# STARTER KIT IN TEACHING MATHEMATICS FOR GRADE 7 SPECIAL EDUCATION STUDENTS WITH QUALITATIVE DYSCALCULIA AMIDST PANDEMIC

Alagbay, Marlon S.

Completed 2021

Republic of the Philippines
Department of Education
Region XII
**KORONADAL NATIONAL COMPREHENSIVE HIGH SCHOOL**
Division of City Schools
City of Koronadal
Corner Rizal St., Jaycee Avenue, City of Koronadal
District IX

---

# Starter Kit in Teaching Mathematics for Grade 7 Special Education Students with Qualitative Dyscalculia amidst Pandemic

---

**ACTION RESEARCH**

**Funded By**

**Basic Education Research Fund (BERF)**

**Region XII**

---

**MARLON S. ALAGBAY, T-I**

Researcher

# ABSTRACT

This study emphasizes “learn by doing, assess in learning “. There is in a great contrast to traditional education system that typically places a strong emphasis on the development and the use of these multiple intelligence's. In addition, it also emphasizes on the diversity of students intelligence; thus it promotes diverse approaches to the teaching and learning process. The study is focus to find out the effect of the Starter Kit in teaching addition for grade 7 special education students with qualitative dyscalculia and uses quasi-experimental design specifically the pretest-posttest non-equivalent group design. Moreover, the study reveals that there was **no significant difference on the pretest means scores and post test means scores** of the two groups as evident by the t-computed value of -0.921 and 0.359 where a p-value is less than 0.05, level of significance. Likewise it also shows **significant difference between the means of the pretest and posttest scores** of both groups as supported by the t-computed value of 9.999 and a p-value of 0.000. However, it is noted that **there was a significant difference between the mean gain scores of the experimental and the control groups** as evidenced by a t-computed value of 2.425 with a p-value of 0.017. This means that the use of the starter kit as a strategy in teaching addition directly influence the result of the academic performance of students.



**Keywords: Starter Kit, Addition, Special Education, Quasi-Experimental, Mathematics**

## I. Context and Rationale

Students develop the sense of capacity to organize and execute course of action to attain their designated goals when progress is seen in their learning tasks because of proper support being provided. When learners believe that they are capable of doing it, learners become more motivated to engage in different learning activities, thereby maximizing the use of their abilities and potentials. It is therefore a great challenge for us educators, to explore and use new innovations and practices in the field of teaching for which the process of learning may be assessed and evaluated through this new approaches and methodologies as to its effectiveness on the outcomes of the students in learning Mathematics in many different ways. Educators should meet the learning needs of every student in order to provide a more inclusive mathematics learning, examine ways in accommodating individual ways of learning, and also it is very important to help learners with special educational needs to understand and value their own preferred ways of learning to broaden the ways in which students go about in learning Mathematics.

Dyscalculia is a term referring to a wide range of life-long learning disabilities involving mathematics. It includes all types of math problems ranging from an inability to understand the meaning of numbers, to an inability to apply mathematical principles to solve problems. If basic math facts are not mastered, students with dyscalculia may have difficulty moving on to more advanced math applications. Dyscalculia makes it hard for students to do math and math related tasks. The extent use of variety of manipulative and pedagogical approaches may address the diversity of learning styles and developmental stages of the students and enhancing the formation of mathematical concepts. At all levels, students should benefit from working with a variety of materials, tools and contexts when

constructing meaning about this new approaches and methodologies in mathematics.

Mathematics can be learned in many ways, some remember best what they have seen, others are good with words and some are very good with their hands or who have a creative, artistic talent and flair. Armstrong (2013), emphasized that schools should employ various approaches to observe students problem-solving skills and their long-term accomplishments. Moreover, there is a need to students current level based from different vies and angles, with this foregoing studies, the researcher proposed a starter kit for grade 7 students with qualitative dyscalculia, in a hope of developing and increasing the skills, potentials, learning effectiveness and performance of the learners of Koronadal National Comprehensive High School-Special Education Department in Mathematics.

**Qualitative Dyscalculia**

Mathematical skills are fundamental to independent living in a numerate thus socio-economic status. An understanding of how concepts of numeracy develop, and the manifestation of difficulties in the acquisition of such concepts and skills, especially in the four basic operations in Mathematics (addition, subtraction, multiplication and division). According to Butterworth (2013) a range of descriptive terms have been used, such as Qualitative Dyscalculia, mathematical disability, arithmetic learning disability, number fact disorder and psychological difficulties in mathematics.

Qualitative Dyscalculia is a specific learning disability affecting the normal acquisition of arithmetic skills (Shalev, 2014). Genetic, nuerobiologic, and epidemiolic evidence indicates that dyscalculia, like other learning disabilities, is a brain-based disorder. However, poor teaching and environment deprivation have also been implicated in its etiology. Arguably, all developmental disorders that are categorized within the spectrum of specific learning difficulties have aspects of behavioral, cognitive and nuerological roots (Morton & Frith, 2015).

Greenhawk (2017) believed that the learners have a broad range of capacities, only some of which are valued and consciously developed through legal education. Conscious development should be hypothesized for a broader range of capabilities that would better prepare the students for a complexity of the real world as well as students will be more engage effectively in the development of their own potentials. Students who are more skilled or comfortable in using their less valued intelligence will have the opportunity to do well and to feel competent.

