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Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Errors and Misconceptions on Problem Solving Among Grade 7 Students: Basis for an Instructional Intervention Plan

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Received: 20 June 2024 **Revised**: 21 July 2024 **Accepted**: 22 July 2024

Available Online: 24 July 2024

Volume III (2024), Issue 3, P-ISSN – 2984-7567; E-ISSN - 2945-3577

Abstract

Aim: This study aimed to design an instructional intervention plan through analyzing the common errors and skills of Grade 7 students in solving problems.

Methodology: This research used descriptive-developmental design to analyze the error committed in solving problem. Also, the level of problem-solving skills and common errors in problem-solving were assessed using one hundred fourteen (114) Grade 7 students in one National High School in the Philippines. The researcher utilized cluster sampling technique in choosing the respondents of this study. In error analysis, the researcher analyzed students' solving process to a 10-items worded problem in algebra focused on the least-mastered competencies for the second quarter in Most Essential Learning Competencies under DepEd MATATAG K to 10 Curriculum. The result of the 10-items worded problems were organized and classified based on the adapted-modified rubrics for scoring student level in problem solving provided by the NEA framework and to assessed the level of performance in problem solving among Grade 7 students.

Results: Majority of the students in the face-to-face learning modality had fair problem solving skill (38%; 43 respondents). Students with fair problem solving skills mean that these students demonstrate competency in solving problems but lack depth in understanding. It was found out that majority of the respondents encountered difficulties and committed multiple errors simultaneously. From the interviews of learners who had low problem solving skills, it was also found out that errors committed on certain stage of problem solving were caused by lack of understanding of concepts and terminologies used, carelessness, negligence, poor retention, and poor mastery.

Conclusion: Most students in the face-to-face learning modality had fair problem solving skills. Lack of understanding of terminologies used, carelessness, negligence, poor retention, and poor mastery caused learners to commit errors in solving Algebra word problems. Based from the errors committed by the students, the Instructional Intervention Plan was proposed. The instructional intervention plan includes the following objectives: deepen understanding of terminologies, word problems and process of problem solving; improve recall of symbols, formula, and steps in solving word problems by actively attending to the information; and mastery of problem solving must be strengthen. The plan also included the following strategies: Terminology Matching Game, M4th Pics 1 Word, Error Correction Stations, Project 4F's and Error Reflection Journal In terms of involvement, the plan only includes the teacher and the learner himself. The resources include instructional materials such as slide presentations, activity sheets, and reflective journals.

Keywords: *Newman Error Analysis, Problem Solving Skills, Instructional Intervention Plan*

INTRODUCTION

The Department of Education (DepEd) issued the Implementing Guidelines on the School Calendar and Activities for the School Year (SY) 2023 – 2024 to enable schools and community learning centers (CLCs) to implement school activities and maximize instructional time in cognizance of the goals and objectives of the DepEd MATATAG Agenda effectively and efficiently (DepEd Order No. 22, s. 2023).

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According to the Legislative Research Service on Second Regular Session, 19th congress, in recent years, there were claims that Filipino learners have displayed notably weak performance in various assessments, highlighting concerns regarding the effectiveness of the K to 12 programs. Identified issues include an overloaded curriculum, excessive teaching demands within constrained time frames, and an overwhelming academic load for educators and students, which hindered the mastery of fundamental skills like reading and simple math. In response, the MATATAG Curriculum, also known as "Bansang Makabata, Batang Makabansa," was introduced on January 30, 2023, under the leadership of Vice President and former Education Secretary Sara Z. Duterte. Aiming to address educational challenges, this initiative seeks to prioritize the mastery of literacy and numeracy skills among learners. It was initially rolled out in 35 schools across seven regions: Ilocos, Cagayan Valley, Central Visayas, Soccsksargen, CAR, Caraga, and NCR.

Furthermore, the MATATAG Curriculum aims to reduce the number of competencies and focus more on developing foundational skills - literacy, numeracy, and socio-emotional skills of Kindergarten to Grade 3 learners, thus decongesting the present K to 12 curriculums. The MATATAG or K to 10 curriculums, which will emphasize five important skills: language, reading and literacy, mathematics, makabansa, and good manners and right conduct, will be implemented in the following phases: SY 2024-2025 – Kindergarten, Grades 1, 4, and 7; SY 2025-2026 – Grades 2, 5, and 8; SY 2026-2027 – Grades 3, 6, and 9;
and SY 2027-2028 – Grade 10.

