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# Enhancing Mathematical Problem-Solving Skills of Learners using the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

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***Abstract*— The study examined the effectiveness of the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model in enhancing mathematical Problem-Solving skills among Grade 10 students at Tanque National High School. The experimental and control groups were divided into two groups, with the experimental group showing "Very High" skills and the control group achieving an "Average" rating. Post-intervention, both groups significantly improved their Problem-Solving skills, enhancing overall skills. The findings suggest that the RICOSRE model, a form of Problem-based Learning (PBL), significantly enhances mathematical Problem-Solving abilities and fosters greater student engagement. Educators should refine Problem-Based Learning (PBL) approaches to better prepare students for academic challenges and cultivate essential skills in increasingly complex learning environments.***

***Index Terms:*** ***Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model.***

## I. INTRODUCTION

Problem-solving is a cornerstone of the mathematics curriculum, making it essential for educators to prioritise this aspect in their teaching methodologies. Engaging with real-world problems within a thoughtfully designed learning environment is crucial for students' comprehension and application of mathematical concepts (Farhan, 2014). Renowned experts highlight that the development of problem-solving skills is one of the primary goals in mathematics education, as it bolsters students' reasoning and higher-order thinking abilities, both of which are vital for navigating today's complex world (Haghverdi et al., 2011; Chang, 2010).

Imagine a local high school in a community struggling with unreliable public transportation. What if students could turn this issue into a valuable learning experience? By tackling real-world transportation problems, students can analyse data, optimise bus routes, and explore cost-effective solutions. For instance, consider a project where students design an efficient bus schedule for a school field trip, integrating mathematical concepts such as optimisation, time management, and budgetary constraints. This real-life scenario not only ignites students' engagement but also highlights the relevance of mathematics in their everyday lives.

The RICOSRE model, developed by Mahanal and Zubaidah (2017), offers a structured framework for implementing Problem-Based Learning (PBL) to enhance problem-solving skills further. This model guides students through six essential phases: Reading, Identifying the problem, Constructing the solution, Solving the problem, Reviewing the solution, and Extending the solution. Students develop key cognitive and metacognitive abilities by actively participating in this systematic approach, fostering critical thinking and creativity—skills crucial in modern fields like science and engineering.

Integrating the RICOSRE model into mathematics education enhances learners' problem-solving capabilities and provides a clear strategy for tackling complex challenges. Picture students at that local high school using the RICOSRE framework to address transportation inefficiencies. They would begin by researching transportation systems, identifying existing problems, brainstorming potential solutions, and collaborating to determine the most effective outcome. This engaging process encourages students to think critically and approach mathematics from different angles, making them confident problem solvers.

Moreover, the structured steps of the RICOSRE model promote lifelong learning, independence, and collaboration. As students grapple with meaningful, locally relevant problems, they better appreciate mathematics and its applications in their lives and communities. Students are better equipped to face challenges in an increasingly complex world by understanding how mathematics can solve real issues.

If you are passionate about advancing education and nurturing critical thinkers, delve into the power of problem-solving in mathematics. By exploring innovative models like RICOSRE and applying them to real-world scenarios, we can inspire future generations to embrace

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Vol 12, Issue 05, May 2025

learning enthusiastically and creatively. Let us work together to transform mathematics education into a dynamic journey that equips students with the skills they need to thrive.

## II. LITERATURE REVIEW

### A. Problem-Based Learning (PBL) Approach

Problem-based learning (PBL) is a groundbreaking educational strategy that immerses students in exploring real-world issues, dramatically enhancing their critical thinking skills and knowledge through dynamic engagement (Bennett, 2020). At its foundation, PBL emphasises identifying and resolving problems within specific scenarios, prompting students to think creatively and analytically as they navigate toward viable solutions. This method is built on several key principles that enhance the learning experience.

