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LEVEL OF PROBLEM-SOLVING SKILLS AND MATHEMATICS ACHIEVEMENT OF SENIOR HIGH SCHOOL LEARNERS BY THE USE OF k-GAS METHOD

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Abstract

To succeed as a 21st century learner, essential skills like problem-solving, metacognition, and communication are vital. This study introduces the k-GAS Method, a digital mnemonic system for 3-Reads Protocol, which helps students identify keywords, given and asked, and solutions in mathematics word problems. The research examines senior high school learners' problem-solving skills, mathematics achievement, and the perceived impact of the k-GAS Method. Using a pretest and post-test design, findings from 43 students reveal that the method improved their math performance from "Average" to "Moving towards Mastery", highlighting its effectiveness in enhancing both problem-solving and reading comprehension.

Keywords: Digital Mnemonic System, k-GAS Method, Mathematics Achievement, Problem-Solving Skills.

INTRODUCTION

As the world entered the 21st century, the academic setting has shifted alongside changes of time. To become productive and successful 21st century learners, they need to acquire skills like problem-solving, creativity, innovation, metacognition, and communication to survive the modern world (Rahman, 2019).

According to Vijayan and Joshith (2018), problem-solving skill is an irreplaceable life skill and is essential to our day-to-day lives. Also, Gurat (2018) exclaimed the importance of mathematical problem-solving skills for the students as it develops a generic ability in solving real-life problems and applying mathematics in real-life situations. Such skill equips students with critical thinking skills allowing them to analyze situations, evaluate options and make informed decisions in an ever-changing world.

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However, the recent result of the Programme for International Student Assessment (PISA) in 2022 revealed that the Philippines still lag behind other countries in reading, mathematics and science. This news manifests challenges in comprehension and application of mathematical concepts among Filipino learners. With that, the Philippine News Agency (2023) reported the urgency to improve future PISA results. With this, the Secretary of the Department of Education called for a concerted effort to realize the MATATAG curriculum which is aimed at improving student outcomes while prioritizing both the learners and teachers' well-being.

The poor performance of the learners in reading and mathematics for two consecutive PISA results may indicate association between these areas. Timario (2020) has revealed that problem solving is dependent on their reading skills. Moreover, a study of Henry, et al. (2016) revealed that the grade level where the learner belongs moderates the influence of English proficiency on Mathematics.

This explicitly indicates that as students get promoted to a higher grade level, they are expected to display literacy and numeracy skills aligned to the competencies prescribed to their level. But, a study conducted by Caraig and Quimbo (2022) revealed that 44% of senior high school students in Calamba displayed poor mastery level in reading comprehension. This entails the need to strengthen basic literacy skills of the learners to augment critical thinking skills necessary to improve problem-solving skills among learners.

Pagaran, et al. (2022) and Puracan, et al. (2023) discovered that senior high school learners from different school respondents in Cebu performed very satisfactorily, with grades ranging from 85-89, in Mathematics. A similar study of Baucas (2024) in Ilocos, Sur likewise indicated satisfactory level of mathematics performance among high school learners. This data corresponds to meeting the minimum standards or expectations for a given grade level. This indicates that students achieve functional proficiency in Mathematics but might need further development to excel in more nuanced and advanced problems.

Lester and Cai (2016) suggested that there is still a need to advance knowledge on how teachers can support students in carrying out complex activities revolving around problem-solving. Hence, despite the growing body of literature on mathematics education, several gaps remain unaddressed. First, there is a lack of local studies focusing on innovative teaching strategies tailored for word problems-solving in Statistics and Probability in the senior high school. Additionally, while many existing studies explore general problem-solving techniques, few examine the impact of a structured, step-by-step problem-solving method on student engagement and comprehension. Furthermore, research overlooks the diverse learning needs of learners, particularly in inclusive classrooms.

Putnam (2015) highlighted the powerful influence of mnemonic devices in facilitating the acquisition of large amounts of information; however, these techniques are not widely utilized in education settings. Furthermore, Robertson (2010) demonstrated that the development of memorable virtual environments can enhance memory retention, emphasizing the need for interdisciplinary collaboration to fully understand their impact.

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The researcher is a Mathematics teacher handling Accountancy, Business and Management (ABM) strand in Iligan City National High School. The Accountancy and Business Management strand seeks to strengthen mathematical abilities, decision making, and time management skills, in addition to familiarizing students with business management ideas. The researcher specifically teaches a section coming from various specialized classes– Special Program for the Arts (SPA), Special Program for Sports (SPS), Special Program for Journalism (SPJ) and Regular classes – and none coming from Science, Technology, and Engineering Program (STEP) during junior high school.

Klang, et al. (2021) highlighted the importance of mathematical problem solving and encouraged the need for research on pedagogies supporting student learning in this area. More so, Villegas (2024) recommended that teachers should incorporate more reading comprehension exercises and activities into their lessons. Hence, this paper focuses on introducing a digital mnemonic system patterned from 3-Reads Protocol encompassing three stages of problem solving: identifying keywords, providing given and asked in the problem, and showing solution. The k-GAS Method was designated to enhance learners' recall. Furthermore, this paper would determine the influence of the digital mnemonic system towards the level of mathematics achievement and problem-solving skills among senior high school students under ABM strand taking Statistics and Probability course during the second semester of school year 2023-2024. With this, the study sought to answer the following questions:

1. What is the level of problem-solving skills of the senior high school learners?
2. What is the mathematics achievement of the senior high school learners?
3. How do the senior high school learners perceive the introduced teaching innovation?
4. Is there a significant difference in the mathematics achievement of the senior high school learners?

METHODOLOGY

This study focused on the 43 senior high school learners under the Accountancy, Business and Management Strand of Iligan City National High School who are expected to display strong mathematical abilities and problem-solving skills to make informed decisions in the area of business. This study employed a one shot pre-test and post-test design in determining the influence of the implemented teaching innovation in instruction. Moreover, a thematic analysis was conducted to explore insights into participants' experiences and perception by identifying, analyzing and reporting patterns that become themes of the research. In this study, the researcher introduced an innovative teaching strategy inspired by 3-Reads Protocol, a three-step problem solving technique that encompasses identifying keywords, providing the given and asked and articulating the desired solution. To help students remember the steps more easily, k-GAS Method, as a digital mnemonic system was made. Each letter of the method stands for every detail warranted for problem-solving: k for "keywords", G for "given", A for "asked" and S for "solution".