Moreover, the main goal of the curriculum is for Filipino learners to become mathematically proficient and critical problem solvers. Developing mathematical proficiency among learners involves the development of confidence and competence in different aspects of mathematics. It includes becoming increasingly aware of the value and usefulness of mathematics (MATATAG –Mathematics Curriculum Guide Grade 1, 4 and 7). In addition, According to Polya (1981), problem-solving is "finding a way out of a difficulty, a way around an obstacle, attaining an aim which was not immediately attainable." Further, the National Council of Teachers of Mathematics (NCTM) (2000) asserted that "solving problems is not only a goal of learning mathematics but also a major means of doing so."

In mathematics education, problem-solving has been considered as a goal, as a process, and as a basic skill. The processes involved in solving mathematical problems, recognizing and understanding a problem, modeling the problem through different representations, planning a solution, executing the solution, and finally checking whether the problem has been solved demonstrate that problem-solving is a very important life skill for 21st-century citizens to possess (MATATAG –Mathematics Curriculum Guide Grade 1, 4 and 7).

Problem-solving skills are one of the primary goals of mathematics education in the K – 12 curriculum, but they are always among the least mastered competencies among secondary learners. Also, it received broad public interest as an important competency prescribed by the Department of Education. With this, it is within expectations that each nation started emphasizing problem-solving as a core domain in high school subjects, particularly Mathematics (Del Valle, 2022).

Problem-solving is also an essential skill in everyday life and a fundamental component of mathematics education. The ability to solve problems involves identifying the problem, analyzing it, determining the appropriate strategies, and executing those strategies to find a solution. In addition, problem- solving is the basis of mathematics learning. Problem-solving teaches people to clarify an issue coherently to avoid misunderstanding information. Sometimes, problem-solving mistakes may occur due to misunderstanding the issue, choosing a wrong concept or misapplying the concept (Chusnul et al., 2017). Certainly, research has shown students often struggle with problem-solving, especially in mathematics, due to various errors and misconceptions. For example, failing to read the question correctly, making a carelessness or mathematical error (Sikurajapathi et al., 2020).

In addition, according to Del Valle (2022), failure to solve problems mathematically may or may not result from a poor understanding of the underlying mathematical concepts. Students may fail to solve problems because they misunderstand the underlying mathematical concepts or fail despite their good conceptual understanding of the necessary mathematical concepts. Besides, it is necessary to identify the conceptual areas in which most students make errors or construct incorrect generalizations, their causes, and how to rectify or correct them (Abenojar, 2024; Mohyuddin & Khalil, 2016).

Thus, the researcher identified the causes of these errors and misconceptions about solving Grade 7 students and designed an instructional intervention plan to help struggling learners answer problem-solving aligned with the K to 10 Curriculum.

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Objectives

This study aimed to analyze the errors of Grade 7 students in Solving Worded Problems in Algebra and then design an Instructional Intervention Plan that caters to students' difficulties and challenges.

Specifically, it sought to answer the following questions:

1. What is the level of problem solving skills of Grade 7 learners in the school year 2023-2024?
2. What are the common errors of the students in solving worded problems in Algebra in terms of:
   2.1. reading;
   2.2. comprehension;
   2.3. transformation;
   2.4. processing skill; and
   2.5. encoding?
3. What instructional intervention plan can be designed to align with DepEd Matatag K to 10 Curriculum to address errors and misconceptions in problem-solving among grade 7 students?

METHODS

Research Design

This research used descriptive developmental design to analyze the error committed in solving problem.

Population and Sampling

This study was conducted in one National High School in the Philippines with one hundred fourteen (114) Grade 7 students as respondents of the school year 2023-2024. Cluster sampling technique was employed in the study.

Instrument

In assessing the problem-solving skill of the learners, the adapted-modified guidelines for scoring rubrics provided in the NEA framework was used. Also, it followed the generally accepted test construction through the preparation of the table of specification (TOS) focused on the least-learned competencies in the second quarter. Then, the researcher-made 10-items problem solving in algebra were checked and validated by seven (7) experts from different schools. After the validation, it was given to the respondents and retrieved personally.

Data Collection

This study was distributed into two phases. Phase 1 collected, analyzed and evaluated quantitative data to determine the level of problem-solving skills of the learners. It includes the collection of outputs from the learners and the analysis and evaluation of the collected outputs through the guidelines provided by the NEA framework. Phase 2 involved planning, preparing and designing of instructional intervention plan. It was identified the causes of errors in solving word problems of the participants that took into consideration in the preparation of the instructional intervention material.

