



GAOSA CONCEPT BOX: A STRATEGIC APPROACH TO ENHANCING PROBLEM-SOLVING SKILLS

JAYLORD F. RUPINTA

Teacher I

Patrocinio National High School
Claveria West District

ABSTRACT

This study aimed to enhance the problem-solving skills of Grade 7 students using the GAOSA Concept Box, with a population size of 30. A random sampling method, specifically a lottery, was used to select the participants. In the Pretest, 19 students (63%) scored at the poor level, while 11 students (37%) were at the average level in terms of mathematical skills. The researcher implemented the GAOSA Concept Box as a strategic approach to improve learners' problem-solving abilities.

The Posttest results indicated a reduction in the number of students at the poor level, and a significant improvement in their scores, with a two-tailed P value of less than 0.0480. This statistically significant difference suggests that the GAOSA Concept Box is an effective tool for enhancing problem-solving skills. Based on these findings, it is recommended that teachers adopt this strategy to improve learners' problem-solving abilities in mathematics.

Keywords: *problem-solving, GAOSA Concept Box, strategy, mathematical skills, Grade 7 learners*

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CONTEXT AND RATIONALE

The Philippines ranks at the bottom in the latest PISA test on creative thinking, which evaluates 15-year-olds' skills in mathematics, science, and reading (Chi, 2024). By the time students reach 15, they should already be equipped with 21st-century skills, particularly in problem-solving, to adapt to an ever-changing world and become competent in their studies and careers.

Mathematics is present in everyday life, but for some students, it can be difficult. Challenges often arise when students have gaps in their learning. However, when math is engaging and meaningful, it becomes easier to understand. Addressing these learning gaps requires innovative strategies that enhance both mathematical and reasoning skills.

Many students struggle with word problems because they do not know how to start, affecting their comprehension and problem-solving abilities. A pretest conducted with 30 Grade 7 learners from a school in Claveria West District showed that 19 students scored low on a 20-point word problem test, while 11 performed at average or high levels. This highlights the need for a strategy to improve problem-solving and comprehension skills.

The researcher introduced the GAOSA Concept Box as a solution. GAOSA stands for Given, Asked, Operations, Solution, and Analysis. It guides students through the problem-solving process by filling out these sections, with each part contributing a total score of 10 points.

Using math worksheets with the GAOSA concept can help students master problem-solving. These worksheets encourage learners to explore various mathematical concepts, starting with basic ones and gradually moving to more complex problems. This structured approach helps students understand concepts deeply and apply them in different situations (Itecau, 2022).

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21st-century skills can be developed through mathematics. By engaging students in complex mathematical tasks, teachers can foster strategic thinking, which benefits both personal and professional lives (Szabo, 2020).

INNOVATION, INTERVENTION, STRATEGY

The GAOSA Concept Box strategy was innovated by Jaylord F. Rupinta, Teacher I of Patrocinio NHS and was used as an intervention in Grade 7 Mathematics to improve problem-solving skills. **GAOSA Concept Box** was designed to provide a structured approach for students to work through problems methodically, by identifying key elements such as Given, Asked, Operations needed, Solution, and Analysis. It focused on Grade 7 students enrolled in a school in the Claveria West District during the 2024-2025 school year. The intervention was carried out in September 2024. The findings and implications are based on the results from this sample, considering the study's limitations.

The **GAOSA Concept Box** is an instructional strategy designed by Jaylord F. Rupinta, to improve word problem-solving skills. It helps learners systematically break down and analyze word problems by guiding them to identify key information, choose the correct mathematical operations, and evaluate their solutions based on how they arrived at the answer. This approach aims to make problem-solving more structured and effective.

The **GAOSA Concept Box** is a tool with 6 rows and 4 columns designed to help students systematically solve word problems. Here is how it works:

The 4 columns are reserved for sections of the GAOSA process, points, and scores. Scores will be assigned to each section of the GAOSA Concept Box, with a maximum score of 10. Each section will contribute to the overall score based on how well the student completes that part of the problem-solving process.

