRIM in terms of mastery experiences, vicarious experiences, verbal-social persuasion, and physiological and emotional arousal; c) compare the performance of students exposed to GRRIM and those exposed to non-GRRIM in terms of posttest and retention test; d) find the significant difference in the self-efficacy level of the students exposed to GRRIM and those exposed to non-GRRIM in terms of mastery experiences, vicarious experiences, verbal-social persuasion, and physiological and emotional arousal. This study used the quasi-experimental research design. The mathematics performance and self-efficacy level were gathered from the participants using validated instruments to answer the research problems. The level of mathematics performance of the students in the pretest, posttest and retention test when exposed to GRRIM and those exposed to non-GRRIM varies from very low to very high level. The self-efficacy level of Grade 9 students towards Mathematics when exposed to GRRIM and non-GRRIM is moderately low. There was a highly significant difference in the posttest scores of those students exposed to GRRIM compared to those exposed to non-GRRIM. On the contrary, there was no significant difference in the mathematics performance of the students when exposed to GRRIM and non-GRRIM in terms of their retention test scores. There was no significant difference in the self-efficacy of students towards Mathematics in terms of mastery experiences, vicarious experiences, verbal-social persuasions and physiological and emotional arousal when exposed to GRRIM and non-GRRIM.

**Index terms:** Gradual Release of Responsibility Instructional Model (GRRIM), Mathematics Performance, Self-efficacy

## 1 INTRODUCTION

Our world today is continuously changing and with change comes new challenges, problems and opportunities for growth. With the advancement of science and technology comes new jobs, changes in the way we communicate with the advent of social media platforms, and the way we learn. In our quest towards scientific and technological advancement, we need nothing short of good performance in Mathematics at all levels of education (NCTM, 2000). Unfortunately, the poor performance of students in Mathematics remains to be a widespread problem today. The results of the latest Trends in Mathematics and Science Study (TIMSS) administered in 2003 revealed low achievement scores in Science and Mathematics of selected Grade 4 and Grade 8 (Second Year High School) students from sample schools (Gonzales, 2004). The Philippines placed 23rd among 25 countries for both Science and Mathematics for Grade 4 and 42nd in Science and 41st in Mathematics among 45 countries for Grade 8 students.


- *Ian Paul B. Saligumba is a faculty of the College of Education, Central Mindanao University (CMU), Philippines. He is assigned to teach Mathematics courses in the Laboratory High School. +639173081402, ianpauls@cmu.edu.ph*
- *Denis A. Tan is a faculty of the College of Education, Central Mindanao University (CMU), Philippines. She is currently the School Principal of the CMU Laboratory High School and the Director of the Office of Admissions, Scholarships and Placement in the same university. +639177103100, teacher.tansined@gmail.com*


Results of the survey also noted that the preparation of Filipino students in TIMSS 2003 was similar to those in TIMSS 1999. This study shows that students need to be informed about different Mathematics study tips that they can use to improve their academic performance in Mathematics. The TIMSS result is in consonance with the 2014 – 2015 National Achievement Test for the 4th year which shows that the Mean Percentage Score (MPS) of CMULHS in Mathematics is 41.14 which is lower than the MPS of the Division of Bukidnon which is 46.24 (DepEd, 2017). Thus, there is a need to study the factors that affect the mathematics performance of students. Several studies were already conducted which helped increase the mathematics performance of students by using innovative teaching strategies, employing new assessment tools, interventions and others. Aside from that, studies have shown that psychological constructs such as self-efficacy, attitude, and mathematics anxiety have a significant impact on the mathematics performance of the students. Providing a quality mathematics education has always been the dream of every mathematics teacher in this country. Teachers are often faced with problems not just professionally but also personally, and this would somehow affect their work. With the advent of the K to 12 Curriculum, teachers also need to adapt to the new curriculum and think of ways on how to engage each learner in every classroom activity to improve their performance in Mathematics. Aside from that, teachers must also be aware of the factors that would affect the performance in Mathematics. Several studies were already employed by the researchers to determine the performance of students in Mathematics and to identify the factors that affect learning Mathematics. Asparin (2013) conducted a study aimed to establish a causal model on mathematics achievement of the second year high school students of the Bukidnon National High School (BNHS) SY 2012-2013. In his study, Asparin found out that students' level of mathematics achievement is destitute and students' levels of understanding the problem, devising a plan, carrying out

the plan, and looking back are very poor. Cordova and Tan (2018) conducted a descriptive-correlational survey to six private high schools in Valencia City with the Grade 9 students as respondents of the study and an Attitude towards Mathematics Test, Mathematics Proficiency Test, and Summative Test were used to gather data. The results of their study show that mathematics proficiency and performance level of Grade 9 students were described as beginning which means that the students lack the basic mathematical skills necessary for them to master Grade 9 Mathematics. Moreover, they also found out a moderate positive correlation between mathematics performance and parent's (mother and father) educational attainment. Their study also shows that the mother's educational attainment best predicts mathematics performance. The study of Cordova supports the study of Davis (2013) when he found out that occupation and educational attainment of parents are the variables that best predict the students' mathematics achievement. Furthermore, he also figured out that the students' profile was more favorable to the students to attain good performance in Mathematics. Aside from that he also discovered that parental support is another ingredient for the growth of learners not only intellectually but also morally and spiritually. Lastly, his study shows that the students' socio-demographic profile is significantly related to students' mathematics achievement. Researchers all around the world have been conducting researches on how to improve the quality of mathematics education. Various strategies have been tried by researchers to improve the performance of students in Mathematics and these strategies were found to be effective. Taylaran (2015) studied the effects of Students Participation Dominated (SPD) and Lecture Discussion Dominated (LDD) instructions on the performance and anxiety level of the students in Mathematics 9 of Quezon National High School. The results of the study showed that students' performance in the Students Participation Dominated (SPD) instruction were significantly higher than those of the Lecture Discussion Dominated (LDD) instruction regarding the pretest, posttest, and retention test scores. The Gradual Release of Responsibility Instructional Model in the "I do it" phase is related to the Lecture Discussion Dominated Instruction and the "You do it together" phase is connected to the Students Participation Dominated Instruction. The study of Villaver (2014) which aimed to determine the effects of Experiential Learning Approach on the Mathematics Performance and Attitude of the students showed that the students' level of performance in the pre- and post-exposure of the experiential learning environment were at the beginning level. The increase in scores is statistically significantly higher compared to the pre-test. She also found out that the conceptual retention is also at the beginning level, but is not significantly different from the posttest scores. Increase in the mathematics performance of students in the study of Taylaran and Villaver supports the study of Miñao (2013) on the effects of Multiple Intelligence-based Instruction in the students' performance and attitudes in Intermediate Algebra. Performance of students exposed to Multiple Intelligence-based Instruction (MIBI) was significantly higher than those in the Non-Multiple Intelligence-based Instruction group in terms of posttest scores. Calfoforo (2013) conducted a research on the effects of the Multiple Representation-Based Instruction to students' performance and attitude in Algebra. The researcher also made use of multiple representations (listing, table, graph, function) in presenting lessons about quadratic functions during the "I do it" phase. The study of Calfoforo supports the study of Miñao where she found out that students' performance in the Multiple Representation-based Instruction group was significantly higher than that in the Traditional Method of Instruction in terms of the pretest, posttest, and retention test. Also, the researcher considered the multiple intelligences of the students in planning the lesson to cater to other forms of intelligence. In addition, Ciubal and Tan (2018) studied about the effects of using the Mathematics Communication Strategies to students' performance and attitude towards Mathematics. The results showed that students exposed to Mathematics Communication Strategies (MCS) had a performance significantly higher than that in the Non-MCS group regarding posttest and retention test. The positive results in the study of Ciubal and Tan confirmed the study of Paglinawan (2011) who conducted a study to examine the effects of Interactive Computer-Assisted Instruction (CAI) on the attitude and performance in High School Geometry of sophomore students of Central Mindanao University Laboratory High School. His study showed that students' performance in the Computer-Assisted Instruction group were significantly higher than those in the Non-Computer-Assisted Instruction group in terms of posttest, retention test, and gain scores. Environments that are rich in mathematical opportunities for students are important if we want our children to develop a deep understanding of Mathematics (Sammons, 2010). Mathematics instruction can be enhanced further through the use of technology such as Computer-Assisted Instruction and tablet or smartphone which the researcher used in explaining the graphs of quadratic function. On the other hand, Ponsica (2011) administered a study to find out the effect of UbD learning plan and an NCTM-based lesson plan on the achievement and attitude towards Mathematics of the first-year high school students of Lake View Academy. The results of her study showed that there was no significant difference in the pretest and posttest scores between UbD-based learning plan and NCTM-based lesson plan. It was also found out that the students under the UbD-based learning plan and NCTM-based lesson plan improved in their learning competencies. Another study by Bermejo (2009) determined the effects of the Mathematics Journal Writing on the learning skills and attitude of the senior students of Bocboc National High School. Students exposed to journal writing improved more in their learning competencies than those who were not. The high achievers and girls exposed to journal writing performed better than those who were not exposed. It was also found out that classroom instruction that incorporates journal writing gave a positive relationship between attitude towards Mathematics and learning competencies such as conceptual and procedural understanding, problem-solving, and mathematical communication. Ebuña (2008) administered a study to determine the effects of vignette classroom technique on the mathematics understanding of students, specifically on the conceptual understanding and the computational skills of the students. It was found out in her study that vignette classroom technique which entails student discourse, and maximum student involvement gave positive effects on the conceptual understanding and computational skills of students on first-degree equations and inequalities in one variable. Aside from vignette classroom technique as used by Ebuña, Canarecio (1998) made use of game-aided lessons and determine its