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During the 3rd quarter of the Academic Year 2023 - 2024, senior high school learners engaged with this new teaching innovation across three content standards: Random Variables, Normal Distribution and Estimation of Parameters. They were presented with relevant word problems and tasked with applying the k-GAS Method, requiring them to clearly indicate keywords, outline the given and asked in the problem and present their solution.

During instruction, senior high school learners were presented with relevant word problems that were being flashed on the screen through PowerPoint presentations. After reading each problem, learners were prompted to identify keywords, which were subsequently highlighted upon correct identification. Next, learners provided the given and asked in the problem which were also highlighted. This color-coding process facilitated the recognition of relationships, enhancing their visualization of the problem. Finally, in arriving at a desired solution, infographics were presented through charts and visual representations- particularly for concepts such as Random Variables and Normal Distribution- along with callout boxes to emphasize key formulas. For formative assessments, learners were then asked to answer word problems which were rated based on a rubric adapted and modified from Patac, *et. al*. (2021).

The researcher made use of a validated 35-item assessment test with a Cronbach's alpha of 0.7752 as a tool to be used for pre-test and post-test which covered Random Variables and Probability Distributions, Normal Distribution, Sampling and Estimation of Parameters. Alongside this, the researcher constructed three problem solving questions per learning competency as a formative assessment to record the influence of the implemented teaching innovation towards their problem-solving skills which was measured through a standardized rubric adapted and modified from Patac, *et. al*. (2021) on their study on *Factor Analytic Method in Developing Scoring Rubric for Word Problems*. Accordingly, problem-solving skills encompass three performance levels: literal knowledge which recognizes the ability of students to identify appropriate keywords within the context of the word problem being read; declarative knowledge which indicates the ability of students to provide the given and asked in the problem; and procedural knowledge which determines the ability of students to set-up concepts into mathematical representations, efficiently carrying out procedures and arrive at a desired answer.

In determining the mathematics achievement of the learners, the researcher made use of the Mean Percentage Score and its descriptive equivalent which was stipulated from DepEd Memo No. 160, s. 2012 on Maximizing Utilization of the National Achievement Test (NAT) Results to Raise the Achievement Levels in Low Performing Schools.

Since the participants of the study are minors, an informed consent was given stating the purpose, potential risks and benefits of the study. Moreover, the consent states that participation is voluntary and no demerits will be given should the participant choose not to participate.

The p-value for Shapiro-Wilk test is 0.7050 which is greater than the 0.05 level of significance. This means that the pre-test and post-test scores are normally distributed. This implies that the parametric paired t-test is appropriate to infer the pre-test and post-test in the mathematics achievement.

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RESULTS AND DISCUSSION

Level of Problem-Solving Skills of Senior High School Learners

Table 1: Level of Problem-Solving Skills of the Senior High School Learners

Indicators	Random Variables		Normal Distribution		Estimation of Parameters	
	Mean	Interpretation	Mean	Interpretation	Mean	Interpretation
Literal Knowledge	3.02	High	2.52	High	3.08	High
Declarative Knowledge	3.67	Excellent	2.81	High	3.43	High
Procedural Knowledge	3.11	High	2.02	Moderate	3.37	High

Legend: 3.50-4.00 Excellent Level 2.50-3.49 High Level 1.50-2.49 Moderate Level 1.00-1.49 Low Level

Level of Problem-Solving Skills on Random Variables

During the first topic on random variables, learners displayed a high level of literal knowledge with a mean of 3.02 which manifests students' ability to correctly identify appropriate keywords within the context of the problem being read. Identifying keywords in a word problem helps students better understand what the problem is asking and what information is relevant to lead them in formulating equations.

Also, students displayed an excellent level of declarative knowledge with a mean score of 3.67. This means that the students have full awareness of the given and asked in the problem. Knowing what is given in the problem ensures that relevant information is filtered which poses clarity in the problem-solving process while identifying what is asked in the problem outlines the goal and outcome required in the problem.

Moreover, learners had a high level of procedural knowledge with a mean score of 3.11. This means that the learners were capable of identifying problems based on their understanding and responding accordingly. However, they sometimes forget to write their answers in a complete sentence and make a conclusion out of their solution.

Level of Problem - Solving Skills on Normal Distribution

With normal distribution, learners had a high level of literal and declarative knowledge with mean scores of 2.52 and 2.81, respectively. This means that the students were able to identify keywords, asked and given in the problem. However, they were only moderate in terms of procedural knowledge with a mean score of 2.02. This indicates that the learners were able to understand the context of the problem but may have failed to draw solutions and arrive at a conclusion. This may also imply that students may have a hard time illustrating the normal curve, labeling points and shading regions.

Level of Problem - Solving Skills on Estimation of Parameters

Lastly, senior high school learners displayed a high level of literal, declarative and procedural knowledge on estimation of parameters with mean scores of 3.08, 3.43 and 3.37, respectively. This implies that the learners can respond to word problems involving this topic effectively.

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Furthermore, students had already improved their procedural knowledge in this topic. This may indicate that they had acquired necessary problem-solving skills after one quarter of being immersed in the teaching intervention.

Solutions of Senior High School Learners on their Formative Tests

To gain a comprehensive understanding of the participants' problem-solving skills, the researcher purposely selected two top scorers (MF15 and MF16) and three low scorers (MF29, MM17 and MM5) who exhibited similar mistakes in their application of the k-GAS Method.

In terms of word problems under Random Variables, MF15 had correctly presented her answer in the problem as shown in Figure 1 below. Accordingly, bingo is one of the popular games in the Philippines where balls are numbered from 1 to 75; if a ball is randomly drawn, what is the probability of getting an odd number. MF15 was right for identifying drawn at random and odd numbers as keywords in the problem. She correctly pointed out that the given was the balls numbered from 1 to 75 and that the problem was asking for the probability that an odd number will be chosen at random. She started her solution by listing and counting all odd numbers from 1 to 75. With that, she ended with a conclusion that the probability of getting an odd number is 38/75.