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Steps for Using the GAOSA Concept Box:

1. Read the problem carefully.
2. Write the information needed in the "Given" section.
3. Identify the question(s) and write them in the "Asked" section.
4. Determine the operations to be used and write them in the "Operations" section.
5. Solve the problem and show your work solutions in the "Solution" section.
6. Analyze and write your interpretation of data based on the results in the "Analysis" section.

This step-by-step approach helps learners break down and solve word problems systematically.

Please refer to the sample word problem below using **GAOSA concept box**.

PROBLEM NO.1		POINTS	SCORE
In 2020, a school recorded a total of 1200 enrollees while in 2022, the total enrollees is1,954. What is the percentage increase in the school’s enrollment? (10 points)			
GIVEN	1200 enrollees in 2020 1,954 in 2022	2	2
ASKED	What is the percentage increase in the school’s enrollment?	2	2
OPERATIONS TO BE USED	Subtraction, Division and Multiplication	1	1
SOLUTION	=1,954-1,200/1,200*100 =754/1,200*100 =0.628*100	2	2

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	= 62.83%		
ANALYSIS	There has been a 62.83% growth in enrollment at the school.	3	3
TOTAL SCORE			10

Figure 1 GAOSA Concept Box

ACTION RESEARCH QUESTIONS

This study aims to improve the problem-solving skills of Grade 7 learners using the GAOSA concept box in a school within the Claveria West District, Claveria, Misamis Oriental. Specifically, it seeks to address the following questions:

1. What is the percentage score of Grade 7 learners on a 20-item word problem test before the use of the GAOSA concept box?
2. What is the percentage score of Grade 7 learners on a 20-item word problem test after using the GAOSA concept box?
3. Is there a statistically significant difference in the numeracy skills of Grade 7 learners before and after using the GAOSA concept box?

Null Hypothesis:

H₀ : Before and after utilizing the GAOSA Concept Box, students in Grade 7 did not significantly differ in their numeracy abilities.

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ACTION RESEARCH METHODS

This study used a Random Sampling Design through a draw-lots of method, selecting 30 respondents to collect the data.

a. Participants

Grade 7 learners enrolled for the school year 2024-2025 in one of the schools in Claveria West, Misamis Oriental, were the participants of the study. Thirty (30) learners participated in this action research.

b. Research Instruments

Pretest Instrument Based on Word Problems from Math 7 Lesson Exemplar. The word problems included in the Math 7 Lesson Exemplar on percentage increase and percentage decrease were employed as the core research instrument for the pretest phase in this study. Developed by Josephine C. Reynoso and Aurora B. Gonzales, Ph.D. of Philippine Normal University – Manila, these word problems were strategically chosen to measure students' initial understanding of these mathematical concepts. This ensured that the research instrument was aligned with both the curriculum standards and the practical application of mathematical skills, making it a reliable tool for assessing students' learning progress.

GAOSA Concept Box, a self-made strategy was utilized to improve students' problem-solving abilities. This method offered a clear, structured approach that guided students through each stage of solving mathematical problems, especially those involving percentage increase and decrease. By encouraging a systematic breakdown of problems, the GAOSA Concept Box played a key role in enhancing students' analytical thinking and solution accuracy. Teachers of mathematics in the district assessed and endorsed the strategy in problem-solving.

c. Data Gathering Method

Data were collected from the identified Grade 7 learners enrolled in one of the schools in Claveria West District during the School Year 2024-2025. The GAOSA Concept Box guided learners in enhancing creative thinking and problem-solving skills.

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d. Data Analysis

Quantitative Analysis

For **Questions 1 and 2**, frequency and percentage **were** used, and pretest and posttest scores **were** compared using an online t-test to measure improvements after implementing the GAOSA Concept Box.

For **Question 3**, statistical analysis **was** conducted to determine if there was a significant difference in students' problem-solving abilities after using the GAOSA Concept Box.

DISCUSSION OF RESULTS AND REFLECTION

Problem 1. What is the percentage score of Grade 7 learners on a 20-item word problem test before the use of the GAOSA concept box?

In Table 1, 63% of the learners (19 out of 30) showed low scores in solving word problems during the pretest. This indicates that a significant portion of the learners struggled with understanding and solving these problems. The high percentage suggests the need for targeted intervention, such as the GAOSA concept box, to enhance problem-solving skills and comprehension.