effect on the students' performance, retention ability, and attitude towards Mathematics. His study showed that there was a significant difference in the pretest scores between Experimental and Control groups. Aside from that, there was a significant difference in the pretest and posttest scores of the Experimental group. However, there was no significant difference in the retention test scores between Experimental and Control groups. The study of Bersano (2016) supports the study of Canarecio when she conducted a similar study on the effects of Game-Aided Instruction to Grade 8 students' mathematics performance and anxiety level. Her study showed that there was an increase in the students' mathematics performance as shown in their pretest, posttest and retention test scores. Mathematics teachers and researchers also have determined other factors that would affect student's performance in Mathematics. Velasquez and Tan (2007) conducted a study to ascertain whether the teachers' teaching styles and students' learning styles will influence the academic performance of the students in Mathematics, English and Science and Technology. Results showed that teachers' age, position and national seminars attended were significantly correlated with the students' academic performance. A highly significant relationship was also established between the students' academic performance and learning styles. The majority of the students got average grades except for students with avoidant learning style, and only a few of them got high academic performance in the rest of the learning styles. Correlation analysis also revealed a significant relationship between the teachers' teaching styles and the academic performance of the students in Mathematics. In addition, Venkatesan and Karimi (2010) found out in their study entitled "Mathematics Anxiety, Mathematics Performance and Overall Academic Performance in High School Students" that Mathematics anxiety significantly has a negative correlation with Mathematics performances and overall academic performance. Moreover, it was also found that there is a significant gender difference in Mathematics anxiety. Aside from that, there is no significant difference between boys and girls in Mathematics performances and academic performance. On the other hand, Andaya (2014) pointed out other factors that would affect the achievements of students in Mathematics such as individual, instructional, classroom management and evaluation factors. Findings revealed that the gains of students in Math Courses (Fundamental Mathematics and Contemporary Mathematics) are poor and students perform low in both subjects. Mathematics achievements are highly correlated to individual and instructional factors and moderately correlated with classroom management and evaluation factors, and the instructional factor is one of the factors that affects most the achievements of students in Mathematics. What should the mathematics teachers do as well as the school to improve the mathematics performance of the Filipino students? It is in this perspective that the researcher of this study was encouraged to explore and use the Gradual Release of Responsibility Instructional Model (GRRIM) to improve the performance of students in Mathematics and increase their self-efficacy towards Mathematics. GRRIM will allow the teachers to work with small groups that are determined specifically by students' achievement levels and needs which allow teachers to closely observe student work, monitor student attention, provide strong support for struggling learners, and provide extra challenges for proficient learners.

### 1.1 Statement of the Problem

This study assessed the mathematics performance and self-efficacy of Grade 9 students in a gradual release of responsibility instructional model (GRRIM). Specifically, it sought to answer the following questions:

1. What is the performance level of students exposed to GRRIM and those exposed to non-GRRIM in terms of:
   a. pretest;
   b. posttest; and
   c. retention test?

2. What is the self-efficacy level of the students exposed to GRRIM and those exposed to non-GRRIM in terms of:
   a. mastery experiences;
   b. vicarious experiences;
   c. verbal-social persuasion; and
   d. physiological and emotional arousal?

3. Is there a significant difference in the performance of students exposed to GRRIM and those exposed to non-GRRIM in terms of:
   a. posttest; and
   b. retention test?

4. Is there a significant difference in the self-efficacy level of the students exposed to GRRIM and those exposed to non-GRRIM in terms of:
   a. mastery experiences;
   b. vicarious experiences;
   c. verbal-social persuasion; and
   d. physiological and emotional arousal?

## 2 METHODOLOGY

### 2.1 Research Design

This study utilized the quasi-experimental design with an intact group of two sections. The dependent variables are the students' self-efficacy level and Mathematics performance in terms of the pretest, posttest, and retention test. The two groups of students were taught the same lessons. Gradual Release of Responsibility Instructional Model was implemented in teaching the experimental group during the third grading period while the traditional method of teaching was utilized in the control group. Pretest and Self-efficacy tests were administered to the students before the start of the experiment. The experiment was conducted during the entire 1st Grading Period as indicated in the course outline and classes were held three hours per week. After the 1st Grading Period, students took the same test which served as posttest and the same self-efficacy test. These tests were employed to determine the extent of learning of the students and whether there was a change in the mathematics performance and self-efficacy level. One week after the posttest, the same test was also conducted to verify the retention of the students.

### 2.2 Locale of the Study

This study was conducted at Central Mindanao University Laboratory High School, University Town, Musuan, Bukidnon. CMULHS is under the regulation of the Commission on

Higher Education which implements a Science High School Curriculum and is a laboratory school of the College of Education, Central Mindanao University. It is headed by a dynamic principal supported by 35 competent faculty and staff members. With the implementation of the K to 12 curriculum, the school offers the Science, Technology, Engineering and Math (STEM) strand to its junior high school completers. During the conduct of the study, the school has 559 junior high school students and 115 senior high school students with a total of 674 students.

**2.3 Classroom Instruction in GRRIM**

Focus lesson (I Do It) is the first phase of the gradual release of responsibility model. This is the when the teacher is demonstrating, modeling and sharing his or her own thinking with the students. Although this part may be brief (5-15 minutes), it is powerful. The three methods used most often in the focus lesson phase are modeling, metacognitive awareness, and think-aloud. Another phase of instruction happens as teachers meet with needs-based groups. Guided instruction (We Do It) is almost always done with small, purposeful groups, which are composed based on students' performance on the formative assessment. In this phase, small group arrangements are evident and grouping changes throughout the grading period. Dialogue is evident between learners and the teacher as they begin to apply the skill or strategy. The teacher also uses cues and prompts to support understanding when a student commits an error and does not directly tell the student the right answer. Collaborative Instruction (You Do It Together) is the often neglected phase of instruction. It is a special event and not just an established instructional routine. When collaborative learning is done right, it is during this phase that students combine their thinking and understanding. Negotiating with peers, deliberating ideas and information, or discussing with others causes students to use what they have gained in focus lessons and guided teaching. Collaborative learning is not just the time to introduce novel information to students. Rather, cooperative learning should be a venue for students to apply information in new situations or to engage in a spiral evaluation of prior knowledge. The last phase is the Independent Learning (You Do It Alone). The ultimate goal of this instruction is that students can independently apply information, ideas, content, skills, and strategies in unique situations. In this phase, students have received modeled, guided, and cooperative learning experiences connected to concepts needed to accomplish independent tasks. Independent tasks cover beyond practice to application and extension of novel knowledge. The teacher meets with individual students for conferencing about the independent learning tasks. Independent tasks will be given to the students that would require the individual application of information formerly taught. These tasks should provide students with chances to use their knowledge to create new products.

**2.4 Instrumentation**

The researcher developed a 46-item mathematics performance test (see Appendix K) on the covered topic (quadratic equations, quadratic functions, graphs, and properties). It was a test obtained from the 50-item first periodic examination. The test obtained a KR21 reliability coefficient of 0.867 using the item analysis software developed by Bermundo, Bermundo and Ballester (2004). The test's table of specifications (TOS) was based on the Department of Education's Curriculum Guide for K to 12 Curriculum Grade 9 Mathematics (see Appendix F). Pretest, posttest, and retention test were conducted before and after the first grading period to measure the mathematics performance of the students. The scale used to interpret the score is as follows:

| Range | Interpretation |
|---|---|
| 90% - 100% | Very High |
| 86 % - 89% | High |
| 80% - 85% | Moderate |
| 75% - 79% | Low |
| 65% - 74% | Very Low |

The Sources of Mathematics Self-Efficacy Scale is a 24-item scale adapted from the work of Usher and Pajares (2009) and an e-mail was sent by the author as permission to use their instrument. The items were created to assess each of the four sources of self-efficacy: mastery experience, vicarious experience, social persuasions, and physiological and affective state as described in the work of Bandura (1997) entitled "Self-Efficacy: The Exercise of Control." Students' responses were assessed using a 6-point Likert-type scale modified for use with middle school students. Students were asked to circle letters (T or F) in varying font sizes to indicate how much each statement applied to them. It had gone through two phases before it was finalized. Based on the results, the author retained six items to represent each of the four hypothesized sources with the alpha reliability coefficients 0.88, 0.84, 0.88, and 0.87 for the final four subscales respectively. This Sources of Mathematics Self-Efficacy Scale was pilot tested to the Grade-9 students of Valencia National High School (see Appendix N) which yields a reliable instrument (see Appendix O). The scale used to interpret the data gathered is as follows:

| Descriptive Rating | Range | Interpretation |
|---|---|---|
| Definitely True | 4.51-5.00 | Very High |
| Mostly True | 3.51-4.50 | High |
| A little bit True | 2.51-3.50 | Moderately High |
| A little bit False | 1.51-2.50 | Moderately Low |
| Mostly False | 0.51-1.50 | Low |
| Definitely False | 0.00-0.50 | Very Low |

**2.5 Statistical Technique**

Descriptive Statistics such as frequency counts, percentage, mean and standard deviation were used to describe the performance level of students in Mathematics and the self-efficacy level of students in terms of (a) mastery experiences; (b) vicarious experiences; (c) verbal-social persuasion; and (d) physiological and emotional arousal. Analysis of Covariance (ANCOVA) was used to determine if there is a significant difference in the performance of students exposed to GRRIM and those exposed to non-GRRIM in terms of (a) posttest, and (b) retention test. ANCOVA was also used to ascertain if there is a significant difference in the self-efficacy level of the students exposed to GRRIM and those exposed to non-GRRIM in terms of (a) mastery experiences; (b) vicarious experiences; (c) verbal-social persuasion; and (d) physiological and emotional arousal.

