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KNOWS STRATEGY AND PRACTICE DRILLS: AN INTERVENTION IN IMPROVING SKILLS ON SOLVING WORK-RELATED PROBLEMS INVOLVING FRACTIONS

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ABSTRACT
This study examined the effectiveness of the KNOWS Strategy and Practice Drills as an intervention in improving skills in solving work-related problems involving fractions. The intervention was designed to address students' persistent difficulties with fraction-based word problems through a structured, mnemonic-based approach. Utilizing a one-group pretest-posttest pre-experimental design, the study was conducted with 33 purposively selected Grade 8 students at Kapalong National High School. Quantitative data were gathered using a 10-item test administered before and after the intervention, and qualitative data were obtained through in-depth interviews. . Findings revealed a substantial difference in the scores before and after the intervention. The mean pretest score was 9.64% (poor), while the mean post-test score was 66.06% (satisfactory). The paired t-test results indicated a significant improvement in students' scores from the pretest to the post-test, with $t(32) = 20.1$, $p < .001$, with a standardized effect size of Cohen's $d = 3.50$. Thematic analysis of student feedback identified five (5) core benefits: 1) enhancing mental clarity; 2) developing analytical confidence; 3) simplifying word problems enhances comprehension; 4) seeing KNOWS as an effective strategy for structured problem solving; and 5) enhancing analytical problem-solving skills. The findings confirm that the KNOWS Strategy and Practice Drills significantly improved both the performance and confidence of students in solving fraction-related problems, demonstrating its potential as an effective instructional approach in mathematics education.

KEYWORDS: *KNOWS Strategy, Intervention, Pre-experimental Design, Fractions, Philippines*

INTRODUCTION
Mastering fractions is a cornerstone of mathematical learning and a critical skill for solving work-related problems encountered in everyday life and academic settings. Students' logical reasoning and practical problem-solving abilities are supported by proficiency in this area (Lamon, 2020). However, gaps in efficiency with procedures and understanding of concepts cause many students to struggle with fractions, which may hinder their overall math performance (Lee et al., 2023). Thus, strategic interventions are required to bridge theory and practical application in order to overcome this obstacle. Research indicates that the integration of structured strategies and active learning can greatly enhance students' confidence and mathematical proficiency (Seigler et al., 2022).

Globally, students encounter persistent difficulties in solving mathematical word problems involving fractions due to limited grasp of basic fraction ideas and difficulty applying the correct steps to solve problems. In Namibia, for example, only 6% of Grade 10 learners could interpret algebraic word problems, with just 5% able to carry out a solution plan—highlighting a clear need for structured strategies (Iilonga & Ogbonnaya, 2023). Similar challenges are seen in Slovakia, where the late introduction of fraction concepts has contributed to lower-than-average performance in mathematics compared to OECD peers (Švecová et al., 2022). In Malaysia, nearly 25% of 13-year-olds misidentified 1/3 as the smallest fraction in a set, revealing widespread misunderstandings that make it harder for students to solve problems accurately (Razak et al., 2021). These findings point to a shared global issue: students often lack both the essential knowledge of fractions and the ability to follow a logical process when solving problems.

In the Philippines, challenges with learning and teaching fractions remain widespread. At Central Luzon State University in Nueva Ecija, around 35% of teacher education students fail or drop Math 311 each year due to difficulty understanding fractions, especially in work-related problems—hindering their academic progress, confidence, and future teaching effectiveness (Pentang et al., 2021). Similarly, at Holy Name University in Bohol, many high school students still struggle to apply what they learned about fractions in earlier grades to more complex problems, indicating a gap between basic knowledge and real-world application (Garcia et al., 2024).

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Furthermore, in Ateneo de Manila University, students also face difficulties with complex fraction problems, particularly when instruction lacks clarity or fails to connect to practical situations like sharing tasks or measuring. These cases emphasize the need for more effective teaching strategies that make fractions easier to understand and apply across different learning levels (Ombid et al., 2024).

Moreover, the study examined the use of the KNOWS Strategy and practice drills as an intervention in improving skills in solving work-related problems involving fractions. This study was conducted at Kapalong National High School, a local secondary school situated in the province of Davao del Norte. Data were collected through paper-based test questionnaires answered by Grade 8 Mt. Apo students from the same school. Furthermore, the researchers conducted this study as it is highly relevant and important to society, and it is beneficial to the program in the institution since it provides insightful data that offers a viewpoint on improving skills on solving work-related problems involving fractions with KNOWS strategy and practice drills as an intervention. Moreover, this research could potentially contribute to the evolution of more efficacious teaching methodologies, ultimately fostering a society with a higher degree of mathematical literacy. The urgency of this research is underscored by the immediate need to mitigate the widespread difficulties students encounter with worded problems and its profound implications for their future and the broader societal context.