Table 1. Pretest Results of Solving Word Problems (Percentage Increase and Decrease

Population size (N)	Showed Low Score in Word Problem	Percentage rate
30	19	63%

Problem 2 What is the percentage score of Grade 7 learners on a 20-item word problem test after using the GAOSA concept box?

In Table 2, 37% of the Grade 7 learners (11 out of 30) demonstrated a low score in solving word problems in the posttest. This is a significant improvement from the pretest, where a larger portion of the learners (63%) had low scores. The decrease in the percentage suggests that the GAOSA Concept Box intervention may have been effective in improving

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There is a statistically significant improvement in the students' scores from the pretest to the posttest. This suggests that the GAOSA concept box had a positive effect on their problem-solving abilities. Therefore, the null hypothesis is rejected.

"Thus, it can be suggested that teachers may improve students' thinking skills by focusing not only on the correct answer, but also on the solution processes of different strategies (Güç et al., 2021)."

Recent studies on problem-solving in mathematics have shown that targeted interventions like the GAOSA Concept Box can lead to improvements in students' problem-solving performance, especially when the approach emphasizes cognitive skills and comprehension. The importance of reasoning and information processing in mathematical problem-solving, as highlighted in the PISA studies, aligns with the positive outcomes observed in the intervention group. Moreover, research has found that the coherence between math and science education plays a critical role in transferring problem-solving skills across subjects, suggesting that the approach used in your study could be even more effective when applied across multiple domains of learning (Springerlink,2019).

CONCLUSION

The results from Tables 1 and 2 show a significant improvement in learners' problem-solving skills, with low scores decreasing from 63% in the pretest to 37% in the posttest. The paired t-test results ($P = 0.0480$, $t = 2.0643$) confirm this improvement is statistically significant, indicating that the GAOSA Concept Box intervention effectively enhanced students' ability to solve word problems.

RECOMMENDATIONS

The use of the **GAOSA Concept Box** has shown promise in enhancing problem-solving skills in mathematics, particularly among Grade 7 learners. Based on the findings, the following recommendations can be made to further optimize its use and extend its impact:

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1. Further Integration into Curriculum

The GAOSA Concept Box should be more widely integrated into the regular mathematics curriculum, as this could reinforce its effectiveness in solving word problems.

2. Incorporating Peer Collaboration

Using the GAOSA Concept Box in small groups or pairs can help learners explain their reasoning to peers, which reinforces understanding.

3. Increasing Student Motivation and Engagement

The GAOSA Concept Box could be adapted to include real-life problems, which would make problem-solving more relevant and meaningful for students. This can help improve both motivation and the application of mathematical knowledge.

4. Periodic Evaluations and Adjustments

Regular assessments using both formative and summative evaluation techniques can track the progress of learners using the GAOSA Concept Box.

5. Support for Differentiated Learning

The GAOSA Concept Box can be adapted for differentiated instruction to cater to various learning levels within a classroom.

6. Long-Term Skill Development

To maximize the benefits, the GAOSA Concept Box should be implemented over an extended period, allowing students to build their skills progressively. This prolonged exposure can also help improve mathematical fluency and strategic thinking.

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DISSEMINATION AND ADVOCACY PLANS

The results of this action research will be used to enhance students' problem-solving skills in word problems. The GAOSA Concept Box can serve as a model for other researchers to develop tools that improve problem-solving abilities. It can also be utilized for enrichment activities and to engage learners in more interactive and effective learning experiences.

This tool can be adopted by schools across the district and division. It is designed to be accessible offline, allowing for easy printing and distribution. To ensure wider reach, the GAOSA Concept Box can be published and shared for broader use.

The action plan for implementing the GAOSA Concept Box will be carried out throughout the school year, offering a structured approach to improving problem-solving skills. Recommendations from this research can guide further improvements and inform the development of curriculum and instructional materials.

The findings will be shared with internal and external stakeholders during conferences, training sessions, and seminars focused on numeracy. Schools within the division will be encouraged to adopt this innovation, based on the findings, conclusions, and recommendations from this research.