## 3 RESULTS AND DISCUSSIONS

### 3.1 Mathematics Performance of Students

The Mathematics performance of the students exposed to GRRIM and those exposed to non-GRRIM in terms of pretest is presented in Table 1. As shown in Table 1, 2 students or 4.08% of the students in the GRRIM group had a low performance and 47 students or 95.92% had a very low performance in the pretest. On the other hand, 1 student or 2.04% of the students in the non-GRRIM group had a moderate performance, 4 students or 8.16% had a low performance and 45 students or 91.84% had a very low performance in the pretest. The overall mean score of the GRRIM group in the pretest is 11 which indicates a very low performance while the non-GRRIM group has an overall mean score of 12.69 which also indicates a very low performance.

***Table 1.*** *Mathematics performance of students exposed to GRRIM and those exposed to non-GRRIM in terms of pretest.*

| Range | GRRIM | | | Non-GRRIM | | |
|---|---|---|---|---|---|---|
| | f | % | Interpretation | f | % | Interpretation |
| 90% - 100% | 0 | 0 | Very High | 0 | 0 | Very High |
| 86 % - 89% | 0 | 0 | High | 0 | 0 | High |
| 80% - 85% | 0 | 0 | Moderate | 1 | 2.04 | Moderate |
| 75% - 79% | 2 | 4.08 | Low | 4 | 8.16 | Low |
| 65% - 74% | 47 | 95.92 | Very Low | 45 | 91.84 | Very Low |
| | $\bar{x} = 11$ (Very Low) | | | $\bar{x} = 12.69$ (Very Low) | | |

The result of this study shows that both groups had a very low level of performance in the pretest. It supports the study of Bersano (2016) when she found out that the students' performance in Mathematics in terms of pretest before exposure to Game-Aided Instruction is very low. It also supports the study of Villaver (2014) when she showed that the level of mathematics performance of students before exposure to experiential learning environment is in the beginning level which indicates a very low performance. Furthermore, this study also supports the study of Catli (2016) when she found out that the mathematics performance of students exposed to ICT-Integrated Instruction and those exposed to non-ICT-Integrated Instruction showed a very low performance. Table 2 shows the Mathematics performance of the students exposed to GRRIM and those exposed to non-GRRIM in terms of posttest. It can be seen in Table 2 that 6 students or 12.24% of the students in the GRRIM group had a very high performance, 6 students or 12.24% had a high performance, 14 students or 28.57% had a moderate performance, 12 students or 24.49% had a low performance, and 11 students or 22.45% had a very low performance in the posttest. On the contrary, 8 students or 16.33% of the students in the non-GRRIM group had a very high performance, 3 students or 6.12% had a high performance, 10 students or 20.41% had a moderate performance, 12 students or 24.49% had a low performance, and 16 students or 32.65% had a very low performance in the posttest. The overall mean score of the GRRIM group in the posttest is 23.67 which indicates a moderate performance while the non-GRRIM group has an overall mean score of 21.78 which indicates a low performance.

***Table 2.*** *Mathematics performance of students exposed to GRRIM and those exposed to non-GRRIM in terms of posttest.*

| Range | GRRIM | | | Non-GRRIM | | |
|---|---|---|---|---|---|---|
| | f | % | Interpretation | f | % | Interpretation |
| 90% - 100% | 6 | 12.24 | Very High | 8 | 16.33 | Very High |
| 86 % - 89% | 6 | 12.24 | High | 3 | 6.12 | High |
| 80% - 85% | 14 | 28.57 | Moderate | 10 | 20.41 | Moderate |
| 75% - 79% | 12 | 24.49 | Low | 12 | 24.49 | Low |
| 65% - 74% | 11 | 22.45 | Very Low | 16 | 32.65 | Very Low |
| | $\bar{x} = 23.67$ (Moderate) | | | $\bar{x} = 21.78$ (Low) | | |

Table 2 shows that the GRRIM group had a moderate performance level while the non-GRRIM group had a low performance level. Villaver (2014) presented that the mathematics performance of the students in the posttest after exposure to experiential learning environment is still in the beginning level which indicates a very low performance is not in consonance to the result of this study. The result of this study also disagree to the study of Bersano (2016) when majority of the students' mathematics performance after exposure to Game-Aided Instruction is still in the very low level. Moreover, it also contradicts to the study of Catli (2016) when she found out that the level of mathematics competency of students exposed to ICT-Integrated Instruction in terms of posttest is moving towards mastery which indicates a high performance. The Mathematics performance of the students exposed to GRRIM and those exposed to non-GRRIM in terms of retention test is presented in Table 3. It can be gleaned in Table 3 that 3 students or 6.12% of the students in the GRRIM group had a very high performance, 3 students or 6.12% had a high performance, 13 students or 26.53% had a moderate performance, 16 students or 32.65% had a low performance, and 14 students or 28.57% had a very low performance in the retention test. On the other hand, 7 students or 14.28% of the students in the non-GRRIM group had a very high performance, 4 students or 8.16% had a high performance, 8 students or 16.33% had a moderate performance, 10 students or 20.41% had a low performance, and 20 students or 40.82% had a very low performance in the retention test. The overall mean score of the GRRIM group in the posttest is 21.78 which indicates a low performance while the non-GRRIM group has an overall mean score of 21.10 which indicates a low performance.

***Table 3.*** *Mathematics performance of students exposed to GRRIM and those exposed to non-GRRIM in terms of retention test.*

| Range | GRRIM | | | Non-GRRIM | | |
|---|---|---|---|---|---|---|
| | f | % | Interpretation | f | % | Interpretation |
| 90% - 100% | 3 | 6.12 | Very High | 7 | 14.28 | Very High |
| 86 % - 89% | 3 | 6.12 | High | 4 | 8.16 | High |
| 80% - 85% | 13 | 26.53 | Moderate | 8 | 16.33 | Moderate |
| 75% - 79% | 16 | 32.65 | Low | 10 | 20.41 | Low |
| 65% - 74% | 14 | 28.57 | Very Low | 20 | 40.82 | Very Low |
| | $\bar{x} = 21.78$ (Low) | | | $\bar{x} = 21.10$ (Low) | | |

The result of this study shows that the students' mathematics performance in the retention test is in the low level. Catli (2016) found out in her study that the level of mathematical competency of students in terms of retention test exposed to non-ICT-Integrated Instruction is in the low level which is supported by this study but the level of mathematical competency of students in terms of retention test exposed to ICT-Integrated Instruction is in the average level which is not parallel to the result of this study. This does not support the study of Bersano (2016) when majority of the students' mathematics performance after exposure to Game-Aided Instruction is in the very low level. In addition, this study does not support the result of the study of Villaver (2014) that the conceptual retention of students exposed to experiential learning environment is still in the beginning level which indicates a very low performance. Majority of the students both in the GRRIM and non-GRRIM group had a low and very low performance level before the intervention which implies that majority of the students have poor performance in Mathematics. Both groups improved their mean score after the intervention. In the retention test, both groups show a decline in the mean score but still the GRRIM group has a higher mean than that of the non-GRRIM group. The results of this study show that when a class is exposed to various instructional models, the students' performance increases and the retention rate is higher as shown in their posttest and retention test scores after the treatment. However, decline of the mean score in the retention test of the students may be caused by the delayed conduct of the retention test due to school activities. These results conform to the study of De Asis (2012) on the effects of cooperative and mastery learning on grade six pupils' performance in Mathematics, wherein the level of pupils' performance in the subject exposed to mastery and cooperative learning increased. The cooperative learning group had the greatest increase among the three groups and this finding suggests that the "You do it together" phase in the Gradual Release of Responsibility Instructional Model may possibly cause the increase in students' performance in Mathematics and must be used in every classroom. In addition, the result is in consonance to the study of Silabay (2002) about the use of Cooperative Computer Assisted Instruction which shows higher result as compared to the Individualized Computer Assisted Instruction. It also supports the study of Asparin (2013) wherein he found out that the students' level of mathematics achievement is very poor. The study of Cordova (2015) is parallel to the result of this study wherein she found out that the mathematics proficiency and performance level of Grade 9 students at private high schools in Valencia City was described as beginning which means that the students have a low performance in Mathematics.

### 3.2 Students' Self-Efficacy

As shown in Table 4, two items with higher means in the GRRIM group before the intervention are "I do well on math assignments" (2.88) and "I got good grades in math on my last report card" (2.31). However, two items with higher means in the non-GRRIM group are "I do well on math assignments" (3.20) and "Even when I study very hard, I do poorly in math" (2.67). These results indicate that both groups had moderately high self-efficacy on mastery experience in terms of "I do well in math assignments" before the intervention. Also, the non-GRRIM group had moderately high self-efficacy on mastery experience in terms of "Even when I study very hard, I do poorly in math", and "I got good grades in math on my last report card" before the intervention. Table 4 also shows that both the GRRIM and non-GRRIM group have the same two items with lower means which are "I do well on even the most difficult math assignments" (1.90 and 1.80, respectively) and "I have always been successful in math" (2.00 and 1.96, respectively). Table 5 shows that both the GRRIM and non-GRRIM group have the same two items with higher means which are "Seeing kids do better than me in math pushes me to do better" (3.16 and 3.45, respectively) and "Seeing adults do well in math pushes me to do better" (3.06 and 3.41, respectively).