At present, numerous studies focus on improving students' mathematical problem-solving skills through the use of structured strategies and mnemonic devices. For instance, Karabulut et al. (2021), in their study *"Examining the Effectiveness of the READER Strategy in Intellectually Disabled Students' Mathematical Problem Solving,"* explored how a mnemonic-based intervention supported students with learning difficulties in solving word problems. Likewise, Tibbit (2016), in *"Comparing the Effectiveness of Two Verbal Problem-Solving Strategies: Solve It! and CUBES,"* investigated the role of step-by-step strategies in helping students understand and solve mathematical tasks. Additionally, Freeman-Green et al. (2020) examined the SOLVE strategy and its impact on secondary students with learning disabilities. While these studies offer valuable insights into the effectiveness of structured interventions, they do not specifically address the challenges faced by Grade 8 Mt. Apo students at Kapalong National High School in solving work-related problems involving fractions. This study identifies a gap in the literature, particularly in terms of localized, classroom-based interventions using the KNOWS Strategy to enhance fraction problem-solving skills. Thus, the present research aims to fill this gap by implementing the KNOWS Strategy and practice drills as an intervention tailored to the specific needs of Grade 8 Mt. Apo students, contributing to the development of targeted strategies for improving performance in solving real-life mathematical problems.

The literature highlights how mnemonics support students in remembering information, concepts, and steps to execute tasks systematically, which enhance their mathematical skills. In connection, KNOWS as a mnemonic strategy facilitates students' understanding of word problems. It relates to the four levels of problem solving proposed by Polya (1945): understanding the problem, designing a plan, performing the plan, and reexamining the solution. These four problem-solving principles align with the KNOWS strategy.

Research Questions

The study aimed to determine the effectiveness of the KNOWS strategy and practice drills as interventions to improve Grade 8 Mt. Apo students' skills in solving work-related problems involving fractions. Additionally, it sought to answer the following key questions:

1. What is the pretest result on the level of skills on solving work-related problems involving fractions of the students?
2. What is the post-test result on the level of skills on solving work-related problems involving fractions of the students?
3. Is there a significant difference between the pre-test and post-test scores of the students?
4. What are the insights of the students in the implementation of KNOWS Strategy and Practice Drills as an intervention?

PROPOSED INTERVENTION/PLAN

Before starting the study, the researcher worked together with the Grade 8 Mathematics Teachers to decide which group of students would take part. Out of the 10 Grade 8 sections, they found one section where the students were clearly having difficulty with math. From this section, 33 students were chosen to join the study.

At the start of the first week, students took a 10-item pre-test on solving work problems that involved fractions. This test, given on a printed questionnaire, helped the teacher understand how much the students already knew. After the test, students were introduced to the KNOWS strategy — a simple, step-by-step method to help them solve work problems more easily. KNOWS stood for **K – Know**: Understand the problem, **N – Need to know**: Identify what the problem is asking, **O – Organize**: Gather and arrange the given information, **W – Work**: Solve the problem, **Solution**: Check and write the final answer.

In the second week, the teacher explained each step of the K.N.O.W.S strategy using simple examples. Students participated by raising their hands to answer. This guided practice helped them understand how to use the method properly. During the third week, students began solving problems on their own using the K.N.O.W.S method. The teacher wrote problems on the board, and students answered them through board work. They also did group activities to support teamwork and learning from one another.

In the fourth week, students worked on harder problems that had more steps. The teacher continued using the board to show the problems, and students solved them individually through board work. This helped students remember the steps better. In

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the fifth week, students solved a new set of challenging problems, both on their own and in groups. These activities gave them more practice and helped improve their skills further. In the final week, students took another 10-item test, given on a printed questionnaire. This post-test checked how much they had improved in solving work problems with fractions using the K.N.O.W.S strategy.

After the intervention, the researcher noticed that students showed clear improvement in solving simple interest problems and developed a more positive attitude toward learning math. The results showed that the students made academic progress and became more confident, which can help them succeed in school over time. This study shows that the K.N.O.W.S strategy can make math more interesting and easier to understand, helping students strengthen their skills and enjoy learning more.