The classical understanding of dyscalculia as a clinical syndrome uses low achievement on numeracy tests as the criterion for gauging academic performance without identifying the underlying cognitive phenotype. This understanding has been unable to inform pathways to remediation, whether in focused interventions or in larger, more complex context of the mathematics classroom (Shalev, Gross-Tur and Neurol 2011). This kind of assessment ignores performance in terms of reduction of errors in the problem solving process. The assessment also fails to consider the fact that, dyscalculia can be highly selective and that it may affect learners with normal intelligence as well as those with normal working memory (Lander! and Bevan 2015). Dyscalculic tendencies among learners become more noticeable by the lime mathematical processes become more elaborate in the fifth or in the sixth grade of preparatory schools (Kenyon, 2013). Kenyon also points that there are no established bodies of research into this phenomenon. Dehaene on the other hand states that, dyscalculia can be detected at a young age. This means that, measures can be taken to ease arithmetical difficulties faced by younger students in middle preparatory school. He suggests that, the problem of dyscalculia can be effectively addressed by understanding the way numeracy is taught and the appropriate assessment that can then be given to learners so as to enhance academic progress (Dehaene 2017). It is with this scenario in mind that the researcher endeavors to investigate the influence that differentiated teaching resources, differentiated teaching methods, adjusted tests and differentiated tasks and classroom assignments have on the academic performance of learners with dyscalculia.

**Starter Kit in Teaching Addition**

Through the implementation of the starter kit for grade 7 students with Qualitative Dyscalculia in the classroom, teachers will indirectly decentralize the classroom, encouraging students to take a proactive role in their learning as well as transforming the teacher's role function from a director to facilitator. Both teachers and students share the opportunity to develop their ability in learning addition as they learn together (Campbel, 2012). Gibson and Govendo (2009) affirmed that the use of a kit in teaching addition in instruction and response options provides a flat form for students to have a diverse and natural ways of learning in the classroom and even in the community. In addition, it may effectively engage students in the learner-centered environment and to foster personal autonomy, responsibility and improvement in their learning.

According to Mokhtar (2010) and Rettig (2015) starter kit in addition when applied to the classroom enable a teacher to take note of various abilities and interest that students portray and also it allows students to have a better learning connection and retention of the lessons. Other than that, teachers could be flexible in the presentation of materials which is being studied in order to create opportunities for all the students in class to use their strengths and encourage students to show more pride and enthusiasm in their work. In addition, Mattetal and Jordan (2017) affirmed that teaching students about addition using varied tool kits may enhance their developmental process and giving the students more opportunities to feel confident about their abilities.

Mathematics ideas may be learn via constructive or in a building process, students have preferred ways of learning some remember best what they have seen,

others are good with words and others have a creative and artistic talent. Teachers should meet the learning needs of the students in order to provide a more inclusive mathematics learning, teachers examine ways to accommodate individuals ways in teaching and teachers should help students to understand and value their own preferred ways of learning and to broaden the ways in which the students go about in learning mathematics because students differ in how they attend to particular information, how students think about it and show what they have learn.

Finally, by changing the discourse and set up in the classrooms, making room for a greater range of interest, concern and approach it is expected that the learners may engage more fully in their development as a versatile and unique individuals. Ronit Bird (2010) stated that “the Dyscalculia Toolkit is the best place to start with a learner who relies on counting for most calculations and who needs to develop a strong feel for numbers and quantities. If we recognize this, I think we will have at least a better chance of dealing appropriately with the many problems that we face in the world”. the book is highly practical, with a broad range. It starts with concrete and visual patterns for single-digit numbers and ends with teaching ideas designed to help children acquire a good conceptual understanding of the topics in mathematics. The toolkit includes, dragmmatic and abstract levels and shows how teacher or parents can manage a careful transition between each stage.

## II. INNOVATION, INTERVENTION AND STRATEGY

Starter Kit is a compilation of interactive educational activities in math for

Qualitative Dyscalculic students. It was being presented during the conduct of thetudy. This material was given at the experimental group while the control group used the traditional chalk and board in teaching mathematics. This study covered 40

days upon the completion of the given learning competency for Special Education student of Koronadal National Comprehensive High School.