***Table 4.*** *Self-efficacy level of students towards Mathematics (mastery experiences) between GRRIM and non-GRRIM group before intervention.*

| Self-efficacy Towards Mathematics (Mastery Experiences) | GRRIM | | Non-GRRIM | |
|---|---|---|---|---|
| | Mean | Interpretation | Mean | Interpretation |
| I make excellent grades on math tests. | 2.27 | Moderately Low | 2.16 | Moderately Low |
| I have always been successful with math. | 2.00 | Moderately Low | 1.96 | Moderately Low |
| Even when I study very hard, I do poorly in math.* | 2.14 | Moderately Low | 2.67 | Moderately High |
| I got good grades in math on my last report card. | 2.31 | Moderately Low | 2.53 | Moderately High |
| I do well on math assignments. | 2.88 | Moderately High | 3.20 | Moderately High |
| I do well on even the most difficult math assignments. | 1.90 | Moderately Low | 1.80 | Moderately Low |
| Overall Mean Interpretation | 2.24 | Moderately Low | 2.40 | Moderately Low |

**negative indicators (scoring is reversed)*

Legend:

| Range | Descriptive Rating | Qualitative Interpretation |
|---|---|---|
| 4.51 – 5.00 | Definitely True | Very High |
| 3.51 – 4.50 | Mostly True | High |
| 2.51 – 3.50 | A little bit True | Moderately High |
| 1.51 – 2.50 | A little bit False | Moderately Low |
| 0.51 – 1.50 | Mostly False | Low |
| 0.00 – 0.50 | Definitely False | Very Low |

***Table 5.*** *Self-efficacy level of students towards Mathematics (vicarious experiences) between GRRIM and non-GRRIM group before intervention.*

| Self-efficacy Towards Mathematics (Vicarious Experiences) | GRRIM | | Non-GRRIM | |
|---|---|---|---|---|
| | Mean | Interpretation | Mean | Interpretation |
| Seeing adults do well in math pushes me to do better. | 3.06 | Moderately High | 3.41 | Moderately High |
| When I see how my math teacher solves a problem, I can picture myself solving the problem in the same way. | 2.92 | Moderately High | 2.65 | Moderately High |
| Seeing kids do better than me in math pushes me to do better. | 3.16 | Moderately High | 3.45 | Moderately High |
| When I see how another student solves a math problem, I can see myself solving the problem in the same way. | 2.63 | Moderately High | 2.73 | Moderately High |
| I imagine myself working through challenging math problems successfully. | 2.78 | Moderately High | 2.45 | Moderately Low |
| I compete with myself in math. | 2.70 | Moderately High | 2.40 | Moderately Low |
| Overall Mean Interpretation | 2.88 | Moderately High | 2.90 | Moderately High |

Legend:

| Range | Descriptive Rating | Qualitative Interpretation |
|---|---|---|
| 4.51 – 5.00 | Definitely True | Very High |
| 3.51 – 4.50 | Mostly True | High |
| 2.51 – 3.50 | A little bit True | Moderately High |
| 1.51 – 2.50 | A little bit False | Moderately Low |
| 0.51 – 1.50 | Mostly False | Low |
| 0.00 – 0.50 | Definitely False | Very Low |

The results show that both groups had moderately high self-efficacy on vicarious experiences. It was also shown that the GRRIM group had a moderately high self-efficacy on vicarious experiences in all the indicators while the non-GRRIM group had a moderately high self-efficacy on vicarious experiences in terms of “Seeing adults do well in math pushes me to do better”, “When I see how my math teacher solves a problem, I can picture myself solving the problem in the same way”, “Seeing kids do better than me in math pushes me to do better” and “When I see how another student solves a math problem, I can see myself solving the problem in the same way.” As shown in Table 5, two items with lower means in the GRRIM group before the intervention are “When I see how another student solves a math problem, I can see myself solving the problem in the same way” (2.63) and “I compete with myself in math” (2.70). On the other hand, two items with lower means in the non-GRRIM group are “I compete with myself in math” (2.40) and “I imagine myself working through challenging math problems successfully” (2.45). The study conducted by Zimmerman (1989) showed the superiority of coping models which is related to vicarious experiences. In his study where he compared an errorless model and a model showing gradual elimination of errors, the coping model raised children’s self-efficacy perceptions 86% from pretesting to post-testing. It can be seen in Table 6 that the two items with higher means in the GRRIM group before the intervention are “My math teachers have told that I am good at learning math” (2.18) and “Adults in the family have told me what a good math student I am” (1.96). On the contrary, two items with higher means in the non-GRRIM group are “Adults in the family have told me what a good math student I am” (1.69) and “Other students have told me that I’m good at learning math” (1.61). Results show that the GRRIM group had a moderately low self-efficacy on verbal-social persuasion in all the indicators. The non-GRRIM group had a moderately low self-efficacy on verbal-social persuasion in terms of “Adults in my family have told me what a good math student I am” and “Other students have told me that I’m good at learning math” while the rest of the indicators had a low self-efficacy on verbal-social persuasion. It was shown also in Table 6 that the two items with the lower means in the GRRIM group are “People have told me that I have a talent for math” (1.59) and “Other students have told me that I’m good at learning math” (1.73). However, two items in the non-GRRIM group with a lower mean score are “People have told me that I have a talent for math” (1.35) and “I have been praised for my ability in math” (1.35). The result of the study conducted by Kampkuiper (2015) about the effect of positive and negative feedback on self-efficacy, cognitive trust and affective trust using coded video-based observations for feedback durations and questionnaires for measuring self-efficacy, cognitive and affective trust suggests that negative feedback is negatively related to self-efficacy and cognitive trust. This supports the result of this study wherein those exposed to GRRIM had a higher self-efficacy level as compared to those exposed to non-GRRIM.

***Table 6.*** *Self-efficacy level of students towards Mathematics (verbal-social persuasion) between GRRIM and non-GRRIM group before intervention.*

| Self-efficacy Towards Mathematics (Verbal-Social Persuasion) | GRRIM | | Non-GRRIM | |
|---|---|---|---|---|
| | Mean | Interpretation | Mean | Interpretation |
| My math teachers have told that I am good at learning math. | 2.18 | Moderately Low | 1.37 | Low |
| People have told me that I have a talent for math. | 1.59 | Moderately Low | 1.35 | Low |
| Adults in my family have told me what a good math student I am. | 1.96 | Moderately Low | 1.69 | Moderately Low |
| I have been praised for my ability in math. | 1.78 | Moderately Low | 1.35 | Low |
| Other students have told me that I'm good at learning math. | 1.73 | Moderately Low | 1.61 | Moderately Low |
| My classmates like to work with me in math because they think I'm good at it. | 1.90 | Moderately Low | 1.40 | Low |
| Overall Mean Interpretation | 1.86 | Moderately Low | 1.50 | Low |

Legend:

| Range | Descriptive Rating | Qualitative Interpretation |
|---|---|---|
| 4.51 – 5.00 | Definitely True | Very High |
| 3.51 – 4.50 | Mostly True | High |
| 2.51 – 3.50 | A little bit True | Moderately High |
| 1.51 – 2.50 | A little bit False | Moderately Low |
| 0.51 – 1.50 | Mostly False | Low |
| 0.00 – 0.50 | Definitely False | Very Low |

In Table 7, the two items with higher means in the GRRIM group before the intervention are "I get depressed when I think about learning math" (2.53) and "My whole body becomes tense when I have to do math" (2.33). On the other hand, two items with higher means in the non-GRRIM group are "I get depressed when I think about learning math" (3.18) and "My mind goes blank and I am unable to think clearly when doing math work" (3.16). The result shows that in the GRRIM group, the only indicator with a moderately high self-efficacy is "I get depressed when I think about learning math" and the rest are moderately low. Results also show that the non-GRRIM group had a moderately high self-efficacy on physiological and emotional arousal in all the indicators. As shown in Table 7, the item with the lowest mean in the GRRIM group before the intervention is "I start to feel stressed-out as soon as I begin my math work" (2.2). However, two items in the non-GRRIM group with a lower mean score are "Just being in math class makes me feel stressed and nervous" (2.65) and "Doing math work takes all of my energy" (2.67). The over-all mean score of the students under CPAAG in Math anxiety is 2.86 (uncertain) and that of students under non-CPAAG is 2.94 (uncertain). Both groups disagreed on statement that they won't worry in solving math problems. It means that they feel worried in solving Math problems. Thus, prior to the conduct of the study the anxiety level of the students are neutral. It conforms to the study of Bersano (2016) wherein her study found out that during the pre-test the respondents have moderate level of anxiety or neutral.

***Table 7.*** *Self-efficacy level of students towards Mathematics (physiological and emotional arousal) between GRRIM and non-GRRIM group before intervention.*

| Self-efficacy Towards Mathematics (Physiological and Emotional Arousal) | GRRIM | | Non-GRRIM | |
|---|---|---|---|---|
| | Mean | Interpretation | Mean | Interpretation |
| Just being in math class makes me feel stressed and nervous.* | 2.24 | Moderately Low | 2.65 | Moderately High |
| Doing math work takes all of my energy.* | 2.24 | Moderately Low | 2.67 | Moderately High |
| I start to feel stressed-out as soon as I begin my math work.* | 2.20 | Moderately Low | 2.90 | Moderately High |
| My mind goes blank and I am unable to think clearly when doing math work.* | 2.31 | Moderately Low | 3.16 | Moderately High |
| I get depressed when I think about learning math.* | 2.53 | Moderately High | 3.18 | Moderately High |
| My whole body becomes tense when I have to do math.* | 2.33 | Moderately Low | 3.04 | Moderately High |
| Overall Mean Interpretation | 2.31 | Moderately Low | 2.94 | Moderately High |