Table 1. Intervention Plan Matrix

Week	Activities	Description	Estimated Time Duration
1	Pre-test and Introduction to KNOWS Strategy	Administered a 10-item pre-test on work-related fraction problems; introduced the KNOWS steps: Know, Need to know, Organize, Work, Solution.	60 minutes (45 min pre-test, 15 min introduction)
2	Teacher Explanation and Guided Practice	Teacher explained each step of the KNOWS strategy with simple examples; students participated by answering questions.	60 minutes (20 min explanation, 40 min guided practice)
3	Independent Problem Solving & Group Activities	Students solved problems on the board individually and participated in group work to practice teamwork and peer learning.	60 minutes (30 min board work, 30 min group activity)
4	Solving More Complex Problems	Students tackled more difficult multi-step problems through board work individually.	60 minutes (entire session dedicated to individual problem solving)
5	Challenging Individual and Group Practice	Students worked on new challenging problems both independently and in groups.	60 minutes (30 min individual, 30 min group work)
6	Post-test	Administered a 10-item post-test similar to the pre-test to measure improvement.	60 minutes

METHODOLOGY

Research Design

This study employed mixed methods incorporating both quantitative and qualitative design. A quantitative research was employed through a one-group pretest-posttest design, a type of pre-experimental approach. It assessed changes resulting from an intervention or project by comparing values before (baseline) and after the intervention (end-line evaluation). Unlike experimental designs, pre-experimental designs lack a control group for comparison; instead, they focus on changes within a single group over time. The observed differences between baseline and end-line values are attributed to the project, suggesting its impact on the outcomes (Wamunyima & Nyirenda, 2023). Alongside, qualitative data were gathered to explore students' learning behaviors, reactions, and challenges throughout the intervention. Employing this combined approach strengthens the research's ability to capture not only what works but also why it works within the specific classroom context (Onwuegbuzie & Hitchcock, 2021).

In the context of this study, the students underwent a pre-test and a post-test. The intervention was implemented between the interval of the two tests. Also, an in-depth interview to selected participants was conducted to reveal their insights about the implementation of the KNOWS Strategy and Practice Drills. Merging both quantitative and qualitative perspectives proved valuable in addressing the diverse and real-world nature of classroom settings. The KNOWS Strategy and Practice Drills was not only evaluated through numerical gains in test performance but also through observational data and student reflections, which revealed insights into their conceptual development and engagement.

Research Respondents

In purposive sampling, a non-probability sampling technique, researchers strategically select participants who possess specific characteristics relevant to the research objectives. This intentional selection process, also referred to as judgmental sampling, relies on the researcher's expertise in identifying individuals most likely to provide valuable and pertinent data, in contrast to probability sampling methods where selection is based purely on chance (Nikolopoulou, 2023).

In this study, 33 participants were purposively selected from the Grade 8 Mt. Apo students enrolled at Kapalong National High School for the school year 2024–2025. Among the ten Grade 8 sections, the Mt. Apo class was selected based on the cooperating teacher's recommendation, considering that this group would benefit most from additional support in solving work-related problems involving fractions. These students, aged 12 to 16, were observed to encounter occasional challenges when solving work-related problems involving fractions, which are foundational skills for understanding more complex problem-solving contexts. The entire class was included to ensure consistency in the implementation of the intervention within a familiar learning environment. Other sections were not included to maintain uniformity in scheduling, instruction, and classroom dynamics during the course of the study.

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Research Instrument

This study utilized an adapted questionnaire sourced from online instructional materials by Hidegkuti (2019) to assess learners' skills in solving work-related problems involving fractions. The instrument was carefully selected for its alignment with the study's objectives and its focus on real-life mathematical applications. It consisted of 10 problem-solving items, each designed to evaluate the student's ability to apply fractional concepts in practical contexts. Scoring was based on a 5-point system per item (3 points allocated for the correct solution process and 2 points for the correct final answer).

In assessing the scores of Grade 8 Mt. Apo students, the researchers utilized a scoring scale adapted from Meidiastuti and Safitri (2021). This scale was used to evaluate the students' total percentage scores in solving work-related problems involving fractions:

Range of Mean	Descriptive Level	Interpretation
90 - 100%	Outstanding	If the measures described in solving simple interests of the students is outstanding.
72-89%	Highly Satisfactory	If the measures described in solving simple interest of the students is highly satisfactory.
54- 71%	Satisfactory	If the measures described in solving in simple interest of the students is satisfactory.
36 - 53%	Fairly Satisfactory	If the measures described in solving in simple interest of the students is fairly satisfactory.
18 - 35%	Needs Improvement	If the measures described in solving in simple interest of the students is needs improvements.
0 - 17%	Poor	If the measures described in solving in simple interest of the students did not meet the expectation.