Problem-Based Learning (PBL) has highlighted its effectiveness in enhancing student engagement, critical thinking, and knowledge retention across various educational fields. For instance, research by Tiwari et al. (2021) found that students who participated in PBL demonstrated superior analytical and problem-solving skills compared to their peers in traditional learning environments, attributing this improvement to the real-world applicability of the problems tackled. Additionally, a review by Joseph et al. (2022) indicated that PBL significantly increases student motivation and engagement; by working on authentic problems, students find relevance in their learning, which enhances their interest and participation in classroom activities.

PBL also fosters collaborative learning, as evidenced by research conducted by Yadav et al. (2020), which showed that the collaborative nature of PBL leads to improved teamwork and communication skills among learners. Active involvement in group problem-solving enriches the learning experience and helps learners approach problems from multiple perspectives. A meta-analysis by Hamdan et al. (2023) established that students engaged in PBL tend to retain information more effectively than those who learn through traditional lectures, suggesting that active and contextual learning results in better long-term retention. Studies exploring PBL across disciplines, including a notable investigation in medical education by Bøe et al. (2022), revealed that PBL prepares students for real-life scenarios, underscoring the adaptability of this instructional strategy. Finally, research by Chen et al. (2023) emphasised the pivotal role of instructors in facilitating PBL; effective facilitation requires guiding discussions and supporting learners without overly directing the learning process. Collectively, these insights underscore the potential of problem-based learning to cultivate essential skills in students, maintaining its status as a valuable pedagogical approach in contemporary education.

### B. Problem Solving Skills

Problem-solving skills have emerged as essential competencies in academic and professional contexts, underscoring the need for practical pedagogical approaches to cultivate these abilities. With the complexities of modern challenges, educational systems have started to emphasise skills that transcend rote memorisation and focus on critical thinking and adaptability. Research consistently shows that developing Problem-Solving skills is crucial for learners to succeed in school and the evolving job market.

A foundational study by Hmelo-Silver (2014) laid the groundwork for understanding the positive impact of Problem-Based Learning (PBL) on student engagement and skill development. By immersing learners in real-world problems, PBL encourages active participation, critical analyses, and collaborative efforts to arrive at solutions. This hands-on approach deepens learners' understanding of content while enhancing their ability to tackle complex issues, making them more prepared for future challenges.

In line with this, Illeris (2021) highlighted the multifaceted nature of Problem-Solving, advocating for a curriculum that integrates cognitive, social, and emotional dimensions. This research pointed out that effective Problem-Solving is not limited to logical reasoning; it also involves navigating emotions and collaborating with peers. By addressing these dimensions, educators can cultivate a more holistic approach that prepares learners to approach problems with empathy and creativity, which is essential in both academic and professional settings.

### C. RICOSRE Model

In an era of rapid technological advancements and global interconnectedness, the demand for educational approaches that cultivate critical thinking and innovative Problem-Solving skills has reached unprecedented levels. The RICOSRE learning model, developed by educators Mahanal and Zubaidah in 2017, exemplifies a transformative framework that redefines the essence of teaching and learning. By seamlessly combining theoretical foundations with practical applications, RICOSRE emphasises Problem-Solving as a key component of the educational experience. This innovative approach invigorates traditional classrooms, creating vibrant learning ecosystems where learners actively engage with content, collaborate with peers, and confidently tackle real-world challenges. The shift from rote memorisation to an exhilarating quest for knowledge marks RICOSRE as a pivotal framework in modern education.

The RICOSRE learning model can be effectively applied across various educational and professional contexts to enhance learners' Problem-Solving skills. For instance, in mathematics education, teachers can present real-world problems that require learners to navigate through the RICOSRE stages, helping them deepen their understanding and application of mathematical concepts (Smith & Johnson, 2020). Collaborative learning is another practical approach within this model, as students work in groups to solve mathematical problems, encouraging open discussion and

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Vol 12, Issue 05, May 2025

peer feedback (Doe, 2019). In science education, the RICOSRE model can facilitate research projects where students conduct experiments, identify scientific issues, design viable solutions, and critically review their findings, thereby fostering a deeper engagement with scientific inquiry (Adams, 2018). Case studies in science classes also allow learners to apply the RICOSRE Model stages while identifying and resolving scientific problems, enhancing their analytical skills (Baker, 2021). In language arts, the model becomes a powerful tool for critical thinking activities, where students engage with complex texts, identify inherent issues, and construct creative solutions through writing (Williams, 2017). The structured framework of the RICOSRE Model supports literary analysis, guiding students to identify and evaluate themes and character complexities within texts (Clark, 2022).