**negative indicators (scoring is reversed)*
*Legend: (similar to Table 6)*

Table 8 summarizes the comparison of students' sources of self-efficacy towards mathematics between GRRIM and non-GRRIM before intervention in terms of mastery experiences, vicarious experiences, verbal-social persuasion, and physiological and emotional arousal. In the GRRIM group, the source of self-efficacy with the highest mean is vicarious experience (2.88) while the lowest is verbal-social persuasion (1.86). In the non-GRRIM group, the source of self-efficacy with the highest mean is physiological and emotional arousal (2.94) while the lowest is verbal-social persuasion (1.50). As reflected in Table 8, the overall mean of self-efficacy of the GRRIM group before the intervention is 2.32 which indicates a moderately low self-efficacy while the overall mean of self-efficacy of the non-GRRIM group before the intervention is 2.41 which means that the group has a moderately low self-efficacy. The GRRIM group builds their self-efficacy in Mathematics through the vicarious experience of observing others. They measure their performance in Mathematics by comparing it with the performance of others. They are also fond of comparing their performance to others like their classmates and adults as they make judgment about their own mathematical capabilities. On the other hand, the Non-GRRIM group builds their self-efficacy in Mathematics by avoiding stress and staying calm, setting their minds in a

positive mood during math classes, and taking problems slowly to avoid being tensed during math classes. The results disagree with what Bandura (1986, 1997) hypothesized that among the four sources of self-efficacy, the most powerful is the mastery experience or the students' interpreted result from their previous accomplishments. In can be seen in Table 8 that in the GRRIM group, the source of self-efficacy with the highest mean is vicarious experience (2.88), while in the non-GRRIM group the source of self-efficacy with the highest mean is physiological and emotional arousal (2.94). Table 9 on the next page sums up the comparison of students' sources of self-efficacy towards mathematics between GRRIM and non-GRRIM after intervention in terms of mastery experiences, vicarious experiences, verbal-social persuasion, and physiological and emotional arousal. In the GRRIM group, the source of self-efficacy with the highest mean is vicarious experiences (2.98) while the lowest is verbal-social persuasion (1.83). In the non-GRRIM group, the source of self-efficacy with the highest mean is physiological and emotional arousal (2.84) and the lowest is verbal-social persuasion (1.51).

***Table 8.*** *Summary of the Students Self-Efficacy Levels between GRRIM and Non- GRRIM group before intervention.*

| Self-efficacy Towards Mathematics | GRRIM | | Non-GRRIM | |
|---|---|---|---|---|
| | Mean | Interpretation | Mean | Interpretation |
| Mastery Experiences | 2.24 | Moderately Low | 2.40 | Moderately Low |
| Vicarious Experiences | 2.88 | Moderately Low | 2.90 | Moderately High |
| Verbal-Social Persuasion | 1.86 | Moderately Low | 1.50 | Low |
| Physiological and Emotional Arousal | 2.31 | Moderately Low | 2.94 | Moderately High |
| Overall Mean Interpretation | 2.32 | Moderately Low | 2.41 | Moderately Low |

Legend:

| Range | Descriptive Rating | Qualitative Interpretation |
|---|---|---|
| 4.51 – 5.00 | Definitely True | Very High |
| 3.51 – 4.50 | Mostly True | High |
| 2.51 – 3.50 | A little bit True | Moderately High |
| 1.51 – 2.50 | A little bit False | Moderately Low |
| 0.51 – 1.50 | Mostly False | Low |
| 0.00 – 0.50 | Definitely False | Very Low |

As presented in Table 9, the overall mean of self-efficacy of the GRRIM group after the intervention is 2.41 which indicates a moderately low self-efficacy while the overall mean of self-efficacy of the non-GRRIM group after the intervention is 2.34 which also means that the group had moderately low self-efficacy. However, it is noteworthy to mention that GRRIM group had higher mean in all sources of self-efficacy compared to the non-GRRIM group except for physiological and emotional arousal. This shows that interventions must be done to increase their self-efficacy especially in the physiological and emotional arousal. It can also be observed that the GRRIM group had a higher overall mean of self-efficacy (2.41) as compared to the non-GRRIM group after the intervention (2.34) although both group had moderately low self-efficacy. This is in contrast to the results before intervention wherein the non-GRRIM had a higher overall mean of self-efficacy (2.41) as compared to the GRRIM group (2.32) as presented in Table 9. The GRRIM group builds their self-efficacy in Mathematics through the vicarious experience of observing others. They measure their performance in Mathematics by comparing it with the performance of others. They are also fond of comparing their performance with others like their classmates and adults as they make judgment about their own mathematical capabilities. On the other hand, the non-GRRIM group builds their self-efficacy in Mathematics by avoiding stress and staying calm, setting their minds in a positive mood during math classes, and taking problems slowly to avoid being tense during math classes. The results of this study after intervention did not conform to what Bandura (1986, 1997) hypothesized that among the four sources of self-efficacy, the most powerful is the mastery experience or the students' interpreted result from their previous accomplishments. In can be seen in Table 13 that in the GRRIM group, the source of self-efficacy with the highest mean is vicarious experience (2.98), while in the non-GRRIM group, the source of self-efficacy with the highest mean is physiological and emotional arousal (2.84).

***Table 9.*** *Summary of the Students Self-Efficacy Levels between GRRIM and non-GRRIM group after intervention.*

| Self-efficacy Towards Mathematics | GRRIM | | Non-GRRIM | |
|---|---|---|---|---|
| | Mean | Interpretation | Mean | Interpretation |
| Mastery Experiences | 2.36 | Moderately Low | 2.28 | Moderately Low |
| Vicarious Experiences | 2.98 | Moderately High | 2.73 | Moderately High |
| Verbal-Social Persuasion | 1.83 | Moderately Low | 1.51 | Moderately Low |
| Physiological and Emotional Arousal | 2.46 | Moderately Low | 2.84 | Moderately High |
| Overall Mean Interpretation | 2.41 | Moderately Low | 2.34 | Moderately Low |

Legend:

| Range | Descriptive Rating | Qualitative Interpretation |
|---|---|---|
| 4.51 – 5.00 | Definitely True | Very High |
| 3.51 – 4.50 | Mostly True | High |
| 2.51 – 3.50 | A little bit True | Moderately High |
| 1.51 – 2.50 | A little bit False | Moderately Low |
| 0.51 – 1.50 | Mostly False | Low |
| 0.00 – 0.50 | Definitely False | Very Low |

### 3.3 Analysis of Covariance of Posttest Results Between GRRIM and non-GRRIM

Table 10 shows the analysis of covariance (ANCOVA) of posttest results between treatments. As shown in the table, the pretest was used as covariate to statistically equate dissimilar prognostic variables which may have an effect on the analysis. The F value between groups is 4.511 with a probability value of 0.036 ($p < 0.05$) indicating a highly significant difference, thus the null hypothesis that there is no significant difference in students' performance in terms of posttest is rejected. This means that GRRIM group with mean 23.67 performed better than the non-GRRIM group with mean 21.78. Several studies were conducted which conform to the result of this study that used varied teaching strategies to improve the quality of mathematics instruction. The study of Ciubal & Tan (2018) is supported by the result of this study wherein there is a significant difference in the posttest scores of the experimental group as compared to the control group when exposed to Mathematics Communication Strategies (MCS) which was also utilized by the researcher in the "You do it together" phase and "You do it alone" phase of the lesson. The result of the study also conforms to Calfoforo (2013) wherein she found out that the students' posttest scores in the Multiple Representation-Based Instruction group was significantly higher than in the Traditional Method of Instruction. Also, it conforms with the findings of Miñao when she found out that the students' posttest scores in the Multiple Intelligence-Based Instruction (MIBI) group was significantly higher than in the non-MIBI group. However, it contradicts to the result of the study of Ponsica (2011) wherein she found out that there was no significant difference in the posttest scores between the UbD-based learning plan group and NCTM-based lesson plan group. It also contradicts to the study of Catli (2016) when she showed that there was no significant difference in the mathematical competency for the students when exposed to ICT-Integrated Instruction and non ICT-Integrated Instruction in terms of their posttest scores.

***Table 10.*** *Comparison of posttest results between GRRIM and non-GRRIM group*

| Group | | Mean | SD | | N |
|---|---|---|---|---|---|
| GRRIM | | 23.67 | 7.163 | | 49 |
| Non-GRRIM | | 21.78 | 8.802 | | 49 |
| Total | | 22.72 | 8.040 | | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 251.160 | 1 | 251.160 | 4.511 | 0.036* |
| Pretest | 892.432 | 1 | 892.432 | 16.030 | 0.000 |
| Error | 5288.874 | 95 | 55.672 | | |
| Total | 56877.000 | 98 | | | |

**Significant at 0.05 level*

Table 11 shows the analysis of covariance (ANCOVA) of retention test results between treatments. As presented in the table, the F value is equal to 3.158 with a p-value of 0.079 ($p > 0.05$) between groups which indicates a nonsignificant difference, thus the null hypothesis that there is no significant difference in students' performance in terms of retention is accepted. This finding means that students exposed to GRRIM have more or less the same retention level compared to the students exposed to non-GRRIM. Although the mean score of GRRIM group in the retention test is nonsignificant compared to the non-GRRIM group, the mean score of the GRRIM group which is 21.78 is higher than the mean score of non-GRRIM group which is 21.10.