Procedure

The researchers conducted assessments before and after the intervention to evaluate its effectiveness. The pre-test aimed to measure the problem-solving abilities of students prior to the intervention, while the post-test was designed to assess their knowledge and progress by using the same set of test questionnaire as in the pre-test. To gather the necessary data, the researchers followed these steps: First, they obtained approval from the school principals where the participants were enrolled. Next, they administered a pre-test to assess the initial problem-solving abilities of the students. Afterward, the KNOWS strategy was introduced, followed by weeks of intervention period. At the conclusion of the study, a post-test was given using the same set of test questionnaires as the pre-test to evaluate any improvements in the students' problem-solving abilities. The data from both the pre-test and post-test were then collected and analyzed. The chart below shows the topics/competencies to be covered in each week of the study.

Table 2. Intervention Schedule

Week	Content	Task	Platform
Week 1	Fraction involving work-related problem	Diagnose Phase: Pre-Test	Scientific Calculator
Week 2		Introduce the intervention which is the KNOWS strategy and its meaning. Also, they will be given drills involving work problems.	
Week 3		Conducting KNOWS Strategy as an intervention in solving work-related problems.	
Week 4		Conducting KNOWS Strategy as an intervention in solving work-related problems.	
Week 5		Conducting KNOWS Strategy as an intervention in solving work-related problems.	
Week 6		Diagnose Phase: Post Test	

In connection, KNOWS as a mnemonic strategy facilitates students' understanding of word problems. It relates to the four levels of problem solving proposed by Polya (1945): understanding the problem, designing a plan, performing the plan, and reexamining the solution. These four problem-solving principles align with the KNOWS strategy.

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Table 3. KNOWS Strategy

Letter	Meaning	Description
K	**K**now	Students identify and write the important information.
N	**N**eed to know	Students review the question and jot down what they are seeking.
O	**O**rganize	Students organize the given information.
W	**W**ork	Students perform and show their calculations.
S	**S**olution	Students check if the answer is reasonable and whether it answered the question.

Statistical Treatment of Data

The statistical tools employed in this study, namely the mean and the t-test, played a crucial role in analyzing the gathered data. The mean, a fundamental measure of central tendency, provided insights into the average performance of students in both the pretest and post-test phases. By calculating the mean scores from the total scores of students in each phase, researchers were able to gauge the overall level of skills on solving work-related problems involving fractions among participants before and after the intervention.

Moreover, the t-test enabled a comparison of means between two populations. It helped determine whether differences in mean scores between pretest and post-test phases were statistically significant, shedding light on the intervention's impact on skills on solving work-related problems. Additionally, the t-test identified significant variations in skill levels pre- and post-intervention, offering valuable evidence to support the study's conclusions.

Data Analysis

The researchers employed **thematic analysis** to examine and interpret the qualitative data derived from the participants' responses (Braun & Clarke, 2006). The process began with **data reduction**, where responses were organized and simplified by clustering similar thoughts and ideas. These grouped responses underwent **coding**; wherein specific labels were assigned to represent patterns within the data. These codes were then organized into categories representing the shared **emerging themes**, each with a corresponding assigned code and theme label. To ensure the credibility of the findings, the assigned themes were reviewed and validated by experts familiar with qualitative analysis procedures.

Ethical Considerations

The participants of this study were Grade 8 Mt. Apo students from Kapalong National High School. To ensure the ethical and responsible conduct of the study, appropriate ethical standards were observed throughout the research process.

Informed Consent. Informed consent includes two essential elements: being informed and giving consent, both of which require careful consideration. Participants were given complete information about the nature of the study, the tasks expected of them, how their data would be used, and any potential risks or consequences. They were required to provide explicit, active, and signed consent before participating. This agreement affirmed their rights to access their data and withdraw from the study at any point without penalty. In this study, the researchers included an informed consent statement on the printed survey form, asking students whether they were willing to participate despite any potential risks. Participation was entirely voluntary, and students had the right to decline. The researcher ensured that all participants willingly and enthusiastically participated in the study. Respondents were also informed of their rights, including the right to refuse to answer sensitive questions, ask questions about the study, terminate participation at any time without providing an explanation, and receive the study's results once it was completed (Denzin & Lincoln, 2011).