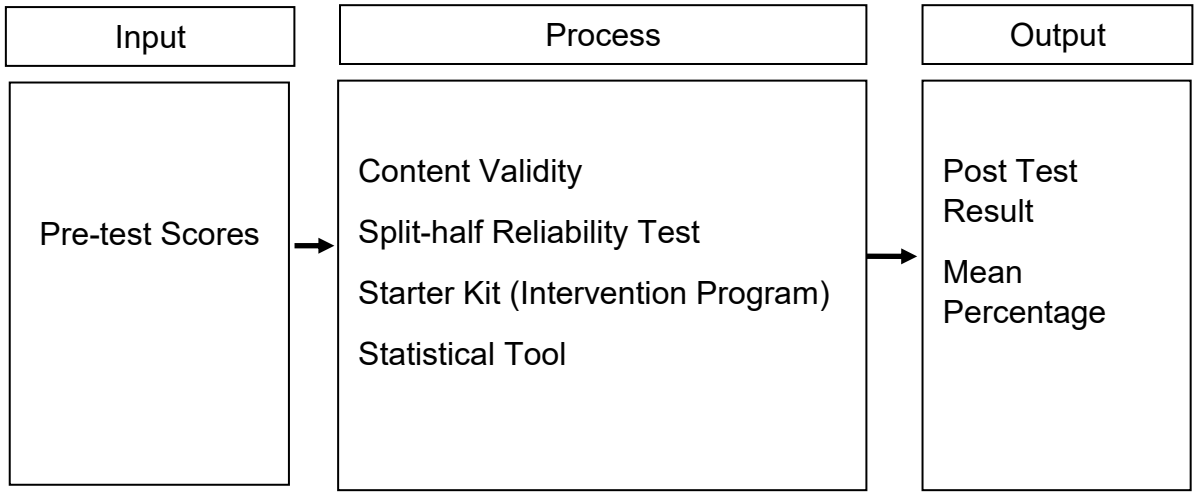


***Figure 1. Conceptual Framework***

**III. Action Research Questions**

Generally, this study will develop and try out the Starter Kit in Teaching Mathematics for Grade 7 Special Education Students with Qualitative Dyscalculia at Koronadal National Comprehensive High School. Specifically, this study will address the following research questions:

1. What is the Mean Percentage in Addition in the Pre-test?
2. Is there a significant difference between the Pre-test scores of the Control and Experimental Group?
3. Is there a significant difference on the Pre-test and Post Test scores of the Experimental group?
4. Is there a significant difference on the Post test scores of Control group and Experimental Group?

## IV. Scope and Delimitation

This study will assess students' performance level and will develop, implement and evaluate a Starter Kit in Teaching Mathematics for Grade 7 Special Education Students with Qualitative Dyscalculia . The Starter kit covers only topics in Operations on Whole Numbers for 2nd and 3rd grading period. The following are the five important parts of every session in the module:

1. Learning Ability/ Competency
2. Lecture/ Discussion
3. Illustrative Examples
4. Drills and activity
5. Evaluation

## V. Action Research Method

This chapter dealt with the aspects involved in collecting data that the researcher used as the basis for his research findings, conclusions and the relevant recommendations that have been submitted at the end of this study. In general, the chapter on research methodology included the research design, the study area, the target population, the sample and the sampling technique, the research instrument used for collecting data, the validity of the research instrument, the reliability of the research instrument, the data collection procedure, the operationalization of the variables and the data analysis technique that the researcher used.