***Table 11****. Comparison of retention test results between GRRIM and non-GRRIM group*

| Group | | Mean | SD | | N |
|---|---|---|---|---|---|
| GRRIM | | 21.78 | 6.523 | | 49 |
| Non-GRRIM | | 21.10 | 8.898 | | 49 |
| Total | | 21.44 | 7.769 | | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 143.658 | 1 | 143.658 | 3.158 | 0.079 |
| Pretest | 1521.032 | 1 | 1521.032 | 33.433 | 0.000 |
| Error | 4821.988 | 95 | 45.495 | | |
| Total | 50897.000 | 98 | | | |

**Significant at 0.05 level*

The result of this study contradicts to the result of the study of Paglinawan (2011) wherein he found out that the students' performance in the Computer Assisted Instruction (CAI) group were significantly higher than that in the Non-CAI group in the retention test. This study also contradicts to the study of Taylaran (2015) when he found out that the students' retention test scores in the Students Participation Dominated (SPD) instruction was significantly higher than those of the Lecture Discussion Dominated (LDD) instruction. The study of Catli (2016) also contradicts to the result of this study when she showed that there was a significant difference in the mathematical competency for the students when exposed to ICT-Integrated Instruction and non ICT-Integrated Instruction in terms of their retention test scores. Although there is no significant difference in the retention test between the two groups, it is worthy to note that there was a significant difference in the performance of the GRRIM group and non-GRRIM group before the intervention as shown in Table 10 with a p-value of 0.000. The Gradual Release of Responsibility Instructional Model was able to bridge the gap between the performance of the experimental group and control group considering the fact that the experimental group is the third section while the control group is the second section.

### 3.3 Analysis of Covariance of Students' Self-Efficacy when exposed to GRRIM and to non-GRRIM

It can be seen in Table 12 that the students' self-efficacy (mastery experiences) when exposed to GRRIM had a mean score of 2.36 with a standard deviation of 0.77 while the non-GRRIM group had a mean score of 2.28 with a standard deviation of 0.89. Table 12 shows an F-value of 2.312 and a p-value of 0.132 indicating a no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM. Thus the null hypothesis, stating that there is no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM in terms of mastery experiences, is not rejected.

***Table 12.*** *Comparison of Self-efficacy levels (Mastery Experiences) between groups*

| Group | | Mean | SD | | N |
|---|---|---|---|---|---|
| GRRIM | | 2.36 | 0.77 | | 49 |
| Non-GRRIM | | 2.28 | 0.89 | | 49 |
| Total | | 2.32 | 0.83 | | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 0.800 | 1 | 0.800 | 2.312 | 0.132 |
| Pretest | 33.933 | 1 | 33.933 | 98.114 | 0.000 |
| Error | 32.856 | 95 | 0.346 | | |
| Total | 594.278 | 98 | | | |

**Significant at 0.05 level*

However, it can be observed that even if the difference is not significant, the mean score of the GRRIM group is higher compared to the non-GRRIM group in terms of mastery experiences. Even if there was no significant difference in the self-efficacy of the students between groups in terms of mastery experiences, it was observed that there was a significant difference in their self-efficacy before the intervention as shown in Table 12 with a p-value of 0.000. The self-efficacy of the GRRIM group in terms of mastery experiences increased after the intervention from 2.24 to 2.36 while the self-efficacy of the non-GRRIM group in terms of mastery experiences decreased from 2.40 to 2.28. The Gradual Release of Responsibility Instructional Model was able to bridge the gap in the self-efficacy of the two groups in terms of mastery experience which led to the increase of self-efficacy among GRRIM group. Each person creates their self-efficacy through the four sources but the most influential source is mastery experience according to Bandura (1977). However, in this study, the source of self-efficacy with the highest mean is the vicarious experiences. Mastery experiences refers to the tasks and activities that each person experiences. Self-efficacy increases if outcomes are successful but those failures lower the self-efficacy. As shown in Table 12, the Grade 9 students have low self-efficacy towards Mathematics in terms of mastery experiences because majority of them don't make excellent grades on math tests as shown in the pretest, posttest and retention test scores. Their low performance in Mathematics tests in the past lowered their belief in themselves that they will succeed in any Mathematics courses which led to the decrease in their performance. Even if some students achieve success in their Mathematics tests through persistent efforts, others continue to doubt their self-efficacy that they could mount the same effort. The study of Sewell and St. George (2000) supports the result of this study when they found out that the use of Creative Problem Solving (CPS) can have positive effects on self-efficacy for learning as shown in the increase of the self-efficacy level. Table 13 shows that the students' self-efficacy (vicarious experiences) when exposed to GRRIM had a mean score of 2.98 with a standard deviation of 0.79 while the non-GRRIM group had a mean score of 2.73 with a standard deviation of 0.92. As shown in Table 18, the F-value is 2.890 and the p-value is 0.092 indicating a no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM. Thus the null hypothesis, stating that there is no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM in terms of vicarious experiences, is not rejected.

***Table 13.*** *Comparison of Self-efficacy levels (Vicarious Experiences) between groups*

| Group | | Mean | SD | | N |
|---|---|---|---|---|---|
| GRRIM | | 2.98 | 0.79 | | 49 |
| Non-GRRIM | | 2.73 | 0.92 | | 49 |
| Total | | 2.86 | 0.86 | | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 1.305 | 1 | 1.305 | 2.890 | 0.092 |
| Pretest | 27.216 | 1 | 27.216 | 60.242 | 0.000 |
| Error | 42.920 | 95 | 0.452 | | |
| Total | 870.694 | 98 | | | |

**Significant at 0.05 level*

On the other hand, it can also be observed that although there is no significant difference in the self-efficacy between the two groups, the mean score of the GRRIM group is higher compared to the non-GRRIM group in terms of vicarious experiences. Even if there was no significant difference in the self-efficacy of the students between groups in terms of vicarious experiences, it was observed that there was a significant difference in their self-efficacy before the intervention as shown in Table 13 with a p-value of 0.000. The self-efficacy of the GRRIM group in terms of vicarious experiences increased after the intervention from 2.88 to 2.98 while the self-efficacy of the non-GRRIM group in terms of vicarious experiences decreased from 2.90 to 2.73. The Gradual Release of Responsibility Instructional Model was able to bridge the gap in the self-efficacy of the two groups in terms of vicarious experiences which led to the increase of self-efficacy among GRRIM group. Vicarious experience is the source of self-efficacy which comes from observing others perform a certain task. In this study, vicarious experiences is the source of self-efficacy with the highest mean which indicates that they believe in their capacity to do Mathematics if they see others (classmates, peers, parents, teachers) do Mathematics. Moreover, their self-efficacy increases if they see adults do well in Mathematics pushes them to do better and if they see kids do better than them in Mathematics pushes them to do better. In this context, the effects of modeling are very relevant and timely since their self-efficacy will increase even higher if best models teach them better ways of doing things. Sewell & St. George (2000) stated that one of the major sources of self-efficacy information comes from models, and this is utilized within the framework of CPS technique. CPS employed teacher modeling strategies and peer modeling as steps of the CPS process and the result yields an increase in the self-efficacy of the students which supports the result of this study. Result of the study of Zimmerman (1989) showed the superiority of coping models where he compared an errorless model and a model showing gradual elimination of errors, the coping model raised children's self-efficacy perceptions 86% from pretesting to post-testing. This results support the result of the study wherein there was an increase in the self-efficacy level of the students after implementing the GRRIM. As shown in Table 14, students' self-efficacy (verbal-social persuasion) when exposed to GRRIM had a mean score of 1.83 with a standard deviation of 0.86 while the non-GRRIM group had a mean score of 1.51 with a standard deviation of 1.01. It can be seen also in the table that the F-value is 0.056 and a p-value of 0.813 indicating a no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM. Thus the null hypothesis, stating that there is no significant difference in

the self-efficacy of two groups exposed to GRRIM and non-GRRIM in terms of verbal-social persuasion, is not rejected.

***Table 14.*** *Comparison of Self-efficacy levels (Verbal-Social Persuasion) between groups*

| Group | | Mean | SD | N |
|---|---|---|---|---|
| GRRIM | | 1.83 | 0.86 | 49 |
| Non-GRRIM | | 1.51 | 1.01 | 49 |
| Total | | 1.67 | 0.95 | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 0.022 | 1 | 0.022 | 0.056 | 0.813 |
| Pretest | 47.801 | 1 | 47.801 | 123.944 | 0.000 |
| Error | 36.638 | 95 | 0.386 | | |
| Total | 360.278 | 98 | | | |

**Significant at 0.05 level*

However, it can be seen that even if the difference is not significant, the mean score of the GRRIM group is higher compared to the non-GRRIM group. Even if there was no significant difference in the self-efficacy of the students between groups in terms of verbal-social persuasion, it was observed that there was a significant difference in their self-efficacy before the intervention as shown in Table 14 with a p-value of 0.000. The self-efficacy of the GRRIM group in terms of verbal-social persuasion decreased slightly after the intervention from 1.86 to 1.83 while the self-efficacy of the non-GRRIM group in terms of verbal-social persuasion increased slightly from 1.50 to 1.51. Verbal-social persuasion is the only source of self-efficacy towards Mathematics that decreased after the intervention. Verbal-social persuasions has the lowest mean score among the four sources of self-efficacy. This indicates that they create their self-efficacy less from what others say about their performance. Although verbal-social persuasions is a weak source of self-efficacy, what others say regarding their performance greatly affects their self-efficacy. Teachers, parents and peers play an important role in the development of a person's self-efficacy. Teachers must cultivate student's beliefs in their mathematical abilities while at the same time assure them that success is achievable. In fact, it is much easier to weaken the self-efficacy of a student through negative remarks than to strengthen such beliefs through positive appraisals. Sewell and St. George (2000) also made use of verbal persuasion in increasing the self-efficacy of students as part of the CPS technique. This supports the result of the study wherein the experimental group had a higher self-efficacy in terms of verbal-social persuasion as compared to the control group after using the GRRIM. Along the CPS process, encouragement was supported by the provision of specific, differentiated feedback. Clear feedback about specific skill development, especially when combined with specific, proximal goals, can be an important influence on self-efficacy (Alderman, 1999; Brophy, 1998) which is also part of the Gradual Release of Responsibility Instructional Model (GRRIM). The result of the study conducted by Kampkuiper (2015) about the effect of positive and negative feedback on self-efficacy, cognitive trust and affective trust using coded video-based observations for feedback durations and questionnaires for measuring self-efficacy, cognitive and affective trust suggests that negative feedback is negatively related to self-efficacy and cognitive trust. This supports the result of this study wherein those exposed to Gradual Release of Responsibility Instructional Model (GRRIM) had a higher self-efficacy level as compared to those exposed to non-GRRIM. Kampkuiper also emphasized that such results demonstrate the importance of examining the complex cognitive mechanisms relating to feedback which might affect the self-efficacy of the learners. Another study conducted by Hattie and Timperley (2007) pointed out that feedback is one of the most powerful influences on learning and achievement but it could either be positive or negative. Verbal-social persuasions could be in a form of feedback and GRRIM also made use of feedback to enhance its effectiveness in classrooms. The study of Hattie and Timperley shows that although feedback is among the major influences, the type of feedback and the way it is given can be differentially effective. Table 15 shows that the students' self-efficacy (physiological and emotional arousal) when exposed to GRRIM had a mean score of 2.46 with a standard deviation of 0.99 while the non-GRRIM group had a mean score of 2.84 with a standard deviation of 1.14. As presented in Table 15, the F-value is 0.308 and a p-value of 0.580 implying a no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM. Thus the null hypothesis, stating that there is no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM in terms of physiological and emotional arousal, is not rejected.