Risk of Harm, Anonymity, and Confidentiality. The researchers took careful steps to safeguard the identity and privacy of all participants. Confidentiality was strictly maintained, and anonymity was ensured by not disclosing any identifying information. All personal information and responses were handled with the utmost care to avoid any risk of social harm or liabilities. To protect respondent identity, any personally identifiable data such as names or addresses were removed from the dataset and stored separately in a secure location. The data will be kept private and destroyed three years after the completion of the study. These procedures aimed to create a secure and trustworthy research environment, ensuring that participation posed minimal risk to the students (Denzin & Lincoln, 2011).

Conflict of Interest. The researcher declared that the study was conducted independently and was free from any affiliations, financial interests, or relationships that could be perceived as a conflict of interest. According to Blanco (2023), any existing or prior affiliations that might influence a study must be declared for ethical review. In this case, no such conflicts existed. The researcher held no authority that could coerce or pressure the participants into joining the study, ensuring the research process remained unbiased and ethically sound. For example, there were no instances where the teacher threatened academic consequences to force students to participate.

RESULTS AND DISCUSSION

This chapter presents the findings and results of KNOWS Strategy and practice drills as an intervention in improving skills on solving work-related problems involving fractions among Grade 8 Mt. Apo students of Kapalong National High School. Analyses and interpretation of data were done parallel to the research objective.

Research Question No. 1: What is the pre-test result on the level of skills on solving work-related problems involving fractions of the students?

Presented in Table 4 are the results of the pretest, showing the performance of 33 students in solving work-related problems involving fractions. The overall mean score is 9.64%, with a standard deviation (SD) of 4.680, indicating a poor

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performance by the students in the pretest. The highest score achieved was 17, while the lowest score was 0. The most frequent scores were 0, obtained by 9 students.

Table 4. Level of Skills in Solving Work-related Problem Involving Fraction Before the Implementation of the KNOWS Strategy and Practice Drills (Pre-Test)

Scores	Frequency	Percentage
0	9	27.27%
1	2	6.06%
3	3	9.09%
4	3	9.09%
5	6	18.18%
7	1	3.03%
8	4	12.12%
10	1	3.03%
11	1	3.03%
13	1	3.03%
16	1	3.03%
17	1	3.03%
Total	**33**	**100%**
Overall Mean		**9.64%**
Standard Deviation		**4.680**
Description		**POOR**

Before the intervention given to the students, the result of the pretest was 9.64, with a standard deviation (SD) of 4.68, classified as very low level of performance, which means that the students' skills did not meet the expectation. This poor performance is consistent with findings from Handayani and Witri (2024) which found that 60.91% of students experienced difficulties in problem-solving related to mixed fraction operations. The difficulties were categorized into conceptual misunderstandings 28.64%, skill-based challenges 52.12%, and problem-solving errors 60.91%. These findings highlight significant obstacles in students' comprehension and application of fraction concepts.

Moreover, similar study of Vitoria et al. (2021) which found that only 45% of students could correctly execute addition and subtraction of fractions, and 25% struggled with finding the least common denominator, and none of the students reduced their answers to the lowest terms. These results indicate a pervasive issue in students' procedural understanding of fractions. Furthermore, it was supported by the study of Astuti et al. (2020) which showed that: reading errors 30.7%, comprehension errors 40%, transformation errors 6.5%, process skill errors 33.3%, and encoding errors 12%. The research highlights the multifaceted nature of students' difficulties in solving fraction word problems.

Research Question No. 2: What is the post-test result on the level of skills on solving work-related problems involving fractions of the students?

Presented in Table 5 are the results of the post-test, showing the performance levels of 33 students in the group in solving fraction involving work problems. The overall mean score was 66.06%, with a standard deviation (SD) of 7.515, indicating a satisfactory performance by the students in the post-test. The highest score achieved was 42, while the lowest score was 21. The most frequent score was 39, obtained by 7 students.

Table 5. Level of Skills in Solving Work-related Problem Involving Fraction After the Implementation of the KNOWS Strategy and Practice Drills (Post-Test)

Scores	Frequency	Percentage
21	2	6.06%
22	2	6.06%
23	1	3.03%
24	2	6.06%

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25	1	3.03%
26	1	3.03%
27	2	6.06%
28	2	6.06%
31	1	3.03%
34	2	6.06%
35	1	3.03%
39	7	21.21%
40	5	15.15%
41	3	9.09%
42	1	3.03%
Total	**33**	**100.00%**
Overall Mean		**66.06%**
Standard Deviation		**7.515**
Description		**SATISFACTORY**

After receiving the KNOWS Strategy and practice drills as an intervention in improving skills on solving work-related problems involving fractions to the students, the result of the post-test was 66.06, with a standard deviation (SD) of 7.515, classified as an average level of performance, which means that the students' skills are satisfactory. This improvement aligns with the findings of Myers et al. (2022) highlighted that integrating visual cues and structured approaches like mnemonics into intervention programs enhances students' comprehension and retention of multi-step problem-solving procedures.