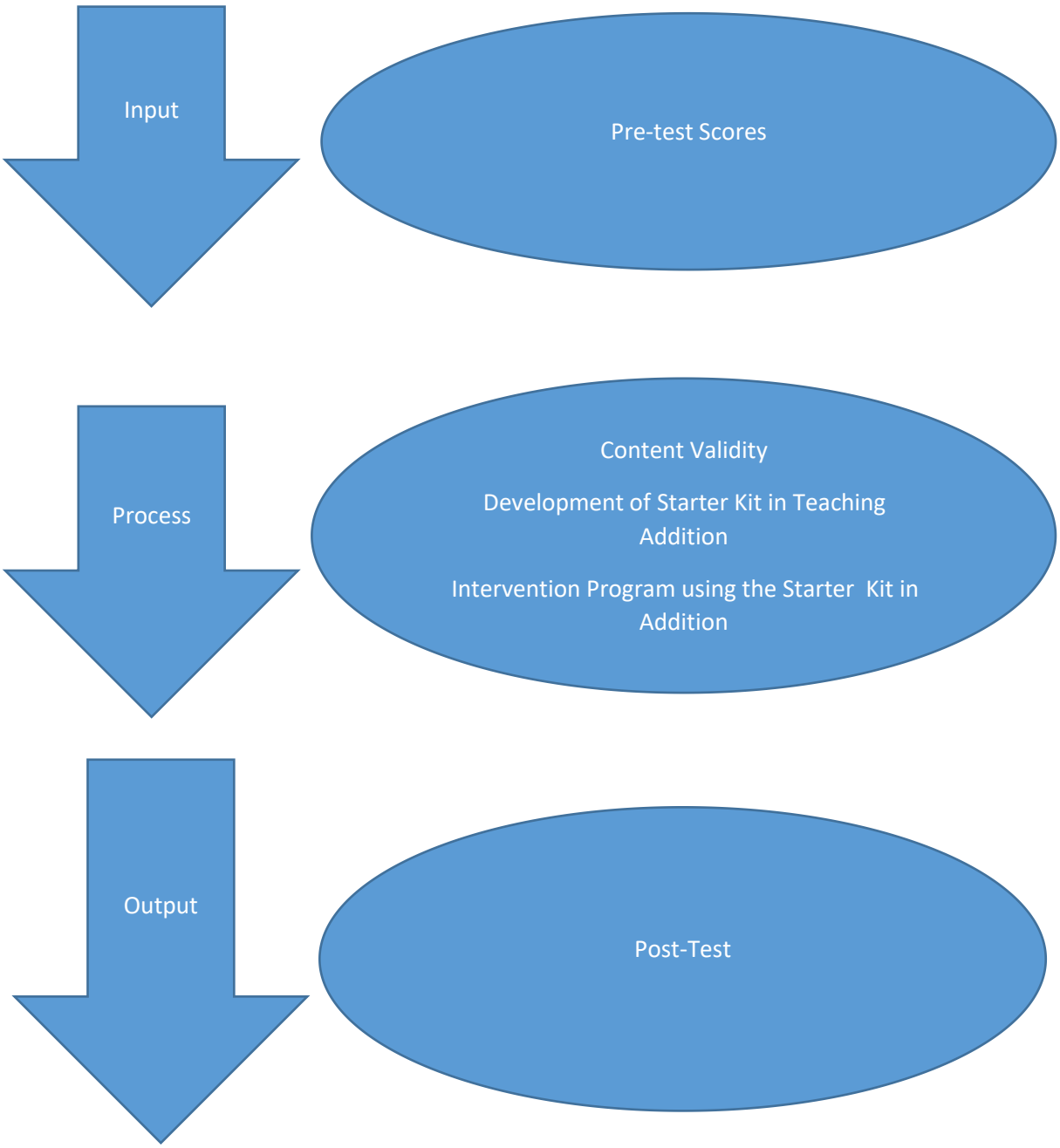


**Figure 1. The Conceptual Framework**

## Research Design

The researcher used descriptive statistics based on factor analysis to analyze the collected data. Factor Analysis is a statistical approach that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions and factors. This statistical approach involves finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions with a minimum loss of information. The technique provided an analysis and an explanation of the opinions and comments of the numeracy teachers who teach mathematics in Koronadal National Comprehensive High School. The main purpose of this study was to evaluate, validate and develop the starter kit in teaching addition on the academic performance of grade 7 special education students with dyscalculia. Factor analysis design was suited for this study because of the structured nature of the questionnaires used. When this design is used, inferences can be used for the study and the researcher sought to obtain information that describes the existing phenomena. I will do this by asking the respondents (numeracy learning support teachers) about their perceptions, opinions and attitudes towards the influence of learning support strategies they used on the academic performance of learners with dyscalculia as far as their training and experience is concerned.

This study employed the quasi-experimental design known as the pre-test and post- test control groups design.

The diagram below presents the quasi-experimental design of the study.

| | *Pre-test* | | *Post-test* |
|---|---|---|---|
| *G1( Experimental)* | O1 | X1 | O2 |
| *G2 (Control)* | O3 | | O4 |

**Figure 2. Research Design**

The following are represented by; G1 refers to the experimental group, G2 refers to the control group, O1 refers to the pretest scores of experimental group, O2 refers to the posttest scores of experimental group, O3 refers to the pretest scores of the control group, 04 refers to the posttest scores of the control group and X1 refers to the use of Starter Kit in experimental group.

Two groups were used in the study. The selection as to what group of students constituted experimental group was done by tossing of coin.

## Research Procedure

There are two groups that involve in this study. The experimental group and the control group were given the pre-test at the start of the study and the post-test at the end of the study. The next part is the Intervention Program where we will employ the Pre-test Post Test Research Design to find out if the Starter Kit is effective in learning Addition on Grade 7 Mathematics.

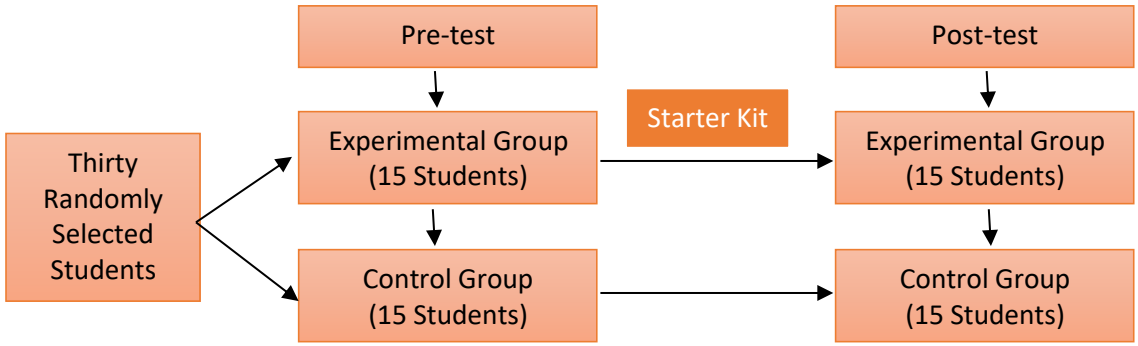


***Figure 3. Schematic diagram representing the various stages of the Pre-test Post Test Research Design***

### *a. Participants and Other Sources of Data and Information*

The study will be conducted at Koronadal National Comprehensive High School since the researcher is teacher of the said school. The respondents of the study are Grade 7 special education students which will be chosen through multi-stage random sampling.

The researchers will identify those students who have low level of performance in addition for the second grading. The researchers will then identify the appropriate respondents for the control and experimental groups.

***b. Data Gathering Procedure***

The researchers will use the Evaluation tool which will be validated by the three experts in the field of Mathematics. Students answer and solution to each problems will be analyzed. After the conduct of the Intervention with the use of Starter Kit, a Post test will be conducted. The result in the Pre-test and Post Test of the control and experimental group will be used to identify significant difference.

The main research instrument in this study was the questionnaire. This instrument was specifically prepared for the numeracy teaching support students in KNCHS. The main purpose of the instrument was to seek the experience, knowledge and skills concerning the influence of the starter kit that they adapt have on the academic performance of learners with dyscalculia.