***Table 15.*** *Comparison of Self-efficacy levels (Physiological and Emotional Arousal) between groups*

| Group | | Mean | SD | N |
|---|---|---|---|---|
| GRRIM | | 2.46 | 0.99 | 49 |
| Non-GRRIM | | 2.84 | 1.14 | 49 |
| Total | | 2.65 | 1.08 | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 0.172 | 1 | 0.172 | 0.308 | 0.580 |
| Pretest | 56.016 | 1 | 56.016 | 99.919 | 0.000 |
| Error | 53.258 | 95 | 0.561 | | |
| Total | 801.806 | 98 | | | |

**Significant at 0.05 level*

Even if there was no significant difference in the self-efficacy of the students between groups in terms of physiological and emotional arousal, it was observed that there was a significant difference in their self-efficacy before the intervention as shown in Table 15 with a p-value of 0.000. The self-efficacy of the GRRIM group in terms of physiological and emotional arousal increased after the intervention from 2.31 to 2.46 while the self-efficacy of the non-GRRIM group in terms of physiological and emotional arousal decreased from 2.94 to 2.84. The Gradual Release of Responsibility Instructional Model was able to help increase the self-efficacy of the students in terms of physiological and emotional arousal through the support of the teachers and their peers. Physiological and emotional arousal is the only source of self-efficacy wherein the mean score of the GRRIM group is lower than the mean score of the non-GRRIM group. The GRRIM group has a moderately low self-efficacy in terms of physiological and emotional arousal as compared to the non-GRRIM group which has a moderately high self-efficacy. Psychological constructs such as anxiety, stress, and others also provide data about the self-efficacy of a person. A person can already gauge their self-efficacy by the emotional state that they experience as they reflect in their own actions. When a certain student experience failures or negative thoughts regarding their performance in Mathematics, those emotional

states can lower their self-efficacy and would trigger additional stress that would lead to poor performance. Students who are in a depressed mode would decrease their self-efficacy about learning Mathematics. To improve their self-efficacy, the teachers must improve the physical and emotional well-being of a student and reduce negative emotional states. As what Bandura (1997) has observed, we live in a psychic environment that are products of our own thinking. Maloney, Schaeffer and Beilock (2013) pointed out some ways how affective factors such as mathematics anxiety and stereotype threat can have a negative impact on the mathematics performance of the learners that may lead to avoidance of Mathematics. Furthermore, they suggested a number of interventions aimed at reducing the negative consequences of anxiety and stereotype threat on mathematics performance. Instructional approaches such as GRRIM may help reduce math anxiety and stereotype threat by supporting the learners with an environment conducive for mathematics learning. Table 16 presents the comparison of all the sources of self-efficacy of students between those exposed to GRRIM and those exposed to non-GRRIM. The mean score of the GRRIM group is 2.41 with a standard deviation of 0.62 while the non-GRRIM group has a mean score of 2.34 with a standard deviation of 0.77.

***Table 16.*** *Comparison of the Students' Self-efficacy levels between groups*

| Group | | Mean | SD | | N |
|---|---|---|---|---|---|
| GRRIM | | 2.41 | 0.62 | | 49 |
| Non-GRRIM | | 2.34 | 0.77 | | 49 |
| Total | | 2.37 | 0.70 | | 98 |
| Source | SS | df | MS | F-value | Sig. |
| Group | 0.464 | 1 | 0.464 | 2.586 | 0.111 |
| Pretest | 30.084 | 1 | 30.084 | 167.531 | 0.000 |
| Error | 17.060 | 95 | 0.180 | | |
| Total | 599.632 | 98 | | | |

**Significant at 0.05 level*

As seen in Table 16, the F-value is 2.586 and the p-value is 0.111 implying a no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM. Thus the null hypothesis, stating that there is no significant difference in the self-efficacy of two groups exposed to GRRIM and non-GRRIM, is not rejected. On the contrary, even if the difference is not significant, the overall mean score of the GRRIM group's self-efficacy is higher compared to that of the non-GRRIM group. Even if there was no significant difference in the self-efficacy of the students between groups from all sources of self-efficacy towards Mathematics, it was observed that there was a significant difference in their self-efficacy before the intervention as shown in Table 16 with a p-value of 0.000. The overall self-efficacy of the GRRIM group towards Mathematics increased after the intervention from 2.32 to 2.41 while the self-efficacy of the non-GRRIM group towards Mathematics decreased from 2.41 to 2.34. The Gradual Release of Responsibility Instructional Model was able to help increase the self-efficacy of the students towards Mathematics through the various phases of the model and by utilizing varied teaching methods and strategies. The result of this study contradicts to the result of the study of Jose (2015) wherein he found out that there is a significant difference in the self-efficacy of students exposed to ICT-GDLE as compared to those exposed to Non-ICT GDLE. The findings also suggest that efforts are needed to promote mathematics self-efficacy for the students because self-efficacy in Mathematics was positively associated with mathematics performance. This was shown in the study of Liu & Koirala (2009) when the results of the correlation analysis indicated that mathematics achievement and mathematics self-efficacy were positively related. Research results have shown that self-efficacy could be increased by using the right instructional strategies (Schunk, 1991 as cited by Liu & Koirala, 2009) and the use of the Gradual Release of Responsibility Instructional Model can help increase the mathematics self-efficacy as shown in the pretest and posttest results.

## 4 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 Conclusions

Based on the findings of the study, the following conclusions were drawn: The level of mathematics performance of the Grade 9 students in their pretest both for the GRRIM group and non-GRRIM group is very low. After the intervention, the GRRIM group had a moderate performance while the non-GRRIM group had a low performance which shows an increase from very low level in the pretest. On the retention test, both groups had a low retention test scores. The self-efficacy of Grade 9 students towards Mathematics when exposed to GRRIM and non-GRRIM is moderately low. Specifically, the self-efficacy of GRRIM group and the non-GRRIM group in terms of mastery experiences is moderately low. Both groups have moderately high self-efficacy in terms of vicarious experiences. Also, both groups have moderately low self-efficacy in terms of verbal-social persuasions. Lastly, the self-efficacy of the GRRIM group in terms of physiological and emotional arousal is moderately low while the self-efficacy of the non-GRRIM group in terms of physiological and emotional arousal is moderately high. Those students exposed to GRRIM have a significantly higher posttest scores as compared to those exposed to non-GRRIM. However, there is no significant difference in the mathematics performance of the Grade 9 students when exposed to GRRIM and non-GRRIM in terms of their retention score. The Grade 9 students of Central Mindanao University Laboratory High School have a high posttest score when the Gradual Release of Responsibility Instructional Model (GRRIM) is integrated in the instruction which resulted to a highly significant difference as compared to those exposed to non-GRRIM. There is no significant difference in the self-efficacy of students exposed to GRRIM and non-GRRIM. Specifically, there is no significant difference in the self-efficacy of students exposed to GRRIM and non-GRRIM in terms of mastery experiences, vicarious experiences, verbal-social persuasion, and physiological and emotional arousal.

### 4.2 Recommendations

The results and findings of the study led to the following recommendations for further research and actions: Mathematics teachers may use varied teaching models such as the Gradual Release of Responsibility Instructional Model (GRRIM) to improve the mathematics performance of the learners since it is noted in this study that there is an increase in the performance of the students before and after the intervention. As part of the Gradual Release of Responsibility Instructional Model, teachers should provide an avenue for their students to discuss their answers with their peers

through cooperative learning since it would help improve their performance. The GRRIM helps increase the self-efficacy of the students. Teachers are encouraged to use the GRRIM to increase the self-efficacy of the students by using different teaching strategies in every phase of the instructional model, the use of games and performance tasks relevant to the topic. Teachers can conduct pretest and posttest of the lessons to determine if students have prior knowledge of the topic and if they have learned something from the lesson along with the use of GRRIM in their classes. Follow up activities such as retention test and remedial classes are also recommended to correct the misconceptions of students about the topic. Teachers, parents and peers need to be very careful when making judgments about the mathematics performance of students because among the four sources of self-efficacy, both groups scored the lowest in verbal-social persuasion. Teachers may give feedbacks and constructive criticisms to avoid discouragements on the part of the learner and should also believe that all students are capable of learning all the topics.

## 5 BIBLIOGRAPHY


[1] Alderman, M. (1999). Motivation for Achievement: Possibilities for Teaching and Learning. Mahwah, New Jersey: Lawrence Erlbaum.