Treatment of Data

In this study, to determine the level of performance in problem solving, frequency count and percentage were utilized using the participants' scores that were obtained based on the guidelines provided in the NEA framework. The same treatment was used to determine the errors of the learners.

Ethical Considerations

In order to protect the well being and interests of all individuals and organizations involved in this study, the researcher has consistently complied with all Ethical Research Protocol.

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RESULTS and DISCUSSION

Table 1
Frequency and Percentage Analysis of Student's Problem-Solving Skills

Score	Reading		Comprehension		Transformation		Processing		Encoding		Overall		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
3	13	11	35	31	26	23	17	15	15	13	21	18	Excellent
2	38	33	15	13	18	16	13	11	13	11	20	18	Satisfactory
1	34	30	36	32	41	36	53	46	51	45	43	38	Fair
0	29	25	28	25	29	25	31	27	35	31	30	26	Poor
Total	114	100	114	100	114	100	114	100	114	100	114	100	

Table 1 shows the level of problem-solving skills of the respondents in each stage as of reading, comprehension, transformation, processing and encoding skills. It could be gleaned from the table that majority of the students in the face-to-face learning modality had fair problem-solving skill (38%; 43 respondents). Students with fair problem-solving skills often demonstrate a moderate level of proficiency in identifying problems, analyzing situations, and creating possible solutions. Rahman et al. (2022) explained that in solving mathematical problems, mathematical proficiency is essential because students learn to choose and use the right strategy in solving problems based on understanding the concepts and formulas in mathematics that are appropriate for the problem situation, explaining the chosen strategy logically, and having a positive view that supports it. However, students may struggle with applying appropriate strategies to solve difficult or unfamiliar problems. Their approach may rely more on trial and error rather than systematic problem-solving methods. Proving from Rahman et al. (2022), students mostly had trial and error strategies but cannot provide the correct conclusions and cannot explain the reasons for selecting strategies logically.

Moreover, most of the students had different types of errors while solving the 10-item worded problems. According to Tong and Loc (2017), learners' errors in solving mathematical problems are caused by many different reasons such as carelessness, subjectivity, wrong application of the calculation rules, incorrect identification of problem kinds, and inaccurate calculation.

In particular, several researchers proved the importance of error analysis in teaching and learning. For better learning outcomes, describing and defending answers for correctly and incorrectly done instances is preferable to just correctly worked examples (Grobe & Renkl, 2017). Additionally, they discovered that explaining why an exercise is correct and incorrect promoted learning transfer and produced better learning results than providing only correct solutions.

Lastly, the researcher analyzed the different kinds of errors made by the students through their solutions. They may design an instructional intervention plan for students with fair problem-solving skills. They may benefit from targeted interventions or training programs to enhance their critical thinking abilities and problem-solving strategies. According to DepEd Order No. 35, s. 2016, the designing of the instructional plan includes six major components (learning targets, strategies/activities, persons involved, resources, time frame, and success indicator) focuses on using strategies and activities to address the causes of errors identified in the study. Thus, learners may focus on targeting their errors to improve problem-solving skills.

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Table 2
Frequency and Percentage Analysis of Student's Reading Error

READING ERROR	Overall	
	f	%
Read the mathematical symbols or operation incorrect	8	7
Read the mathematical symbols or operation incomplete	11	10
Did not answer	7	6
Total	26	23

Reading error is when students make mistakes in reading important words in the question or are wrong in reading the main information, so they could not use the information to solve the problem according to Del Valle (2022), as cited in Fitriani et al. (2018). In this study, reading error is committed when an individual cannot read the mathematical symbols or operations provided in the problem.

Table 2 shows the frequency and percentage analysis of the respondents' reading error. It can be seen that three cases of reading error found: read the mathematical symbols or operation incorrect, read the mathematical symbols or operation incomplete and did not have an answer.

Reading stage is assessed in Newman framework as the ability to read and identify information (Del Valle, 2022). In written outputs, both can only be assessed by the same criteria. Based on the reading error, it could be gleaned from the table that most students read the mathematical symbols or operation incompletely (10%; 11 respondents). The teachers asked the students to read the problem and give a follow up question: What mathematical symbols or operations presented in the problem? Most students can read the given problem but cannot identify the mathematical symbols or operations presented in each problem. For learners to improve their reading comprehension, an understanding of the mathematical text is to be expected. According to Fuentes (2018), reiterated that good solvers use operational webs they construct in their mind while forming meaning, and thus they can relate the events in the problem text and follow the flow of events thoroughly.