ACTION PLAN

PHASES	OBJECTIVES	ACTIVITIES	PERIOD	PERSONS INVOLVED	OUTPUT
PLANNING	To enhance problem-solving skills in word problems.	Administered Numeracy screening test. Conduct Pretest	1 day	School Principal Teacher Learners	Improved scores in word problems.
IMPLEMENTATION	To implement and apply the	Administer GAOSA Concept box	2-3 days	School Principal Teacher	Active application of GAOSA

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	strategy GAOSA concept box.			Learners	Concept Box strategy
EVALUATION	To evaluate the effectiveness of the GAOSA Concept box.	Conduct Posttest	1 day	School Principal Teacher Learners	Evaluation results on problem-solving skills
DISSEMINATION	To share findings and recommendations.	Disseminations via online and offline platforms	1 week	School Principal Teacher Learners	Widespread dissemination of research findings

UTILIZATION PLANS

The findings of the study will be a fundamental point of reference for internal and external stakeholders in all high schools, especially those in the Claveria West District, when making decisions and developing policies.

Students' problem-solving and critical thinking abilities can be improved through remedial and enrichment exercises that use the GAOSA Concept Box. The GAOSA Concept Box facilitates significant linkages between subjects by adding pertinent interdisciplinary issues and learning competencies from the curriculum guide across various grade levels. This is in keeping with the Philippine Professional Standards for Teachers (PPST), especially regarding Key Result Area (KRA) 1, which highlights the PPST Module 1's emphasis on applying knowledge across curriculum areas.

Moreover, the GAOSA Concept Box can be improved by incorporating it into ICT-based instructional strategies. This strategy supports a variety of multiple intelligences and meets the educational demands of students, especially in the areas of mathematical and logical intelligence development.

The research's conclusions will help the division as a whole and one high school in the Claveria West District by improving problem-solving abilities.

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PRETEST

WORD PROBLEM

NAME	YEAR & SECTION	SCORE
TEACHER	DATE	PARENTS SIGNATURE

At the end of the lesson the learners will be able to solve problems involving percentage increase and percentage decrease.

B. Solve the following problems.

1. In 2020, a school recorded a total of 1200 enrollees while in 2022, the total enrollees is 1,954. What is the percentage increase in the school's enrollment?
(10 points)

2. Jane reduces her monthly spending from Php 4,500 to Php 3,960. What is the percentage of decrease in her monthly spending? (10 points)

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ASKED		2	
OPERATIONS TO BE USED		1	
SOLUTION		2	
ANALYSIS		3	
TOTAL SCORE			

Table 1.1
Pretest results before using GAOSA Concept Box

Students number	Pretest results
1	20
2	10
3	10
4	0
5	10
6	0
7	20
8	20
9	10
10	20
11	0
12	10
13	0
14	20

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15	10
16	0
17	10
18	10
19	0
20	0
21	10
22	20
23	20
24	0
25	20
26	20
27	20
27	20
29	0
30	10

Table 2
Posttest results using GAOSA Concept Box

Students number	Posttest using GAOSA Concept Box
1	18
2	18
3	16
4	2
5	20
6	7
7	18
8	19

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9	20
10	14
11	10
12	4
13	14
14	14
15	2
16	11
17	20
18	14
19	2
20	2
21	18
22	15
23	20
24	18
25	18
26	19
27	15
27	10
29	8
30	15

Table 3. Paired t-test results on the significant difference between the pretest and posttest from before and after the use of GAOSA Concept Box

	Mean	P value (two-tailed value)	t	Remarks
Pretest	10.67			
Posttest	13.37	0.0480	2.0643	

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By conventional criteria, this difference is statistically significant

Notes: mean of Pretest and Posttest is -2.70 $N=30$ $df = 29$
95% confidence interval of this difference from -5.38 to -0.02

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FINANCIAL REPORTS

Proposal (1 st Phase)				
Activities/Strategies	Item	Quantity	Unit Price	Total Price
Crafting of Research Proposal	Internet Service	1 unit	200.00	200.00
	Bond-Paper (Short)	50 pcs.	1.00	50.00
Full-blown (2 nd Phase)				
Crafting of Completed Action Research	Internet Service	1 unit	200.00	200.00
	Bond paper (A4)	150	1.00	150.00
	Soft bond	4	100.00	400.00
TOTAL EXPENSES				1,000.00

Source: Personal fund

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