[2] Andaya, O. J. (2014). Factors that Affect Mathematics Achievement of Students of Philippine Normal University – Isabela Campus. Researchers World – Journal of Arts, Science & Commerce, 5(4), October 2014.

[3] Asparin, A. (2013). Problem Solving Abilities and Psychological Attributes of Sophomore Students: A Causal Model on Mathematics Achievement. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[4] Bandura, A. (1997). Self-efficacy: The Exercise of Control. New York: Freeman.

[5] Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

[6] Bandura, A. (1977). Self – efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191–215. Retrieved from https.//www.uky.edu/~eushez/Bandura/Bandura1977 PR.pdf

[7] Bermejo, E. (2009). Mathematics Journal Writing: Its Effect on Students' Learning Competencies and Attitude in Advanced Algebra of Bocboc National High School, SY 2008-2009. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[8] Bermundo, C., Bermundo, A., & Ballester, R. (2004). Test Checker and Item Analyzer with Statistics. Naga: DOST.

[9] Bersano, M. N. (2016). Game-Aided Instruction in Mathematics: Effects on Grade 8 Students' Performance and Anxiety Level. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[10] Brooks, A. W. (2013). Get Excited: Reappraising Pre-Performance Anxiety as Excitement. Journal of Experimental Psychology, 143 (3), 1144-1158

[11] Brophy, J. (1998). Motivating Students to Learn. Boston: McGraw Hill.

[12] Burns, M. (2008). Do The Math. Broadway, New York: Scholastic Inc. Retrieved from http://medind.nic.in/jak/t10/i1/jakt10i1p147.pdf

[13] Calfoforo, A. V. (2013). Multiple Representation-Based Instruction: Effects on the Performance and Attitudes of Students in High School Algebra. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[14] Canarecio, N. (1998). Game-Aided Lessons in Teaching First-Year Mathematics in Mindanao Mission Academy. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[15] Ciubal-Fulgencio, NR, Tan, DA. (2018)." Mathematics Communication Strategies: Effects on Attitudes and Performance of Grade 8 Students". Asian Academic Research Journal of Multidisciplinary, vol.5, no. 2, February 2018.

[16] Cordova, C., Tan, DA. (2018). "Mathematics Proficiency, Attitude and Performance of Grade 9 Students in Private High School in Bukidnon, Philippines". Asian Academic Research Journal of Social Sciences and Humanities, vol. 5, issue 2, pp. 103-116, February 2018.

[17] Davis, R. (2013). Parental Scaffolding, Psychosocial Attributes and Students' Mathematics Achievement. Unpublished Master's Thesis. Central Mindanao University (Graduate School).

[18] De Asis, A. (2012). Effects of Cooperative and Mastery Learning on Grade Six Pupils' Performance in Mathematics. Unpublished Master's Thesis. Central Mindanao University (Graduate School).

[19] Duke, N. & Pearson, D. (2002). Effective Practices for Developing Reading Comprehension. What Research Has to Say about Reading Instruction. Ed. A. E. Farstup and S. J. Samuels. Newark: International Reading Assoc. 205-42. Retrieved from http://dl.ueb.vnu.edu.vn/bitstream/1247/9977/1/Effecti ve%20 Practices%20for%20Developing.pdf

[20] Ebuña, J. (2008). Vignette Instruction: Its Effects on Mathematics Understanding of Freshmen Students at Bocboc National High School, SY 2007-

2008.Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[21] Fisher, D., Frey, N. & Lapp, D. (2011). Focusing on the Participation and Engagement Gap: A Case Study on Closing the Achievement Gap. Journal of Education for Students Placed at Risk, 16: 56-64. San Diego, California.

[22] Fisher, D. & Frey, N. (2008). Better Learning Through Structured Teaching: A Framework for the Gradual Release of Responsibility, Association for Supervision and Curriculum Development, Alexandria, Virginia.

[23] Fisher, D. & Frey, N. (2008). Homework and the Gradual Release of Responsibility: Making "Responsibility" Possible. English Journal 98(2), 40-45. National Council of Teachers of English.

[24] Fisher, D. & Frey, N. (2007). Implementing a Schoolwide Literacy Framework: Improving Achievement in an Urban Elementary School. The Reading Teacher 61, pp. 32-45

[25] Gonzales, P. (2004). Highlights From the Trends in International Mathematics and Science Study (TIMSS) 2003 (NCES 2005-005). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

[26] Graves, M. F. & Fitzgerald, J. (2004). Scaffolding reading experiences for English- language learners. Norwood, MA: Christopher-Gordon.

[27] Gray, P. (2014). Instructional Supports in Mathematics for an Age of Rigorous Standards. New York, NY: Triumphlearning

[28] Jose, A. (2015). Students' Self-Efficacy and Mathematics Performance in an Information and Communications Technology Guided-Discovery Learning Environment. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[29] Kampkuiper, J. (2015). The effect of positive and negative feedback on self- efficacy, cognitive trust and affective trust. 5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

[30] Lavasani, M. G., Mirhosseini, F. S., Hejazi, E., & Davoodi, M. (2011). The Effect of Self-regulation Learning Strategies Training on the Academic Motivation and Self-efficacy. Procedia – Social and Behavioral Sciences 29, 627-632

[31] Liu, X. & Koirala, H. (2009). The Effect of Mathematics Self-Efficacy on Mathematics Achievement of High School Students. NERA Conference Proceedings 2009

[32] Maloney, E., Schaeffer, M. & Beilock, S. (2013). Mathematics Anxiety and stereotype threat: shared mechanisms, negative consequences and promising interventions. Research in Mathematics Education, 15 (2), 115-128

[33] Marcia, A. (2007). Teachers' Performance Indicators and Pupils' Achievement in Mathematics of Sixth - graders of Valencia City Central Elementary School SY 2006-2007. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[34] Mcleod, S. A. (2015). Jean Piaget. Retrieved from www.simplypsychology.org/piaget.html

[35] Mcleod, S. A. (2014). Lev Vygotsky. Retrieved from www.simplypsychology.org/vygotsky.html

[36] Miñao, R. (2013). Multiple Intelligence-based Instruction: Effects on Students' Performance and Attitudes in Intermediate Algebra. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[37] Nanta, S. (2012). Teaching Standards and Self-Efficacy of Senior Students in Valencia National High School: A Causal Model for Mathematics Achievement. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[38] National Council of Teachers of Mathematics (2000). Principles and Standards for School Mathematics. (1st ed.). Reston, VA

[39] Nicolaidou M. & Philippou, G. (2002). Attitudes Towards Mathematics, Self- Efficacy and Achievement in Problem Solving. European Research in Mathematics Eductaion III. Retrieved from http:// www.dm.unipi.it/~didattica/CERME3/proceedings/Groups/TG2/TG2_nicolaidou_cerme3.pdf

[40] Paglinawan, J. (2011). Effects of Interactive Computer-Assisted Instruction on Students' Attitude and Performance in High School Geometry. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[41] Pajares, F. (2002). Overview of social cognitive theory and of self-efficacy. Retrieved from http://www.emory.edu/EDUCATION/mfp/eff.html

[42] Pearson, P. & Gallagher, M. (1983). The instruction of reading comprehension. Contemporary Educational Psychology, 8, 317-344. Retrieved from http://www.ideals.illinois.edu/bitstream/handle/2142/17939

[43] Ponsica, D. (2011). Lesson Planning Under Understanding by Design Environment on Students' Achievement and Attitudes in Elementary Algebra. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[44] Salvan, E. (2011). Constructs of Mathematics Teachers' Self-Efficacy Beliefs: A Validation. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[45] Sammons, L. (2010). Guided Math : A Framework for Mathematics Instruction. Huntington Beach, California: Shell Education. Retrieved from http://www.sisd .net/cms/lib/TX01001452/Centricity/Domain/4444/SEP%2050534%20Guided%2 0Math.pdf

[46] Schunk, D., Hanson, A. & COX, P. (1987). Peer model attributes and children's achievement behaviors. Journal of Educational Psychology, 79, 54 – 61.

[47] Sewell, A. & St. George, A. (2000). Developing efficacy beliefs in the classroom. Journal of Educational Enquiry, 1 (2).

[48] Siegle, D. & Mccoach, D. (2007). Increasing student mathematics self-efficacy through teacher training. Journal of Advanced Academics, 18 (2) 278-312

[49] Silabay, G. (2002). Individualized and Cooperative Computer Assisted Instruction: Effects on the Algebra Achievement of Sophomore High School Students. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[50] Taylaran, R. (2015). Participatory Teaching Methods: Effects on Students'Anxiety Level and Performance in Mathematics. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[51] Usher, E. & Pajares, F (2009). Sources of Self-Efficacy in Mathematics: A Validation Study. Contemporary Educational Psychology, 34, 89 – 101.

[52] Venkatesh Kumar, G. & KARIMI, A. (2010). Mathematics Anxiety, Mathematics Performance and Overall Academic Performance in High School Students. Journal of the Indian Academy of Applied Psychology, 36 (1), 147-150.

[53] Velasquez, J. & Tan, D. (2007). Teaching and Learning Styles and Academic Performance of High School Students in Mathematics, English and Science and Technology. Unpublished Master's Thesis. Central Luzon State University (Graduate School). Retrieved from http://serp-p.pids.gov.ph/mod/mobile/details. php?pid=4401&param=

[54] Villaver, L. G. (2014). Experiential Learning Approach: Effects on Mathematics Performance and Attitude. Unpublished Master's Thesis. Central Mindanao University (Graduate School)

[55] Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

[56] Wood, D. J., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. Journal of Child Psychiatry and Psychology, 17 (2), 89-100

[57] Zimmerman, B. (1989). A Social Cognitive View of Self-Regulated Academic Learning. Journal of Educational Psychology. 81 (3), 329 – 339