**VI. Workplan**

The researchers will develop a Starter kit in teaching addition for the purpose of improving students' performance in Grade 7 Mathematics with Dyscalculia. Starter Kit in teaching addition will be used in an intervention program. The Researchers uses the concept of Self-directed learning which is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs and evaluating learning outcomes (Knowles as cited by Bartholomew 2016).

This research will embrace the product and tool research method (Richey and Klein, 2007) or previously known as Type 1 developmental research (Richey, Klein & Nelson 2004). The product for this research is the Starter Kit in Teaching Addition for Grade 7 special education students with dyscalculia which will be conceptualized, designed and developed based on the learning needs of the

students with dyscalculia. The researcher is the main designer and developer of the said starter kit. The development process is illustrated in table 1.

***Table 1. Work Logs of Development Process and Stages***

| Task | Start Date | Days to Complete |
|---|---|---|
| **Submit the intention letter to Conduct** | Wednesday, August 05, 2020 | 2 |
| **Creation of Questionnaire** | Friday, August 06, 2020 | 2 |
| **Content Validity Test** | Monday, August 18, 2020 | 5 |
| **Revision of the Questionnaire** | Monday, September 14, 2020 | 1 |
| **Reliability Test** | Monday, September 21, 2020 | 1 |
| **Finalization of the Questionnaire** | Friday, October 16, 2020 | 1 |
| **Conduct of Pre Test** | Monday, October 19, 2020 | 20 |
| **Compilation of the Starter Kit** | Monday, July 30, 2020 | 5 |
| **Finalization of the Starter Kit** | Monday, November 16, 2020 | 20 |
| **Finalization of the Action Research Paper** | Monday, January 18, 2021 | 15 |
| **Critic Reading of the Final Paper** | Monday, February 22, 2021 | 10 |
| **Revision of the Final Paper** | Friday, March 26, 2021 | 10 |

## VII. Cost Estimates

| Expenses | Budget |
|---|---|
| **Materials for starter kit** | |
| **Paper** | **5,000.00** |
| **Printing** | **4,000.00** |
| **Other Materials** | **1,000.00** |
| **Snacks** | **5,000.00** |
| **Travel Expenses** | **2,000.00** |
| **Statistician** | **500.00** |
| **Professional Reading** | **500.00** |
| **Contingency Fund** | **400.00** |
| **TOTAL** | **18,400.00** |

## VIII. Action Plan/ Proposed Program

| Objectives and Targets | Strategies/ Activities | Time Frame | Person Involved | Expected Output | Remarks |
|---|---|---|---|---|---|
| **To choose the respondents for the intervention program.** | Pre test | Sept 21-22, 2020 | Researcher | List of respondents | complied |
| **To inform the respondents and their parents/guardian regarding the program.** | Construction of Parents permit | Sept 27-28, 2020 | Researcher, Parents, Students | Reply slip, List of respondents | complied |
| **To orient parents and students about the program.** | Parents and respondents meeting | Oct 2, 2019 | Researcher, Parents, Students | Parents Attendance | complied |
| **To improve students' performance in Addition using Starter Kit** | Starter Kit<br>Part 1. Learning Competency<br>Part 2. Discussion<br>Part 3. Illustrative Examples<br>Part 4. Drills and Practice<br>Part 5. Evaluation | Oct. 4-31, 2020 | Researchers and Students | Attendance | complied |
| **To evaluate students' performance after the Intervention.** | Post Test | Feb. 20, 2021 | Researcher and Students | Post Test Scores | complied |
| **To gather students feedback and responses regarding the Starter Kit in teaching Addition.** | Evaluation | Mar.12, 2021 | Researchers and Students | Evaluation Result | complied |

## IX. PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter deals with presentation, analysis and interpretation of the data gathered in this study. The various results are presented in the succeeding tables with corresponding discussions and explanations. It also answers specific problems stated in previous chapter.

**Table 1**

**Difference between the Means of the Pretest Scores of Experimental and Control Group**

| Group | mean | sd | t computed | p- value | Remark | Decision |
|---|---|---|---|---|---|---|
| Experimental | 9.56 | 3.018 | -0.921 | .359 | NS | Accept $H_0$ |
| Control | 10.10 | 2.845 | | | | |

Table 1 shows the difference between means of the pretest scores of experimental and control groups. The results revealed that there was no significant difference between the means of the two groups as evidenced by a t-computed value of -0.921 and a p-value of 0.359. *A p value of less than .05 indicates that there is significant relationship between the said variables.* This implied that the results of the test at the start of the experiment were the same. The students in the experimental and control groups had the same achievement in the pretest.

Wilmot et at (2013) show the tare is a strong evidence that Starter Kit reporting can inspire and engage students when incorporated into student-centered learning activities through: increased student motivation, enhanced learning experience; higher marks; development potential for deeper learning of the subject; development of learner autonomy; enhance team working and communication skills; a source of evidence relating to skills for interviews; learning resources for future cohorts use.

**Table 2**

**Difference between the Means of the Pretest and Posttest Scores of the Control Group**

| Control | mean | sd | t computed | p- value | Remark | Decision |
|---|---|---|---|---|---|---|
| Posttest | 14.14 | 2.399 | **9.999** | **.000** | **S** | **Reject** $H_0$ |
| Pretest | 10.10 | 2.845 | | | | |

It is shown in table 2 that there was significant difference between the mean scores in the pretest and posttest of the control group. This implied that the students performed better in the posttest than in the pretest as evidenced by the t-computed value of 9.999 and a p-value of .000. It was also noted that the mean difference in their scores was more than four points.