Table 3
Frequency and Percentage Analysis of Students' Comprehension Skill Errors

COMPREHENSION ERROR	Overall	
	f	%
Cannot determine what is asked in the problem	15	13
Copied the exact questions	10	9
Did not answer	9	8

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Total	34	30

The table above shows the frequency and percentage analysis of comprehension errors committed by the respondents. Three (3) kinds of comprehension errors were identified. It includes not determining what is asked in the problem, copying the exact questions, and not answering.

Based on the comprehension error, it could be gleaned from the table that most students cannot determine what is asked in the problem (13%; 10 respondents). The teachers asked the students to read the problem and give a follow up question: *Determine what is asked in the problem?*

According to Simbulas et al. (2015), a significant relationship existed between comprehension and learners' problem-solving skills. In addition, Timario (2020) says that comprehension is a predictor of problem-solving skill. It can be said that learners' lack of understanding of terminologies, the actual word problem, as well as the process of problem-solving must be addressed properly to avoid committing errors which will eventually improve problem-solving skill of learners.

Table 4
Frequency and Percentage Analysis of Student's Transformation Error

TRANSFORMATION ERROR	Overall	
	f	%
Mixed up the variable	19	17
Wrong equations	21	18
Did not answer	15	13
Total	55	48

In the transformation stage, learners were expected to represent all the given variables required in the problem and formulate the mathematical equation or inequality to be used. There were three transformation error detected on the students solutions. These are follows: mixed up the variable, wrong equations, and did not answer. Based on transformation error, it could be gleaned from the table that most students cannot commit wrong equations (18%; 21 respondents). The study conducted by Pongsakdi (2020) supported this, which states that learners who write the mathematical equation and inequality directly without making sense of the problem and without forming a relationship between what is given and what is asked and who use the problem. Also, according to Travis (2015) who focused on the translation aspect of the solution of word problems, recommended ways to correct transformation error.

Table 5
Frequency and Percentage Analysis of Students' Processing Skill Errors

PROCESSING ERROR	Overall	
	f	%

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Solution were incomplete	11	10
Rounding off were incorrect	10	9
Solution were incorrect	12	11
Did not answer	8	7
Total	41	36

Percentage analysis of processing errors made is shown in table 5. In the processing stage, it refers to the student's written computation or solution. Students in this level could not use a particular procedure in a solution. In terms of Processing, it could be seen from the table that majority of the students solution were incorrect (11%; 12 respondents). Processing errors caused by poor mastery and insufficient recall can be addressed by error targeting and correcting and explicit instruction.

According to Ashlock (2016), if learners are to gain computational fluency, they need to learn different computation methods to use in varied problem-solving situations. Another supported study from 12% of the respondents had committed this kind of error. It can be said that although the learner knows what to do, they tend to forget or had difficulties remembering the procedure in solving the problem. This finding is supported by Ruzlan et al. (2013) who claimed that the causes of errors are confusion. This finding supported by Ruzlan et al. (2013) who claimed that the causes of errors are confusion, insufficient time, anxiety, forgetting the procedures, carelessness, and difficulty of questions. There is poor retention since learner has difficulty retrieving the information. Confusion and forgetting the procedures can be attributed to poor retention of the topic. There were 4 different kinds of mistake made in the processing stage of solving word problems.

Table 6
Frequency and Percentage Analysis of Students' Encoding Errors

ENCODING ERROR	Overall	
	F	%
No conclusion	13	11
Copied the same question	14	13
Encode conclusion incorrectly	17	15
Did not answer	15	13
Total	59	52

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Encoding is writing and presenting the final answer completely and accurately. This involved a proper concluding statement that details the final answer. It was found to be the most common mistake copied the same question. Table 6 illustrates the frequency and percentage analysis of errors made by the respondents in the encoding stage. In this study, four kinds of encoding errors were gathered from the respondents. These were follows: no conclusion, encode conclusion incorrectly, copied the same questions and did not answer.