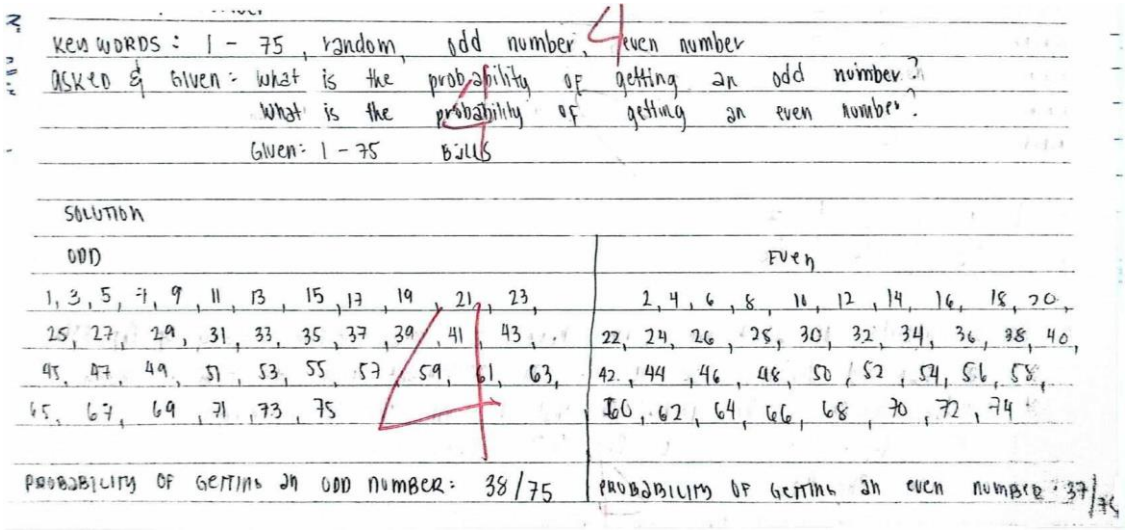

Figure 1: MF15's Solution to Word Problem on Random Variables

Figure 2 below shows the solution of MF15 to the word problem on Normal Distribution. MF15 correctly wrote that mean, standard deviation and probability were the keywords in the problem. She then presented Php. 850 as the mean and Php. 80 as standard deviation were given and the probability of earning less than Php. 930 was being asked in the problem. Afterwards, she drew a normal curve, divided and correctly labeled points of the curve with Php. 850 at the center and Php. 80 difference for each preceding and subsequent points. She then shaded regions from left to Php. 930 of the curve (less than Php. 930) and correctly added 34.15% (one standard deviation to the right of the curve) and 50% (the entire left half of the curve) which resulted to 84.15% as the probability of earning less than Php. 930.

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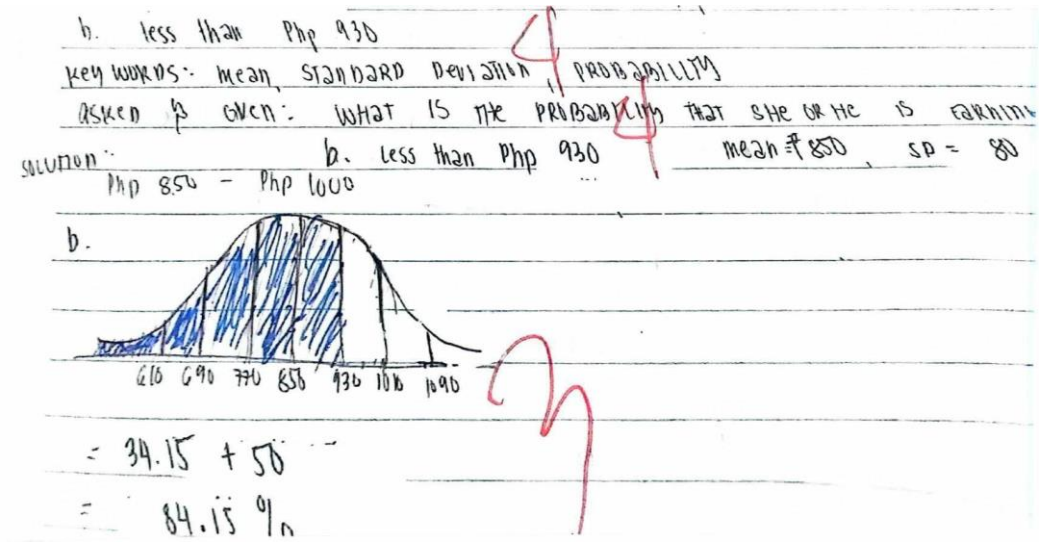

Figure 2: MF15's Solution to Word Problem on Normal Distribution

Lastly, for Estimation of Parameters, MF15 correctly identified confidence level and margin of error as keywords of the problem as shown in Figure 3 below. She then correctly provided $Z_{\frac{\alpha}{2}} = 1.645$, E=0.05 and $\sigma = 0.5$, except for 90% as the confidence level, as given in the problem. Even so, she showed the correct formula, substituted the given and executed the operations of the solution. She then wrapped her answer correctly by writing that the quality controller must test at least 271 products to estimate the proportion of high quality goods with a 90% confidence level and a margin of error of 5%.

Overall, MF15 displayed excellent literal, declarative and procedural knowledge in all three content standards during the third quarter for Statistics and probability.