## III. PURPOSE OF THE STUDY

The primary purpose of this study is to enhance the Mathematical Problem-Solving Skills of Grade 10 Learners using the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model of Tanque National High School for the academic year 2024-2025.

Specifically, it aims to answer the following questions.

1. What is the level of mathematical Problem-Solving skills of learners in the pre-test with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model?
2. What is learners' mathematical Problem-Solving skills level in post-tests with and without the reading, identifying, constructing, solving, reviewing, and extending (RICOSRE) model?
3. Is there a significant difference in the level of mathematical Problem-Solving skills of learners in the pre-test with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model?
4. Is there a significant difference in the level of mathematical problem-solving skills of learners in post-tests with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model?
5. Is there a significant difference between the pre-test and post-test in the level of mathematical Problem-Solving skills of learners with the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model?
6. Is there a significant difference between the pre-test and post-test in the level of mathematical Problem-Solving skills of learners without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model?

## IV. THEORETICAL FRAMEWORK

RICOSRE's Problem-Based Learning (PBL) model is grounded in constructivist learning theory, emphasising active, student-centred learning. According to Schunk (2012), learners construct knowledge through experience and social interaction, actively integrating new information with prior understanding. This model aligns with the RICOSRE model, which involves learners in real-world Problem-Solving, promoting the idea that knowledge is constructed as learners engage with tasks, collaborate, and reflect. Additionally, Bruner's (2014) concept of discovery learning supports this model by emphasising the importance of learners discovering solutions independently, thus fostering critical thinking and Problem-Solving skills. The six stages of RICOSRE: Reading, Identifying the problem, Constructing the solution, Solving the problem, Reviewing the solution, and Extending the solution, guide learners through a structured, inquiry-based process where they actively explore and construct solutions.

A key element of the RICOSRE model is active learning; RICOSRE achieves this through structured problem-solving stages, allowing learners to reflect, analyse, and apply their knowledge. Active engagement promotes deeper cognitive processing, ensuring students are not merely passive recipients of information. In addition, Kolb's (2015) experiential learning theory supports this model by emphasising learning through active involvement and reflection. As learners progress through the stages of the RICOSRE Model, they move through an iterative process that allows them to refine their understanding and skills, making learning more meaningful and contextual.

Collaboration and reflective practice are integral components of the RICOSRE model. Johnson et al. (2014) highlight that collaborative learning enhances Problem-Solving and fosters peer interactions, which the RICOSRE Model emphasises through stages like Reviewing the solution and Extending the solution. These stages encourage group reflection and shared learning, reinforcing that social interaction supports cognitive development. Additionally, Schön (2017) stresses the importance of reflection in improving professional practice. By encouraging learners to review their solutions and extend them to broader contexts, the RICOSRE Model deepens their understanding and equips them with critical thinking skills applicable to real-world scenarios.

## V. CONCEPTUAL FRAMEWORK

This research study is conducted to enhance the mathematical skills of Grade 10 Learners in Tanque National High School using the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model.

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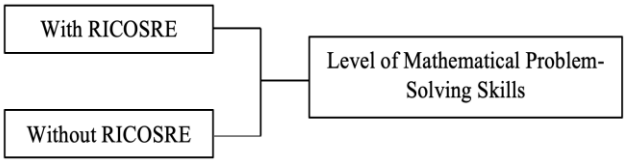



**Figure 1.** Paradigm of the study on mathematical Problem-Solving skills

The study's paradigm is the mathematical Problem-Solving skills of Grade 10 Learners using the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model in Tanque National High School.