In terms of Encoding, it shows from the table that majority of the students encode conclusion incorrectly (15%; 17 respondents). Some of the students' answer shows that the solutions are correct procedurally, but in the final answer, rounding off to the nearest hundredths will make the value incorrect. Through interview from student #54, he was rushing to answer the given question because it has time allotted in every problem that made confused in rounding off. Instead of 2.66, he simply copied the 2 digits in decimal places. 15% of the students had committed this type of error. This finding is also supported by Ruzlan et al. (2013) who claimed that the causes of errors are confusion, insufficient time, anxiety, forgetting the procedures, carelessness, and difficulty of questions.

Instructional Intervention Plan

The results of the analysis enabled the researcher to gain an in-depth understanding of the errors encountered by learners in solving word problems as well as the causes of these errors. It was found out that learners committed errors in each stage of problem solving and committed multiple errors at the same time. From the interviews of learners with low problem skills and the most errors, it was also found out that errors committed on certain stage of problem solving were caused by lack of understanding, carelessness, negligence, poor retention, and poor mastery. An intervention plan was proposed in the study to improve the problem-solving skills of Grade 7 learners in the face-to-face learning modalities. The designing of the instructional plan included six major components (learning targets, strategies/activities, persons involved, resources, time frame, and success indicator) that were identified in an action plan prescribed by DepEd Order No. 35, s.2016. It focused on the use of strategies and activities to address the causes of errors identified in this study as follows:

A. Learning Objectives/Targets

To address the causes of the errors, this study proposes for the following objectives to be targeted:

Deepen understanding of terminologies, word problems and process of problem solving. According to Simbulas, Regidor and Catulpos (2015), there existed significant relationship between comprehension and problem-solving skills of learners. It was supported by Timario (2020), saying that comprehension is indeed a predictor of problem-solving skill. It can be said that learners' lack of understanding of terminologies, the actual word problem, and the process of problem solving must be addressed properly to avoid committing errors which will eventually improve their problem-solving skills.

Improve recall of symbols, formula, and steps in solving word problems by actively attending to the information. Strong memory retention means that a learner can easily put knowledge to use without overloading memory, since background knowledge will be readily available. This allows the individual with more cognitive scope to think creatively, critically, or analytically in solving word problems, thus avoiding deliberate disregard for important information and unintentional errors.

Mastery of problem solving must be strengthened. The goal of learning is not only to easily remember a skill but also to easily apply that skill. In problem solving, the whole process requires mastery. Thus, strengthening the learners' mastery in problem solving is vital.

B. Strategies/Activities

Terminology Matching Game is a game provided with DIY cards with a set of terminology related to problem-solving including terms like "sum," "product," "difference," "quotient," "at least" etc. This game is not only helps students deepen their understanding of terminologies in problem-solving but also encourages collaborative learning and discussions.

M4TH PICS 1 WORD is a game adapted from Four Pics One Word application but limited to mathematical concepts, symbols or operations. It develops comprehension skills and enhances learning efficiency. The teacher will flash a game through power point presentation. Four (4) pictures and scrambled letters will be flashed on the screen as your hints to identify the word being asked in a span of 15 seconds. Each group will be given an illustration board and

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chalk to write the answers. In every correct answer, there will be additional two (2) points. After each round, the teacher will facilitate a discussion to review the pictures and clarify any misconceptions.

Error Correction Stations develops critical thinking skills. The teacher will set up the stations around the classroom, each with a different algebraic problem posted. Students rotate through the stations, identify errors, and the facilitator will correct them before moving to the next station.

PROJECT 4F'S (FOUR FUNDAMENTAL OPERATIONS)
The teacher will provide five (5) items equation including four fundamental operation addition, subtraction, multiplication and division. Five volunteer students will solve in front of the class. Afterwards, they will discuss it by applying real life scenario. This activity aims to master the four fundamental operations, to increase the mathematical and numeracy skills, to enhance students' understanding of mathematical concepts and engagement in class activities and to apply four fundamental operations in real life scenario.

Error Reflection Journals
The students make error reflection journals where they document the errors they encounter while solving algebraic problems along with explanations of why they think the errors occurred and how they can avoid them in the future. Individual reflection is self-monitoring. Familiarity to one's encounters and solutions made will greatly improve one's learning avoiding carelessness while increasing mastery of the skills.

C. Persons Involved
In this study, Newman's Error Analysis Framework focused on identifying learners' individual errors thus this study proposes limited involvement, only including the teacher and the learner himself. The teacher focuses on constructing meaningful educational experiences for the learner, mainly acting as the facilitator of learning. On the other hand, the learner plays a crucial and active role in his or her education along with the others. They will take ownership of tasks and activities and be held accountable for their learning with the teacher's guide and their classmates' help.