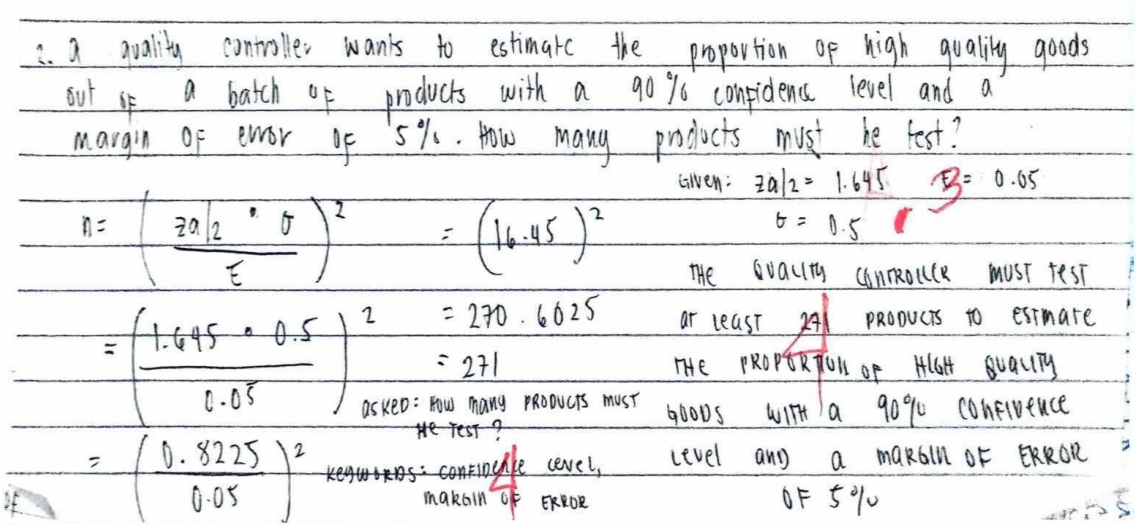

Figure 3: MF15's Solution to Word Problem on Estimation of Parameters

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The researcher also cites MF16's turned in answers. As seen in Figure 4 below, MF16 was given a similar problem on Bingo except that she was tasked to determine the probability of drawing an even number at random. She correctly identified the keywords, provided the given and asked, and showed her solution. However, she failed to end her answer with a conclusion indicating that the probability of drawing an even number at random is 37/75.

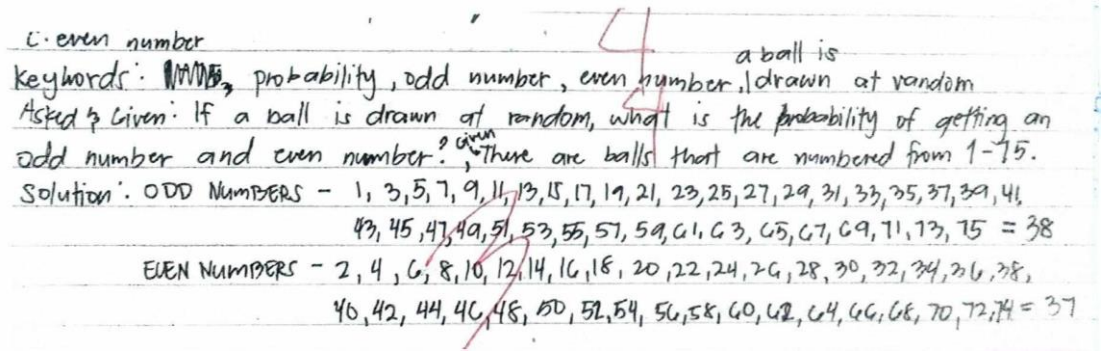

Figure 4: MF16's Solution to Word Problem on Random Variables

Figure 5 displays the solution of MF16 on the word problem under Normal Distribution. She correctly performed each step from identifying keywords, providing given and asked in the problem and showing the solution. However, she also failed to indicate that the probability of earning Php. 850 – Php. 1010 is 47.7%.

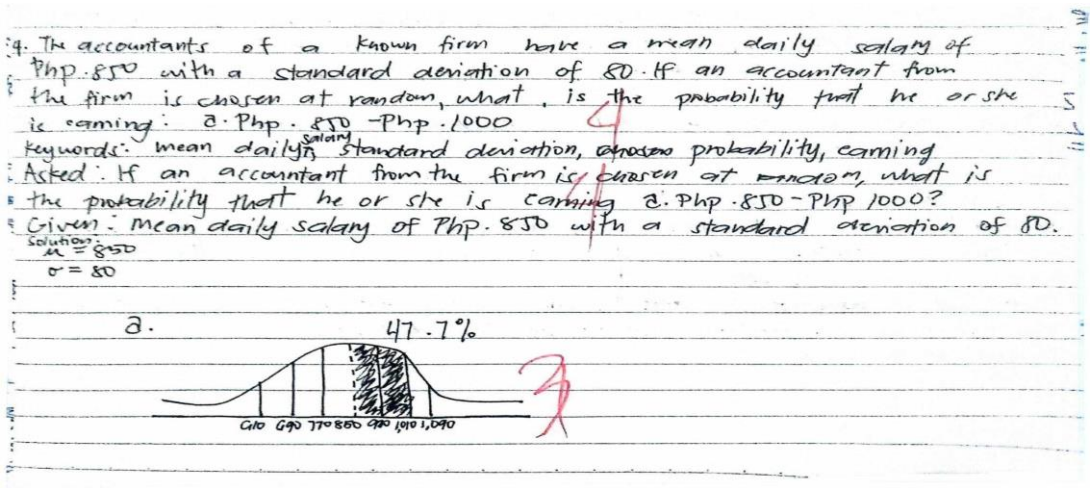

Figure 5: MF16's Solution to Word Problem on Normal Distribution

Figure 6 shows MF16's solution on Estimation of Parameters. As seen, she correctly identified keywords, given and asked in the problem and performed necessary operations. Notably, she now ended her answer with a sentence indicating that the interval estimate for the population mean, with 95% confidence level, is approximately between 113.68mL to 126.32mL.

Overall, MF16 may fail to end her answers in a sentence indicating the final answer; nevertheless, she displayed excellent literal, declarative and procedural knowledge.