Similarly, the study of Skinner and Cuevas (2023) found that explicit teaching of schema-based and mnemonic strategies significantly improved the problem-solving skills of middle school students, especially in word problems involving fractions and other mathematical operations. Furthermore, Widiyasari et al. (2022) explored how integrating mnemonic techniques within the CORE teaching model affects students' creative thinking and metacognitive awareness in mathematics. The study found that students exposed to mnemonic strategies demonstrated enhanced problem-solving abilities and greater awareness of their cognitive processes, leading to improved mathematical performance.

Research Question No. 3: Is there a significant difference between the pre-test and post-test scores of the students?

Presented in Table 6 are the results of the significant difference between the pretest and post-test scores, indicating the performance levels of 33 students in solving work-related problems involving fractions, $t(32) = 20.1$, $p < .001$. Since the probability value ($p < .001$) is less than the level of significance ($\alpha = 0.05$), the null hypothesis is rejected. This means that there is a significant difference between the pretest and post-test scores.

Table 6. Significant Difference Between Pre-test and Post-test of the Students

	t	df	p	Mean difference	Std. Error difference	Cohen's d
Post-test—Pre-test	20.1	32	<.001	28.212	0.493	3.50

In terms of the mean scores, the pretest showed a mean of 9.64%, with a standard deviation (SD) of 4.68, while the post-test showed a mean of 66.06%, with a standard deviation (SD) of 7.515. This indicates a notable increase in performance from the pretest to the post-test among the group. Additionally, the effect size was calculated Cohen's d, which was 3.50, suggesting a very large effect. This indicates that the KNOWS strategy and practice drills had not only a statistically significant but also a practically meaningful impact on improving students' skills on solving work-related problems involving fractions.

The findings showed that the students' scores on the pretest and post-test differed significantly. This suggests that the Grade 8 students' ability to solve fraction-related work-related problems was enhanced by the KNOWS Strategy and practice exercises used as an intervention. This outcome is consistent with research by Cui et al. (2021), which showed that incorporating computational thinking into mathematical problem-based learning helps students apply algorithmic strategies, logical reasoning, and abstract thinking, which improves performance and deepens understanding in mathematics.

Moreover, in order to improve students' mathematical problem-solving abilities, Cahyani et al. (2021) used graphic organizers in conjunction with the Relating-Experiencing-Applying-Cooperating-Transferring (REACT) learning strategy. Over the course of three cycles of classroom action research, the study

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found that students' average problem-solving scores significantly increased from 29.1 to 69.5. According to the research, students' ability to solve mathematical problems, especially in real-world situations, can be successfully enhanced by using structured learning techniques like REACT. Additionally, the study by Nasrullah et al. (2023) looked into how students' interest in learning mathematics and their ability to solve problems were affected by Problem-Based Learning (PBL). The findings showed that PBL greatly improved students' ability to solve problems and boosted their interest in mathematics. In order to improve mathematical competencies, the study emphasizes the significance of dynamic, student-centered learning strategies.

Research Question No. 4: What are the insights of the students in the implementation of KNOWS Strategy and Practice Drills as an intervention?

There were five major themes emerged in this study: 1) enhancing mental clarity; 2) developing analytical confidence; 3) simplifying word problems enhances comprehension; 4) seeing KNOWS as an effective strategy for structured problem solving; and 5) enhancing analytical problem-solving skills. These themes are shown in Table 7.

Table 7. Insights of Students in the Implementation of KNOWS Strategy and Practice Drills as an Intervention