D. Resources
The use of instructional materials makes learning more interesting and appealing to learners. They also allow the students and the teacher to participate actively and effectively in discussions. They provide a bigger room for the acquisition of skills and knowledge. This study proposes the use of power point presentation and journals.

Power point presentation has become an embedded part of many instructional settings. It is more geared towards information exchange than skill development and is a great tool for explicit instruction. It increases visual impact, improves audience focus, provides annotations and highlights, and increases spontaneity and interactivity (Multani, 2018).

Reflective journals are notebooks or pieces of paper that students use when writing about and reflecting on their own thoughts. The act of reflecting on thoughts, ideas, feelings, and their own learning encourages the development of metacognitive skills by helping students self-evaluate and sort what they know from what they don't know. The process of examining one's own thoughts and feelings is particularly helpful for students who are learning new concepts or beginning to grapple with complex issues that go beyond right and wrong answers. The most important aspect of reflective journal writing is to encourage students to begin to think about their own thinking. The reflective process transfers the responsibilities of self-appraisal and understanding the elements of quality work from the teacher to the student.

E. Time Frame
Although the amount of instructional intervention a student requires to make progress varies, research suggests that the duration of intervention for elementary students be at least 8–16 weeks with the length and frequency of intervention at 30–120 minutes per day. According to Dr. Moats, the exact amount of time is based on students' age and needs, intervention must be planned to occur 4-5 days/week for 20-40 minutes. Since a quarter in high school includes an average of 8 weeks, so the intervention proposed was within this time frame. It is important to ensure

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that the student remains engaged in the instruction being provided and that instruction during the intervention must be carefully designed and guided by continuous progress monitoring (Vaughn, et al., 2012).

F. Success Indicator

To monitor the success of the intervention, data will be collected from the learners in the form of scores through participation through checklist, individual and group performance through rubrics, and observational data through anecdotal records.

A **performance assessment** involves applying and showing skills and knowledge through various performance tasks. The purpose of a performance assessment is to measure how well a student can apply the knowledge they've learned, not if they can recall the knowledge. Learners will be graded individually or by group through a rubric. A rubric is typically an evaluation tool or set of guidelines that will be used to measure students' attainment against a consistent set of criteria. They will be used as scoring instruments to determine grades or the degree to which learning standards have been demonstrated or attained by students, individually or by group.

An **anecdotal observation** is a story about a child's behavior throughout the intervention. Observation starts when the learner begins the experience and ends when the he or she stops participating in the experience. It's a useful method to record events or actions based on the students' strengths, interests, achievements, development and needs all throughout the duration of the intervention. Del Valle (2022)

Conclusion

In light of the findings of the study, the following conclusions were drawn:

Most students in the face-to-face learning modality had fair problem solving skills. Lack of understanding of terminologies used, carelessness, negligence, poor retention, and poor mastery caused learners to commit errors in solving Algebra word problems. The instructional intervention plan includes the following objectives: deepen understanding of terminologies, word problems and process of problem solving; improve recall of symbols, formula, and steps in solving word problems by actively attending to the information; and mastery of problem solving must be strengthen. The plan also included the following strategies: Terminology Matching Game, M4th Pics 1 Word, Error Correction Stations, Project 4F's and Error Reflection Journal. In terms of involvement, the plan only includes the teacher and the learner himself. The resources include instructional materials such as slide presentations, activity sheets, and reflective journals.

Recommendations

Based on the findings and conclusions made in the study the following recommendations are hereby suggested:

To teachers, teaching strategies and instructional materials to be used must focus on errors committed by learners in solving word problems. Teachers should be aware of areas that may potentially cause students to form misconceptions in solving worded problems. Enough effort and examples should be devoted to addressing the apparent errors. Numerous components of instruction and student learning may be assessed, as well as numerous tactics that can be used to assist students understand mathematical concepts. When misunderstandings are minimized, clarity of concepts increases, resulting in greater learning outcomes and more positive learning experiences.

To students, they must be accounted for their own learning and be part of the solution. It is highly suggested that errors of learners be emphasized so that they may correct their own error.

To future researchers, they may extend the scope of the variables of the study to provide further analysis of the study particularly the respondents. It is also recommended to use students from different grade level and schools or may also be extended across different learning modalities.

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