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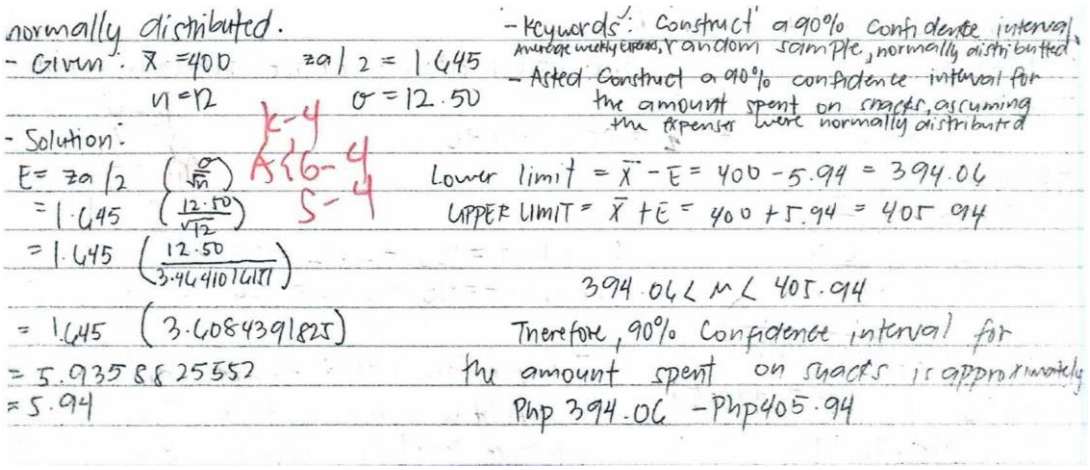

Figure 6: MF16's Solution to Word Problem on Estimation of Parameters

A notable observation from MF29 was presented in Figure 7 below. For her answer in the problem under Random Variables, she only identified probability distribution as a keyword missing out important keywords as tested at random and mean. Further, she correctly wrote what is asked in the problem but failed to indicate the given that helped her in her solution. In the end, she failed to correctly present the solution warranted for the specific problem.

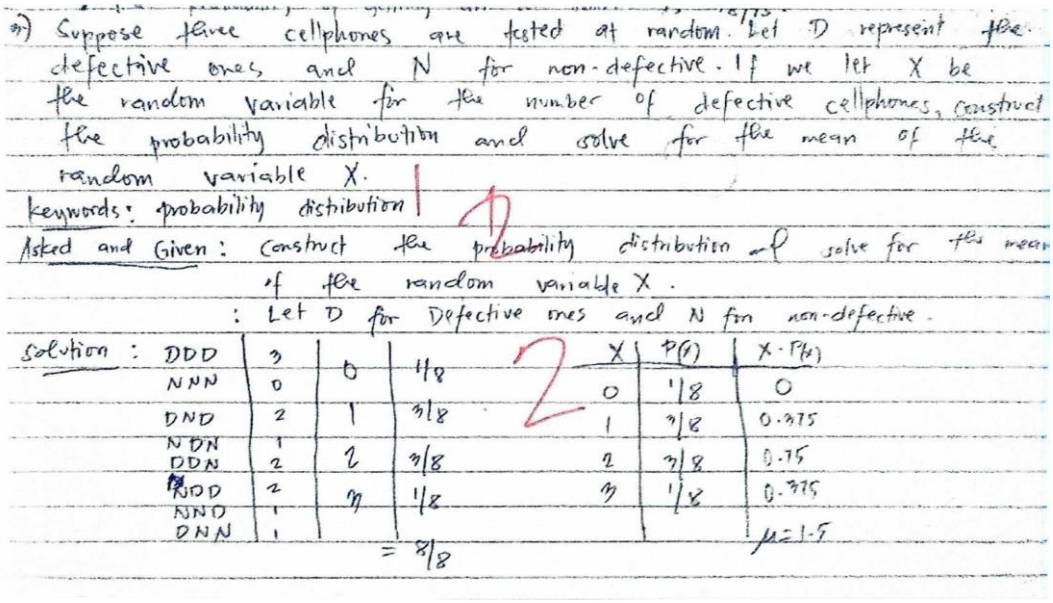

Figure 7: MF29's Solution to Word Problem on Random Variables

MF29 in Figure 8 on Normal Distribution clearly identified keywords not mindful of the entire problem as she only wrote probability and standard deviation while missing out mean as an important keyword which would help her set up the normal curve. Next, she provided what is asked in the problem but failed to identify the given. In the end, she was not able to show a solution.

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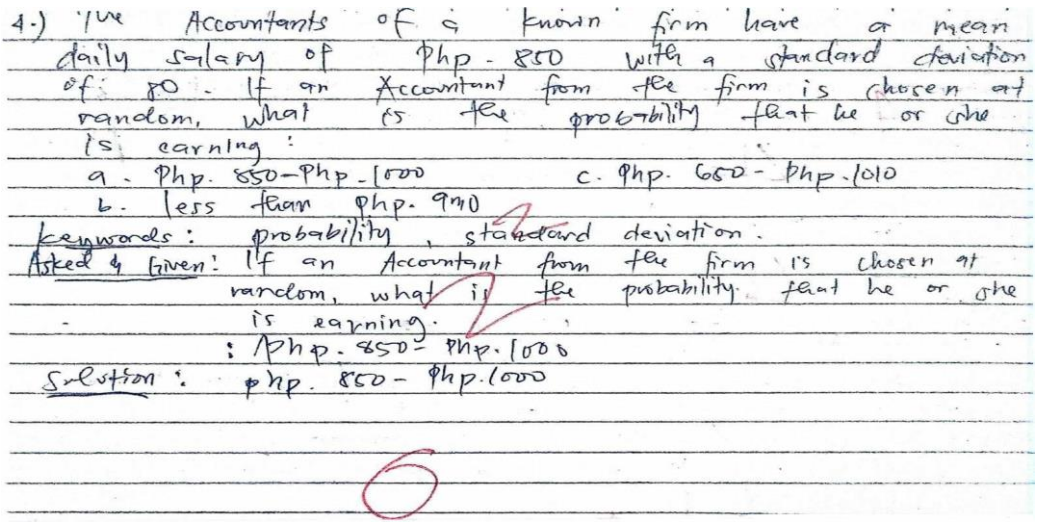

Figure 8: MF29's Solution to Word Problem on Normal Distribution

However, on Estimation of Parameters, MF29 in Figure 9 correctly identified all keywords: sample size, proportion of high goods, estimate, confidence level and margin of error. She was also able to provide the given which were 90% confidence level and 5% margin of error and correctly indicated what is asked in the problem. This time, she was able to set out the correct formula to be used leading to perform the operations and provide the correct answer.