Emerging Themes	Supporting Statements
Enhancing Mental Clarity	• "I felt happy and more confident because the KNOWS Strategy made the problems easier to understand. The steps were simple and clear, so I did not get confused." (IDI-01) • "What I need to do became clearer because of the steps in KNOWS. I felt guided on what to do first and next." (IDI-02) • "My thinking flows more smoothly when I have a guide to follow." (IDI-06)
Developing Analytical Confidence	• "It made it easier to break down the questions and focus on what was being asked. Because of it, I became faster and more accurate in solving.) (IDI-01) • "I understand the process better now. It is not like before when I would just guess and solve randomly—now I know how to analyze the problem." (IDI-03) • "Before, I used to feel pressured just by looking at the problem because it seemed long and hard, but now I am more confident. It really helped with my focus." (IDI-05) • "Now I'm calmer when answering. I even started to enjoy math more because of this." (IDI-09)
Simplifying Word Problems Enhances Comprehension	• "I suggest that the word problems should be made a little simpler and not too difficult. We really struggle sometimes when the question is too complex and the process is too long." (IDI-01) • "It would be better if the word problems are not too long and complicated. Sometimes we get confused by the length and the terms used. If the wording is simpler, we can understand better." (IDI-04) • "Maybe, what I can suggest is to simplify the problems a bit. Because if they're too long and complex, we get overwhelmed. It would be better if the situation is more relatable and easier to understand." (IDI-08) • "The questions should be a bit simpler because sometimes they're too hard to understand. It doesn't have to be super difficult just to help us practice." (IDI-10)
Seeing KNOWS as an Effective Strategy for Structured Problem Solving	• "I would tell them to really use KNOWS so they're always guided. It's great to use especially when the word problem is difficult. You won't get confused because you already know the process." (IDI-02) • "Use KNOWS especially if you get confused. It's not hard to use, and it really helps you understand the problem." (IDI-03) • "Really use the KNOWS Strategy because it guides you through the entire solving process. It helps you understand faster and keeps you from getting overwhelmed by the question. It's nice to use because your answers become more organized." (IDI-07)
Enhancing Analytical Problem-Solving Skills	• "I understand the process better now. It's not like before when I would just guess and solve randomly—now I know how to analyze the problem. I feel trained to think properly before I start computing." (IDI-03) • "Before, I used to be confused about where to start, but now it's clear. It helped me not get confused when analyzing problems." (IDI-06) • "It helped me slowly understand the problem and what is needed. Because of KNOWS, the flow of how I solve is clearer." (IDI-07) • "Before, I used to start solving right away but it turns out wrong. Now, I know how to analyze step by step. Because of KNOWS, my understanding is clearer and my answers are more accurate." (IDI-10)

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The first theme of this study revealed that participants during the intervention of KNOWS Strategy and practice drills contributed to enhancing mental clarity. It was supported by the study of Kennedy and Romig (2024), which emphasizes the significance of Cognitive Load Theory (CLT) in educational settings, noting that structured instructional designs can alleviate the burden on working memory. They argue that when learners are presented with organized information, it facilitates the transfer of knowledge from working memory to long-term memory, enhancing comprehension and retention. Similarly, this finding aligns with Sharma et al. (2023), who emphasized that cognitive restructuring techniques– particularly those using guided step-by-step strategies– enable individuals to reduce confusion and enhance mental clarity.

Moreover, the second theme revealed that KNOWS Strategy has significantly contributed to the development of analytical confidence among students when solving work-related problems involving fractions. The study's outcome was consistent with that of Freeman-Green et al. (2020), which looked at how the SOLVE mnemonic strategy affected the ability of learning-disabled eighth-graders to solve problems. According to the study's findings, students who learned the mnemonic became more adept at solving problems. The students' confidence in their ability to solve word problems increased. Similar to this, a study by Desi et al. (2025) showed that using an open-ended approach in mathematics instruction greatly enhanced students' self-confidence, mathematical comprehension, and capacity for creative thought. According to the study's findings, these methods foster investigation and several approaches to solving problems, which improves students' analytical skills.

Furthermore, the third theme revealed that participants highlighted the need in simplifying word problems to enhance comprehension. The result of the study was supported by the study of McNeil and Kirkland (2021), which looked at the impact of rephrasing difficult word problems to encourage deeper mathematical thinking among middle school students, corroborated the study's findings. According to their research, students who worked through these reformulated problems were more likely to use sophisticated problem-solving techniques and showed enhanced comprehension. The idea that improving comprehension and analytical abilities can result from simplifying word problems' language and structure is supported by this study. Furthermore, a study by Noriega et al. (2024) showed that improving reading comprehension skills has a direct positive impact on students' capacity to solve mathematical word problems. By making problem statements simpler and more consistent with students' reading abilities, educators can facilitate better understanding and problem-solving performance.

Further, the fourth theme revealed that participants recognized the KNOWS Strategy as an effective tool for structured problem-solving, particularly in tackling work-related problems involving fractions. The results of this study accords with that of Abdullah and Abbas (2022), which found that graphic organizers, such as the KNOWS Organizer, improved students' mathematical thinking by helping them recognize important facts and relate them to what they already knew. These organizers aid students in tracking each step and visualizing the problem-solving process, which improves clarity and lessens confusion. In addition, Powell and Fuchs (2020), which stated that students who used structured word-problem organizers showed markedly better comprehension, interpretation, and step-tracking in elementary and middle school mathematics lessons.