Ruedas (2011) in his study about Computer Assisted Instruction in teaching Advanced Algebra, he made a conclusion that comparing to the lecture method, the use of Computer Assisted Instruction was more effective method in improving the student's performance in Advanced Algebra. In his study, the control group which was taught with the traditional lecture method only obtains a mean gain score of6.83 points, much lower than the mean gain score of the experimental group which was taught wit CAI which is 15.97. This yields mean difference of 9.14 points.

**Table 3**

**Difference between the Means of the Pretest and Posttest Scores of the Experimental Group**

| Experimental | mean | Sd | t computed | p- value | Remark | Decision |
|---|---|---|---|---|---|---|
| Posttest | 15.06 | 2.874 | **12.317** | **.000** | **S** | **Reject** $H_0$ |
| Pretest | 9.56 | 3.018 | | | | |

It can be seen in table 3 that there was a difference between the means of the pretest scores and posttest scores of the experimental group. This was supported by a t-computed value of 12.317 and a p-value of .000. The result revealed that the achievement level of the students after the experiment was better than their achievement level before the experiment. An increase of about six points in the mean score of the posttest was noted. This further implied that the use of the starter kit to students' achievement level in teaching addition was effective.

The authors indicated that traditional learning methods rely on reading and writing, so difficulties with these skills often hinder content instruction. Although research in the content areas examining the efficacy of using mobile devices and apps is only emerging (Nordness, Haverkost, & Volberding, 2011), it does provide evidence that these technologies can help students with disabilities and other learners who are at risk of learning failure in the content areas (Rappolt-Schlichtman et al., 2013; Twyman & Tindal, 2006)

**Table 4**

**Difference between the Mean Gain Scores of the Experimental and the Control Group**

| Group | mean | sd | t computed | p- value | Remark | Decision |
|---|---|---|---|---|---|---|
| Experimental | 5.50 | 3.157 | **2.425** | **.017** | **S** | **Reject** $H_0$ |
| Control | 4.04 | 2.857 | | | | |

It was noted that there was a significant difference between the mean gain scores of the experimental and the control groups as evidenced by a t-computed

value of 2.425 with a p-value of .017. This revealed that the use of starter kit in teaching addition was better than the usual method in teaching addition. The students achieved better when they were exposed to the starter kit. Giving the students the starter kit in addition would facilitate their learning and so they would achieve better.

Interactive Videos is thus found to be an effective strategy in enhancing the performance of dyscalculic children. With proper guidance given by the teachers, dyscalculic can be made to do arithmetic calculations in correct ways. In addition, these disabled students need a great deal of structured practice and immediate corrective feedback to develop their numerical skills. This type of instruction canhelp such children to overcome their learning problems and attain tangible improvement in mathematical abilities.

## X. SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

### Summary

This study aimed to find out the effect of comic strips to students achievement level in Addition.

Specifically, it attempted to answer the following questions:

1. What is the Mean Percentage in Addition in the Pre-test?

.2. Is there a significant difference in the pretest scores of the control and experimental group?

3. Is there a significant difference in the pretest and posttest scores of the control group?

4. Is there a significant difference in the pretest and posttest scores of the experimental group?

5. Is there a significant difference in the mean gain scores of the experimental group and control group?

The respondents of the study were the thirty (30) special education students officially enrolled at Koronadal National Comprehensive High School, Koronadal City, South Cotabato School Year 2020 - 2021.

## Findings

The following were the results of the study:

1. These two groups of students had no different scores at the start of the experiment and the groups are homogenous as shown by the standard deviation of the scores in the experimental and control groups. There scores were not significantly different.

2. There was no significant difference between the means of the pretests of the experimental and control groups as evidenced by a t-computed value of -0.921 and a p-value of 0.359.

3. There was a significant difference between the mean scores in the pretest and posttest of the control group as supported by the t-computed value of 9.999 and a p-value of .000.

4. There was a difference between the means of the pretest scores and posttest scores of the experimental group as attested by a t-computed value of 12.317 and a p-value of .000. The result revealed that the achievement level of the students after the experiment was better than their achievement level before the experiment.

5. There was a significant difference between the mean gain scores of the experimental and the control groups as evidenced by a t-computed value of 2.425 with a p-value of .017.

.

**Conclusions:**

Based on the findings, the following are the conclusions:

1. There was no significant difference between the mean of the pretests of the experimental and control groups at the start of the experiment.

2. There was a significant difference between the means of the pretest scores and posttest scores of the control group.

3. There was a significant difference between the mean scores in the pretest and posttest of the experimental group.

4. There was a significant difference between the mean gain scores of the experimental and the control groups. The use of comic strips by teachers in teaching geometry was better than the usual method of teaching geometry.