MF29 showed a case that outlines the importance of identifying keywords, asked and given in the problem in arriving at a solution. This further manifests the need to better understand and comprehend the context of a word problem as a basis for arriving at a correct solution.

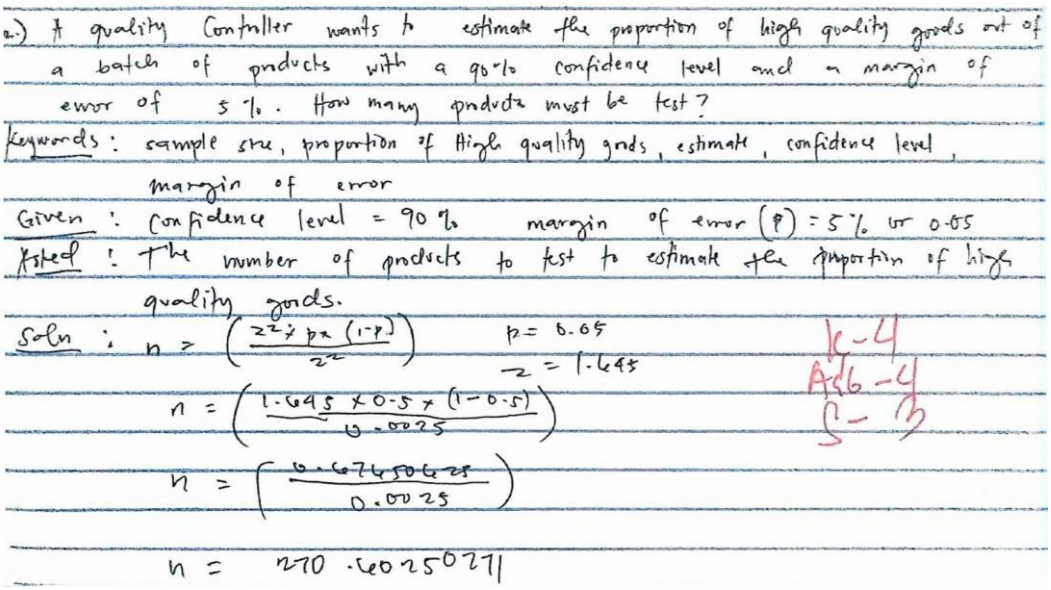

Figure 9: MF29's Solution to Word Problem on Estimation of Parameters

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MM5's answer is presented in Figure 10 below. MM5 was able to correctly provide the keywords for the specific problem on Random Variables. He even correctly provided what is given and asked. In his solution, he listed all 8 possible outcomes. He then provided the correct probability distribution table. However, he failed to show the proper solution as he failed to perform addition and multiplication of fractions.

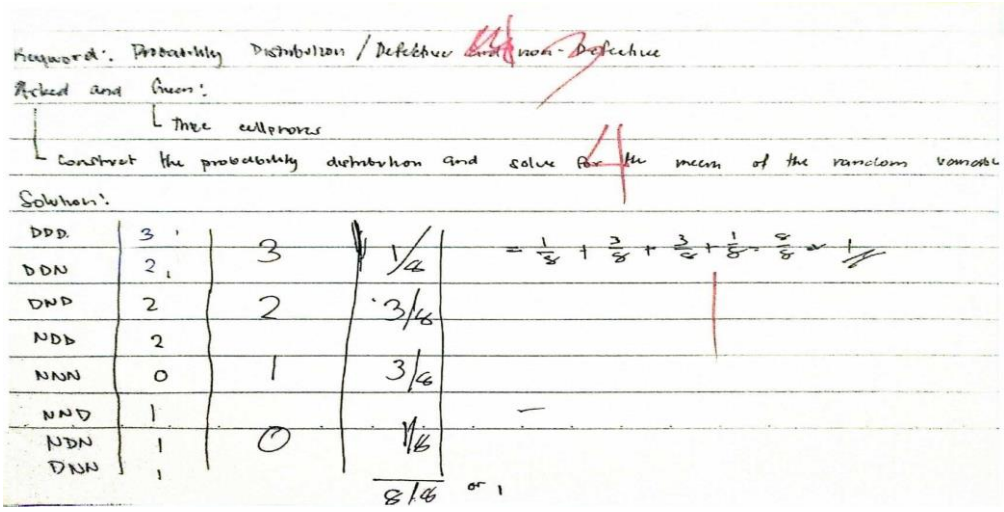

Figure 10: MM5's Solution to Word Problem in Random Variables

MM17 also showed a similar problem with MM5 on the same word problem as shown in Figure 11 below. MM17 had correctly identified keywords, given and asked in the problem. He even perfectly listed down all 8 possible outcomes and set out the probability distribution table. He even further correctly set-up the formula in finding the mean, $\mu = xP(x)$. However, he also failed to perform addition and multiplication of fractions. MM5 and MM17's cases warrant the need for mathematics teachers to revisit basic arithmetic. This is to prepare students for the current learning competencies they need to display based on their grade level and as prescribed in the Curriculum Guide set by the Department of Education.