In addition, the fourth theme revealed that participants engaging in structured problem-solving strategies, such as the KNOWS strategy, has significantly enhanced their analytical skills. The study's findings were corroborated by a study by Harahap et al. (2024), which highlighted the value of critical thinking in mathematics and discovered that students who received instruction using step-by-step frameworks did better in comprehending and resolving analytical problems. According to the findings of their study, students who followed structured problem-solving procedures were able to approach problems with careful analysis rather than relying solely on guesswork. In the same way, Özkubat et al. (2020) found that the 'Solve It! Teaching students with special needs to solve mathematical word problems has proven successful as a result to the cognitive strategy instruction model, which includes steps like reading, paraphrasing, visualizing, hypothesizing, predicting, calculating, and checking.

CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

The results of the pre-test revealed that the Grade 8 Mt. Apo students had a poor level of performance in solving work-related problems involving fractions, with an overall mean score of only 9.64%. This low performance indicates that students lacked both conceptual understanding and problem-solving strategies necessary for dealing with fraction-based word problems. The findings support previous research which highlights students' struggles with mixed fraction operations, least common denominators, and reducing fractions, suggesting the need for structured interventions to improve foundational skills.

Following the implementation of the KNOWS Strategy and practice drills, the post-test results showed a significant improvement in students' performance, with the mean score rising to 66.06%, classified as satisfactory. This indicates that the intervention was effective in enhancing students' ability to approach and solve work-related problems involving fractions. The improvement is consistent with other studies that found structured and mnemonic-based strategies help students better comprehend, retain, and apply multi-step problem-solving procedures.

Moreover, the statistical analysis using a paired t-test showed a significant difference between the pre-test and post-test scores, with a large effect size (Cohen's d = 3.50), confirming that the KNOWS Strategy and practice drills had a meaningful impact on students' problem-solving skills. This significant

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improvement supports the rejection of the null hypothesis and validates the effectiveness of the intervention. It suggests that structured strategies like KNOWS can lead to both statistical and practical gains in mathematical performance among junior high school students.

Additionally, the students' insights gathered through in-depth interviews highlighted five key themes: 1) enhancing mental clarity; 2) developing analytical confidence; 3) simplifying word problems enhances comprehension; 4) seeing KNOWS as an effective strategy for structured problem solving; and 5) enhancing analytical problem-solving skills. These qualitative insights provide a deeper explanation of why performance improved. Taken together, these themes not only support the observed quantitative results but also highlight the mechanism through which the intervention worked. The structured yet flexible design of the KNOWS strategy addressed both cognitive and emotional barriers to learning, making it a promising tool for enhancing mathematical problem-solving among junior high school students.

RECOMMENDATION

Based on the study's findings, it is recommended that schools adopt the KNOWS Strategy and Practice Drills as an intervention tool in teaching Grade 8 students how to solve work-related problems involving fractions. This structured approach has proven to be effective in enhancing students' problem-solving skills, conceptual understanding, and confidence when dealing with real-life mathematical situations. The use of the KNOWS mnemonic– Know, Need to Know, Organize, Work, and Solution– provides a clear and systematic guide for students to follow, reducing confusion and improving clarity in approaching complex fraction problems.

The structure of the KNOWS Strategy makes it suitable not only for classroom instruction but also for remediation and peer tutoring programs. Teachers are encouraged to integrate this strategy into their regular lesson flow, especially when teaching mathematical word problems. Its step-by-step format helps build learning routines, enhances independent thinking, and supports students who typically struggle with abstract concepts. Moreover, to maximize the effectiveness of the KNOWS Strategy across diverse learner profiles, teachers are encouraged to adapt the strategy for students with disabilities and other learning needs. For learners with reading difficulties or language impairments, teachers can incorporate visual supports, such as icons or graphic organizers, to represent each step of KNOWS (e.g., a magnifying glass for "Know", a question mark for "Need to know").

Further, future studies may consider conducting longitudinal research to assess the sustained impact of the KNOWS Strategy over an extended period—such as across multiple quarters or school years—to determine whether improvements in problem-solving persist or fade without continued reinforcement. This would provide valuable insight into the long-term effectiveness and retention value of the intervention. Additionally, future research could examine how the KNOWS Strategy functions when integrated with technology-enhanced learning platforms or game-based learning environments, especially for students with attention or engagement challenges. A quasi-experimental design with a control group is also recommended to provide more rigorous evidence of causality.

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