## Recommendations

The following recommendations were made based on the findings of the study:

1. The students should be given enough examples and applications for them to increase their scores in the posttest.
2. Starter Kit should be used in every addition class because it helped the students remember the concepts easily compared to the traditional method.
3. The Starter Kit used in teaching addition should be in line with the topics that would be given in the lectures.
4. The Starter kit should have direct applications in real life situations.
5. The teachers integrate multiple forms of media which includes text, graphics, audio and video into lectures in teaching special education students with dyscalculia as teaching strategies that would fit the students' learning styles.
6. This help special education students in attaining learning needs especially in mathematics for them to be able to solve and understand mathematical symbols in a more different way of learning with the use of Starter Kit Materials.
7. Replication of this study is highly recommended using other methods such as computer aided instruction and practical work approach with experimental design

## XI. List of References


Ainley P (2001) From a National System Locally Administered to a National System Nationally Administered: The New Leviathan in Education and Training in England, Journal of Social Policy; 30, 457-476, Cambridge University Press.

Amanda K. (2009):Co-occurrence of Learning Disabilities, Dyscalculia talks 57. American Psychiatric Association (1994). Diagnostic and statistical manual of mental disorders (4th edition). Washington, DC:

American Psychiatric Association. Ashcraft, M. H., Yamashita, T. S., & Aram, D.M. (1992). Mathematics Performance in Left and Right Brain-lesioned Pupils and Adolescents. Brain and Cognition, 19, 208-252.

Attwood T (2002) Methods of Teaching Mathematics to Pupils with Dyscalculia. Baddeley, A. D., Lewis, V., & Vallar, G. (1984). Exploring the articulatory loop. Journal of Experimental Psychology, 36A, 233-252.

Badian, N. A (1983). Arithmetic and Nonverbal Learning: Progress in Learning Disabilities Vol. 5, 235-264, New York; Grune and Stratton. Behrmann, M., Schaff, J. (2001). "Assisting educators with assistive technology: Enabling children to achieve independence in living and learning". Children and Families 42 (3): 24-8. Bell, F H (1978): Teaching and Learning Mathematics in Secondary Schools.

Bird R (2007): The Dyscalculia Toolkit, Paul Chapman Publishing, London. Bisanz, J. (1999a). The development of mathematical cognition: Arithmetic. Journal of Experimental Child Psychology, 74, 153-156.

Borg, W.R & Gall, M.D. (1989) Educational Research: An Introduction. 5lh Edition Bruce P. (1991) Diagnosing Learning Disorders Bullerworth B (1999): The Mathematical Brain (Macmillan, London).

Butterworth B (2005): Handbook of Mathematical Cognition (Psychology Press, Move, UK). Butterworth, B (2003) Dyscalculia Screener:

Highlighting Children with Specific Learning Difficulties in Mathematics, London: InferNelson.

Butterworth, B., Girelli, L., Zorzi, M. & Jonckheere, A.R. (2001). Organisation of Addition u Facts in Memory. Quarterly Journal of Experimental Psychology, 54A, 1005-1029. Byrnes, J. (1996). Cognitive development and learning in instructional contexts.

Boston: Allyn and Bacon. Cappelletti, M., Butterworth, B., & Kopelman, M. D. (2001). Spared numerical abilities in a case of semantic dementia. Neuropsychologia, 39, 1224-1239. Centre For Teaching and Learning Mathematics 1986. (CTLM)

Chinn. S., (2004): The Trouble with Mathematics, London. Concroft Report (1982): The Committee of Inquiry into the Teaching of Mathematics in Schools, Mathematics counts: London: IIMSO

Cook, A., Hussey, S. (2002). Assistive Technologies — Principles and Practice (2nd ed.). MosbySchlosser, R. W.; Wendt, O. (2008). "Effects of augmentative and alternative communication intervention on speech production in children with autism: a systematic review". American Journal of Speech-Language Pathology 17 (3): 212-230.

Dehaene S, Piazza M, Pinel P, Cohen L (2003): Cognition Neuropsychology 20, 487.

Dehaene, S., Dehaene- Lambertz, G., & Cohen, L. (1998). Abstract representations of numbers in the animal and human brain. Trends in Neurosciences, 21, 355-361.

Department for Education and Skills, (2001) Guidance to Support Pupils with Dyslexia and Dyscalculia. London Press. Disability Discrimination Act, UK 1995.

Dowker A. (2009): What works for children with mathematical difficulties? The Effectiveness of Intervention. (Department for Children, Schools and Families, UK 174504). 67'

Dowker, A (2003) Interventions in Numeracy: Individualised Approaches in Thompson, Enhancing primary mathematics Teaching, Open University Press.

Favvcett, A. J. & Nicolson, R.I. (1994). Naming Speed in Pupils with Dyslexia. Journal of Learning Disabilities, 27, 641-646.Field 2005: Discovering Statistics using SPSS; Sage publication, California.

Fuson K (1988): Children's Counting and Concepts of Numbers (Springer Verlag, New York).

Gardner H 1983 Frames of mind: The theory of multiple intelligences. New York: Basic Books. Geary, D. C (1993). Mathematical disabilities: Cognition, neuropsychological and genetic components. Psychological Bulletin, 114, 345-362.

Geary, D. C., & Hoard, M .K. (2001). Numerical and Arithmetical Deficits in Learning-Disabled Children: Relation to Dyscalculia and Dyslexia. Aphasiology, 15, 635-647.

Geary, D. C., Hoard, M. K., & Hamson, C.O (1999). Numerical and Arithmetical cognition. Patterns of functions and deficits in children at risk for a mathematical disability. Journal of Experimental Child Psychology, 74, 213-239.

Geary, D.C. Thomas B and Yao, Y. (1992). Counting Knowledge and Skill in Cognitive Addition: A Comparison of Normal and Mathematically Disabled Pupils. Journal of Experimental Pupil Psychology, 54, 372-391.