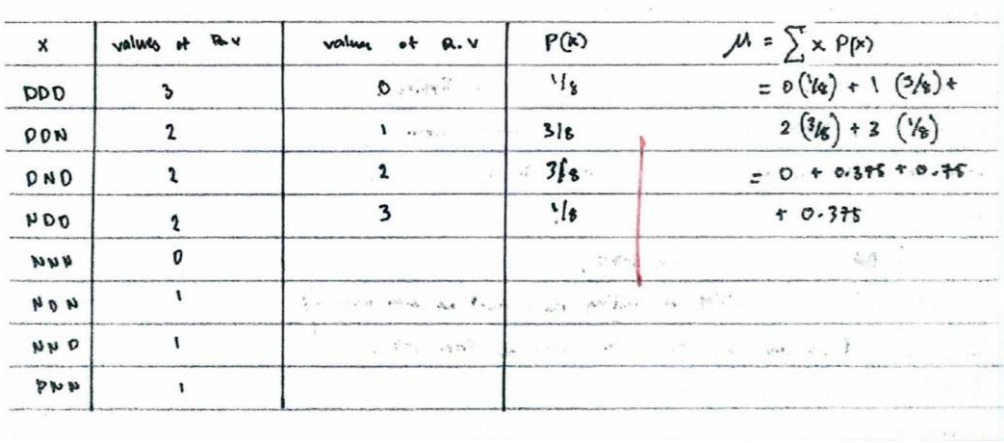

Figure 11: MM17's Solution to Word Problem in Random Variables

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Mathematics Achievement of Senior High School Learners

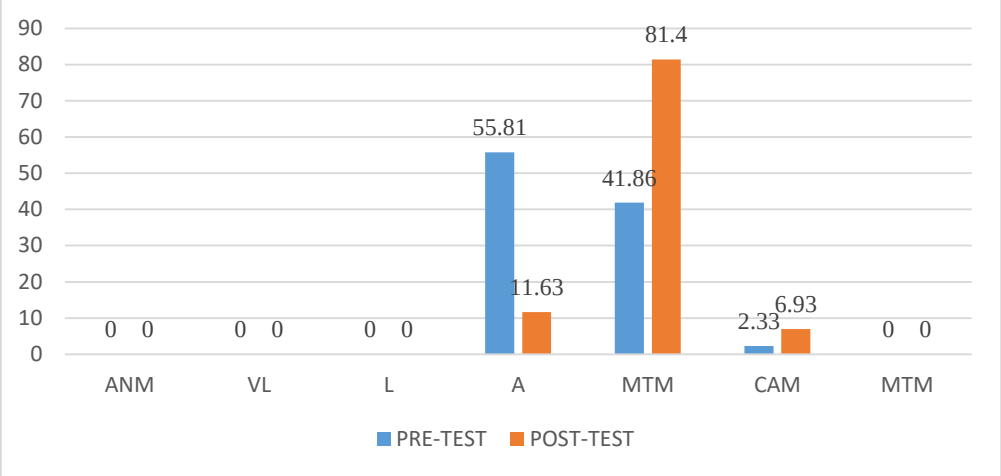

Figure 12: Bar Graph on the Pre-Test and Post-Test of Senior High School Learners

Figure 12 shows the pre-test and post-test scores of the participants. As could be seen during the pre-test, the majority (55.81%) of the learners showed "Average" level of mathematics achievement before the instructional intervention was implemented while 41.86% of the class were "Moving towards Mastery". This could be because the set of learners came from regular classes, some even came from Special Program for Sports (SPS) and Special Program for Arts (SPA), during junior high school which did not share the same curriculum as those in the Science, Technology and Engineering curriculum. Galangco (2023) studied a path model of mathematics achievement in senior high school and found that junior high school mathematics performance contributed the strongest influence. This indicates that a strong mathematics background in junior high school can positively influence students' future mathematics achievement in senior high school.

In terms of the post-test, there was a notable improvement. A large portion (81.40%) of the class were "Moving towards Mastery" while few (6.97%) were "Closely approximating Mastery". Results indicate an improved performance and moved into a higher proficiency range. Also, the mean score was increased to 78.01 which demonstrates positive growth in understanding and proficiency from "Average" to "Moving towards Mastery".

To conclude, the results reflect a positive impact of the instructional intervention between the pre- and post-tests. With this, the students generally showed improvement in their level of mathematical achievement, moving from "Average" to "Moving towards Mastery".

Table 2: Descriptive Statistics of the Mathematics Achievement of Senior High School Learners with Mean Percentage Score and its Descriptive Equivalent

Variable	Overall MPS	Descriptive Equivalent	SD
Pre-test	64.91	Average	4.18
Post-test	78.01	Moving towards Mastery	2.72

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Table 2 discusses the mathematics achievement of the senior high school learners as shown in their pre- and post-test scores. As seen, the overall mean percentage scores of the participants during pre-test was 64.91 which is interpreted as "Average".

However, after the implementation of the teaching innovation, the overall mean percentage scores during post-test increased to 78.01 which is interpreted as "Moving towards Mastery". This suggests significant improvement in mathematics achievement of the participants through the implementation of the teaching innovation.

Moreover, the standard deviation had decreased from 4.18 during the pre-test to 2.72 in the post-test. This suggests that students' scores become more consistent, manifesting that participants performed similarly well in the post-test.

Senior High School Learners' Perception on the New Teaching Innovation

Challenges in Comprehending Mathematical Language

Reading comprehension is a prerequisite in solving word problems. However, participants recognize their difficulty in understanding the context of the word problem being read. MM5, MM14, MM17 and MF 27 wrote "confused" to describe their initial reaction when introduced to word problems. MM9 further wrote, "…there are still slow students studying nowadays…"

The responses show that students did not exhibit necessary learning competencies expected of them based on their grade level. Furthermore, the confusion and recognition of incompetence clearly manifest a weak display of fundamental literacy and numeracy skills among participants despite their grade level.

MM5: "In problem solving, most nalisdan nako ang pagsabot sa laglum na words." (*I find understanding difficult words challenging in problem solving.*)

MF18:"… difficult words to understand…"

MF15:"Difficult terms that I cannot understand/comprehend."

Commonly, word problems often contain special terms and vocabulary that may not be familiar with learners. This complexity can disconnect the learners from the text, making it challenging for students to grasp the underlying concepts necessary for problem-solving. Also, some respondents may have primarily engaged with traditional mathematics exercises focused only on computations, leaving them unprepared for the contextual language of problem-solving.

Responses indicate the need for students to broaden their vocabulary to be able to understand the context of the problem and have an initial picture of what the problem is all about. This might be the reason why MM14 said he had a hard time analyzing the problem.