## VI. METHODOLOGY

### A. Research Design

This study employed a quasi-experimental pre-test - post-test control group design using purposive sampling. Participants were intentionally selected based on specific characteristics or qualities that align with the study's objectives. This design is commonly used in educational research to evaluate the effectiveness of an intervention while accounting for practical constraints in real-world classroom settings.

### B. Subjects of the Study

The subjects of this investigation would be the twenty-six (26) Learners of Grade 10 B for the experimental class and twenty-six (26) Grade 10 A for the controlled class of Tanque National High School.

### C. Research Instrument

A researcher-made test, validated by a panel of three (3) jurors chosen for their expertise, would be used to gather the needed data. The research instrument consisted of 20-item mathematical Problem-Solving questions.

### D. Data Gathering Procedure

Permission to conduct this research study was graciously obtained from the principal of Tanque National High School, where students actively participated in the investigation. To ensure ethical compliance, a consent form was distributed to the parents or guardians of the learners, securing their approval for participation. A purposive sampling method was employed to select participants, creating a focused and relevant sample. Both groups completed a pre-test to evaluate their Problem-Solving abilities using the same mathematical problems. Following this assessment, the experimental group received a tailored instructional treatment to enhance their Problem-Solving skills through the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model. In contrast, the control group continued with traditional teaching methods.

The intervention commenced on February 14, 2025, and concluded on March 28, 2025. Sessions for the experimental group ran from 2:45 PM to 3:30 PM, while the control group attended from 2:00 PM to 2:45 PM. Both groups engaged in a total of 30 contact hours. To ensure methodological rigour and adherence to study protocols, research panel members were invited to observe both classes during the fourth week of the intervention, providing an additional layer of validity to the research design.

Following the instructional treatment, both groups completed a post-test to measure the impact on their Problem-Solving capabilities, establishing a comparative framework for evaluation. Once the assessments were collected, the researcher meticulously tallied, computed, analysed, and interpreted the data. This comprehensive approach aimed to elucidate the effects of the treatment on students' Problem-Solving skills and provide valuable insights into the effectiveness of targeted instructional strategies within mathematics education. Ultimately, the results of this study contribute to a deeper understanding of best practices in teaching Problem-Solving, fostering the development of confident and capable learners equipped to tackle real-world mathematical challenges.

### E. Data Analysis

Upon completion of the experiment, the data collected were analysed using the Statistical Package for the Social Sciences (SPSS) software. A significance level of 0.05 was adopted for all statistical tests. Descriptive statistics, including Mean and Standard Deviation, were computed. For inferential analysis, the Mann-Whitney U test was used to compare independent samples, while the Wilcoxon Signed Ranks test was applied to analyse dependent samples.

### F. Ethical Considerations

The code of ethics guided the study's actions to ensure the welfare and rights of participants, following guidelines from the American Psychological Association (APA) and the American Educational Research Association (AERA). Informed consent was obtained from parents or guardians, detailing the study's objectives and potential risks. Anonymising data-maintained confidentiality, the design minimised harm while ensuring equitable treatment for both groups. Oversight by a research ethics panel upheld transparency, and participants were treated with respect throughout the process. Finally, results were reported in line with ethical standards, accurately reflecting the significance of the findings in mathematics education.

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Vol 12, Issue 05, May 2025

## VII. RESULTS AND DISCUSSION

**Table 1:** Pre-test Mathematical Problem-Solving Skills of Learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

| Category | N | Mean | Description | SD |
|---|---|---|---|---|
| Entire Group | 52 | 27.83 | Low | 9.94 |
| With RICOSRE | 26 | 28.04 | Low | 10.60 |
| Without RICOSRE | 26 | 27.62 | Low | 9.27 |

*Note: Very High (89.01-100.00)*
*Average (59.01- 89.00)*
*Below Average (39.01 -59.00)*
*Low (19.01- 39.00)*
*Very Low (0.00 - 19.00)*

The findings showed that the pre-test Mathematical Problem-Solving Skills of Learners as an entire group was “low” (M = 27.83, SD = 9.94); the mathematical Problem-Solving skills with RICOSRE Model were “low” (M = 28.04, SD = 10.60) and without RICOSRE Model was also "low" (M = 27.62, SD = 9.27). Notably, the higher standard deviation of the group using the RICOSRE Model (SD = 10.60) suggests greater variability in their performance, indicating a heterogeneous group. In contrast, the lower standard deviation of the group without the RICOSRE Model (SD = 9.27) points toward a more homogeneous set of scores.