Ginsburg, H. P (1997). Mathematics Learning Disabilities: A view from developmental psychology. Journal of Learning Disabilities, 30, 20-33.

Gross J, C. Hudson, D. Price: The Long Term Costs of Numeracy Difficulties (Every Child a Chance Trust and KPMG, London, 2009).

Gross- Tsur V, O. Manor, R.S. Shalev (1996): Developmental Medicine Child Neurology, 38 Jane E (2009): Number Sense and its Relevance to

Dyscalculia, Dyscalculia talks 32. Jane E (2010): The Dyscalculia Assessment 68'

Jennipher W (2005) Journal for Lynchburg city schools Virginia USA, 2005. Jensen, A. (1998). The 'g' factor and the design of education. Intelligence, instruction, and assessment: Theory into practice. R. J. Sternberg and W. M. Williams. Mahwah, NJ: Lawrence Erlbaum, 111-132. Jordan, N., Hanich, L. B.,

Kaplan, D., &Dick, J. (2001). Performance across different areas of mathematical cognition in children with learning difficulties. Journal of Educational Psychology, 93, 615-626.

Karugu. G (1999) What is Special Education? Paper presented at the meeting of the National Conference on Disability, Human Rights and Development, Mombasa Kenya.

Kay. J. & Yeo , D (2003) Dyslexia and Mathematics: David Fulton. Kenyon R, Ed.D (2003) Facts and Statistics on Learning Disabilities and Literacy: Bridges to Practice, London Press.

Landerl K, Bevan A, Butterworth B (2004), Cognition 93, 99. Laurilland D (2011) Centre for Educational Neuroscience and London Knowledge Laboratory: Institute of Education, University of London, London WCIN 3 QS, UK.

Lewis, C., Mitch, G., & Walker, P. (1994). The prevalence of specific arithmetic difficulties and specific reading difficulties in nine and ten year old boys and girls. Journal of Child Psychology and Psychiatry, 35, 283-292.

Lowa: W.M.C Brown Company Limited Michelle, S., (ed) (1995) Teaching Mathematics: New York; Routledge Nancy. K. & Daniel P. Morgan (1991): Resource Room Teachers' use of Strategies that Promote the Success of Handicapped Students in Regular Classrooms. Journal of Special Education, Jan 1991; volume 25: 221-235.

National Dissemination Centre for Children with Disabilities, 2007. National Research Center on Learning disabilities UK 2010 (NRCLD). 69' National Research Centre on Learning Disabilities (2007): Seessional paper, Response to Intervention.

Ndurumo, M. W (1993) Exceptional Children Nairobi, Longman Publishers. New York: Longman.

OECD (2010), the High Cost of Low Educational Performance: The Long-Run Economic Impact of Improving Educational Outcomes (OECD, Paris).

Oluocli, G.P (2002) Essentials of Curriculum Development Nairobi, Birds Printers. Republic of Kenya (2010) Kenya Certificate of Secondary Education Report -2010, Nairobi; KNEC.

Rourke, B. P. (1989). Nonverbal Learning Disabilities: The Syndrome and the Model. New York: Guilford Press.

Rourke, B. P. (1993) Arithmetic Disabilities, Specific and Otherwise: A neuropsychological perspective. Journal of Learning Disabilities, 26, 214-226.

Savage, M.D. & Ilawkes, T (2000) Measuring the Mathematics Problem, The engineering Council, London.

Scherer, M. J. (2004). Connecting to Learn: Educational and Assistive Technology for People with Disabilities. Washington, DC: American Psychological Association (APA) Books.

Shalev R S (2007): Why is Mathematics so Hard for some Children? The Nature and Origins of Mathematical Learning Difficulties and Disabilities: H. Brookes Publishing, Baltimore, MD, 2007.

Shalev, R. S., & Gross-Tsur, V. (1993). Developmental dyscalculia and medical assessment. Journal of Learning Disabilities, 26, 134-137.

Siegel, L. S & Ryan, E. B. (1989). The development of working memory in normally achieving and subtypes of learning disabled children. Child

Development, 60, 973-980. Special Education Disability Act, UK 2001. 70'

Sternberg, R. J., & Grigorenko, E. L. (1999): Our Labeled Children: What every Parent and Teacher needs to know about Learning Disabilities. Reading, MA:

Perseus Publishing Group Temple, C. (1991). Procedural dyscalculia and number fact dyscalculia: Double dissociation in developmental dyscalculia. Cognitive Neuropsychology, 8, 155-176.

Thurman E., Vollmer H & Pieper I (2010), Language of Schooling: Focusing on vulnerable learners; Journal on the right of learners to quality and equity in Education, Geneva, Switzerland.

Varma S (2011) Department of Educational Psychology, University of Minnesota, Minneapolis, MN55455, USA.

Visser J. (1993). Differentiation, Making it Work. National Association for Special Needs, NASEN 1993. Warrington, E. K., Cipolotti, L., & Bulterworth, B. (1996). Short-term Memory Impairments and Arithmetical Ability. Quarterly Journal of Experimental Psychology, 49A, 251-262.

Watt T T (2003) Are Small Schools and Private Schools better for Adolescents' Emotional Adjustment? American Sociological Association, Volume 76. 344-367.