Challenges in Extracting Essential Information

In solving word problems, one must be able to distinguish information which holds significant bearing in the solution.

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However, respondents were aware that they have a difficulty in filtering information from the problem being read.

> MF27: "…hard to find the given…"
>
> MM5 & MF26: "Identifying the main problem."
>
> MM10: "It would be helpful to practice identifying [relevant information] and ignoring the irrelevant stuff."

The responses indicate that the participants face significant challenges in identifying critical and relevant information within the word problems. This may stem from their lack of systematic method of breaking down the information being read. With this, they may find it overwhelming to decide which elements are relevant to the solution.

Conclusively, identifying relevant information in word problems is crucial as it helps students focus on the key detail necessary for solving the problem. This allows them to have a sound reasoning and better organization of thoughts which ultimately help lead them to a more accurate solution.

Struggles in Converting Verbal Statements to Mathematical Expressions

MF3 confided that "sometimes it's difficult to understand the word problems into mathematical equations." MF7 also agreed that "ang pinakalisod na aspect in problem solving is pag translate ang word problems into mathematical equations." (*The most difficult aspect in problem solving is translating word problems into mathematical equations.*)

One of the most important skills in solving word problems is the ability to make mathematical representations of the problem. Being able to fully understand and comprehend the context of the problem is a must but translating concepts into mathematical representations, symbols or formulas is another thing. However, respondents confessed reasons why they are struggling in this area.

> MM14: "I think ang challenging/confusing that I find most ang pag re-call/pag-remember sa formulas kay daghan kaayog formula ang math." (*I think the challenging and confusing part in problem solving is recalling appropriate formulas needed for the problem as Math offers a lot of fomulas to memorize.*)
>
> MF22: "I was not able to memorize the formula."
>
> MF30: "I find it challenging to remember all the different formulas and rules."

These responses indicate that a significant number of students struggle to translate verbal statements into mathematical expressions, largely attributing this difficulty to the overwhelming number of formulas in mathematics. The sheer volume of formulas and concepts can create a cognitive overload, making it hard for students to recall appropriate mathematical expressions when faced with a word problem.

Moreover, many respondents may not have sufficient exposure to various mathematical expressions in which these formulas apply since they mostly came from Special Program in

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the Arts, Sports, Journalism and Regular classes during their junior high school. This lack of familiarity can hinder their ability to make connections between words and mathematical symbols effectively.

Increased Confidence through a Step-by-Step Process

When asked if the teaching innovation had increased their confidence in mathematics, the participants MM13, MM14 and MF9 unanimously exclaimed, "Yes". Accordingly, the introduced problem solving technique made them better understand the problem through breaking down pieces of information found in the problem, allowing them to better visualize the problem.

> MM13: "makasabot ko kong e step by step ang problems" (*I can easily understand the step-by-step process in solving problems.*)
>
> MM14: "mas napadali ang akong pagsabot using step-by-step" (*My understanding has improved with the step-by-step process.*)
>
> MF9: "When there's too much information, breaking down problems into smaller parts and focusing on the key information could help me solve it."

The responses from participants reveal that employing a structured problem solving method enhanced their ability to understand word problems. The teaching innovation encouraged them to break down word problems into manageable steps. Through the step-by-step process, participants reported a feeling of increased confidence in their problem solving skills.

In conclusion, the teaching innovation fosters a systematic way of understanding and analyzing word problems that, accordingly, empowered them to engage with word problems more confidently and competently. Thus, it leads to a notion that future applications of this method could further enhance problem-solving skills of learners.

Significant Difference in the Mathematics Achievement of Senior High School Learners

Table 3: t-Test Result on the Difference in the Mathematics Achievement of the Senior High School Learners

Variables	N	Mean	SD	t	p-value
Pre-Test	43	64.91	4.18	-7.8671	8.5858e-10*
Post-Test	43	78.01	2.72		

*p<0.0001

As could be seen in Table 3, the pre-test mean score before the implementation of the teaching innovation is 64.91 while the post-test mean score is 78.01. When the mean difference was analyzed using t-test of dependent samples, it yielded a probability value of 8.5858e-10 which is significant at 0.05 level rejecting the null hypothesis. Thus, there is a significant difference in the mathematics achievement of senior high school learners. This means that there is a significant improvement in the mathematics achievement of the senior high school learners when the teaching innovation was introduced.

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Results concurrent to Simbulas, Regidor and Catulpos (2015) highlighting the importance of understanding and comprehending the context of a word problem. As exemplified by the participants of the study, identifying keywords, given and asked in the problem help them to have a picture of what the problem is all about. With that, they were able to outline steps on how to correctly solve the problem by setting out formulas necessary for a specific problem and performing operations indicated.

Moreover, the teaching innovation introduced in this study hones and develops problem solving skills of senior high school learners by integrating fundamental literacy and numeracy skills of students. Data conclusively showed the interplay between language and mathematics in the mathematics achievement of learners. Hence, reading comprehension determines the level of problem solving skills among learners.

CONCLUSION AND RECOMMENDATIONS

In view of the analysis of data, the following conclusions were drawn:

1. Senior high school learners often struggle to come up with an accurate solution when they cannot identify key information from word problems. This difficulty highlights the importance of a teaching innovation for effective comprehension and analysis of textual information as it directly impacts their problem solving skills.
2. The introduced teaching innovation has improved the mathematics achievement of senior high school learners from “Average” to “Moving towards Mastery”. This calls for the implementation of training and workshops for teachers to deepen their understanding on the innovative teaching strategy used.
3. The implementation of the step-by-step problem-solving method has significantly enhanced the confidence of senior high school learners in their mathematics abilities. By providing a structured approach, students have gained a greater sense of mastery and self-assurance in their skills.
4. Mathematics achievement of senior high school learners had significantly improved from pre-test to post-test after being exposed to teaching innovation. Thus, suggesting the continued implementation of the teaching innovation for Statistics and Probability. Also, future researchers may look into possible influences of integrating technology-based learning to a larger sample to further enhance and substantiate the research findings.

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