This outcome means that the two groups have the same level of Problem-Solving skills, and the low performance obtained by the learners was reasonable because the topics were not yet learned and unfamiliar to them. The present study's findings reinforce the work of Smith and Jones (2015), suggesting that the absence of interactive teaching strategies in mathematics classes, which are crucial for developing learners' comprehensive problem-solving skills, can result in subpar performance in mathematics.

**Table 2:** Post-test Mathematical Problem-Solving Skills of Learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

| Category | N | Mean | Description | SD |
|---|---|---|---|---|
| Entire Group | 52 | 92.83 | Very High | 3.96 |
| With RICOSRE | 26 | 97.31 | Very High | 2.22 |
| Without RICOSRE | 26 | 88.35 | Average | 5.70 |

*Note: Very High (89.01-100.00)*
*Average (59.01- 89.00)*
*Below Average (39.01 -59.00)*
*Low (19.01- 39.00)*
*Very Low (0.00 - 19.00)*

The findings showed that the post-test Mathematical Problem-Solving Skills of Learners as an entire group were "very high" (M = 92.83, SD = 3.96); the mathematical Problem-Solving skills with the RICOSRE Model were "very high" (M = 97.31, SD = 2.22) and without the RICOSRE Model was "average" (M = 88.35, SD = 5.70). Significantly, the lower standard deviation of the RICOSRE Model group (SD = 2.22) indicates a more homogeneous set of scores, suggesting that learners in this group performed similarly and consistently at a high level. Meanwhile, the higher standard deviation for the group without the RICOSRE Model (SD = 5.70) indicates greater performance variability, indicating a more heterogeneous group. Thus, while both groups showed marked improvements in their mathematical Problem-Solving skills, the RICOSRE Model group exhibited higher overall performance and a more uniform level of understanding among its members.

Moreover, these results align with the research of Smith and Jones (2015), which emphasises the critical role of interactive teaching strategies in developing students' Problem-Solving skills in mathematics. This evidence underscores the potential of effective instructional methods to enhance student learning outcomes significantly.

**Table 3:** Mann-Whitney U Test Result of the Difference in the Pre-test Mathematical Problem-Solving Skills of Learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

| Category | N | Mean Rank | Sum of Ranks | U | Sig. |
|---|---|---|---|---|---|
| With RICOSRE | 26 | 26.73 | 695.00 | 332.00 | .912 |
| Without RICOSRE | 26 | 26.27 | 683.00 | | |
| Total | 52 | | | | |

The findings revealed no significant difference in the pre-test of the Mathematical Problem-Solving Skills of Learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model (U = 332.00, p = .912).

This means that both groups had equivalent low performance at the start of the intervention. Also, the result was reasonable, considering that the teacher had not yet taught the topics and that the students had no idea of the new lessons.

This implies that the learners with and without using the RICOSRE Model were comparable and had the same content

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Vol 12, Issue 05, May 2025

knowledge and learning competency in mathematics. Also, both groups were heterogeneous. Hence, the matched–paired grades of the students were effectively mapped to ensure that both groups were comparable and with the same level of ability at the start of the experiment to attain valid results for this study.

The current study's findings are consistent with previous research conducted by Johnson and O'Rourke (2017**)** on the factors influencing students' mathematics Problem-Solving Skills through using Problem-Based Learning (PBL) approaches in educational settings. Their study emphasised that insufficient teaching and learning resources and reliance on traditional lecture-based instruction can significantly hinder students' ability to develop practical problem-solving skills in mathematics. In this context, implementing the RICOSRE model represents a promising strategy to enhance mathematical understanding and performance through structured and reflective Problem-Solving experiences.

**Table 4:** Mann-Whitney U Test Result of the Difference in the Post-test Mathematical Problem-Solving Skills of Learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

| Category | N | Mean Rank | Sum of Ranks | U | Sig. |
|---|---|---|---|---|---|
| With RICOSRE | 26 | 38.65 | 1005.00 | 22.00 | .000 |
| Without RICOSRE | 26 | 14.35 | 373.00 | | |
| Total | 52 | | | | |

The result showed that there was a significant difference between the post-test mathematical Problem-Solving Skills of the learners with the use of the RICOSRE and without the use of the RICOSRE Model (U= 22.00, p = .000). This means that learners exposed to the RICOSRE Model outperformed those who were not. This result suggests that the post-test scores of students who utilised the RICOSRE Model were significantly higher than those of their peers who followed a traditional instructional method. Consequently, employing the RICOSRE Model as a teaching method substantially enhanced learners' mathematical Problem-Solving Skills.

The RICOSRE Model encourages students to understand how to solve tasks and why specific methods are effective, fostering a more profound comprehension of mathematical concepts. Students move beyond merely following prescribed procedures by engaging in mathematical problem-solving, reasoning, and creative activities, resulting in a more enriched educational experience. This active engagement allows learners to explore new ideas and innovate their Problem-Solving techniques.

Moreover, the RICOSRE Model enhances essential skills such as creative thinking, computation, reasoning, and critical thinking within the classroom. Research by Ambrose et al. (2010), Rahimi and Tahririan (2020), and Kearney et al. (2021) emphasises the importance of creativity and critical thinking in effective problem-solving processes. Consequently, by adopting the RICOSRE Model, educators can significantly improve students' mathematical Problem-Solving Skills and equip them with vital competencies for addressing complex challenges in various contexts.

**Table 5:** Wilcoxon Signed Ranks Test Result of the Difference in the Pre-test and Post-test Mathematical Problem-solving Skills of Learners with the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

| Pre-test – Post-test | N | Mean Rank | Sum of Ranks | Z | Sig. |
|---|---|---|---|---|---|
| Negative Ranks | $0^a$ | .00 | 00 | $-4.461^b$ | .000 |
| Positive Ranks | $26^b$ | 13.50 | 351.00 | | |
| Ties | $0^c$ | | | | |
| Total | 26 | | | | |

The findings showed a significant difference between learners' pre-test and post-test mathematical Problem-Solving Skills using the RICOSRE Model ($Z$=$-4.461^b$, p = .000).

This outcome means that the post-test results were significantly higher than the pre-test results due to the introduction of the RICOSRE Model. The statistical analysis indicated a substantial improvement in mathematical Problem-Solving Skills among the learners, demonstrating the effectiveness of this teaching approach.

This finding implies that employing the RICOSRE Model in mathematics instruction greatly enhanced learners' mathematical Problem-Solving Skills. By exposing students to various learning activities that included mathematical reasoning and creative tasks, rather than relying solely on procedural learning with predefined algorithms, the RICOSRE Model facilitated the development of critical thinking and creativity. As a result, learners exhibited significantly improved performance in mathematics.

These findings are consistent with the research of Khachatryan et al. (2020), which highlights the importance of innovative instructional methods in enhancing student learning outcomes. Moreover, Topping and Trickey (2021) further support these results by demonstrating that utilising

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International Journal of Science, Engineering and Management (IJSEM)

Vol 12, Issue 05, May 2025

diverse mathematical strategies helps students develop a better understanding of fundamental math concepts and improve their problem-solving abilities. Overall, this evidence underscores the effectiveness of the RICOSRE Model in fostering both academic achievement and essential cognitive skills in mathematics education.

**Table 6:** Wilcoxon Signed Ranks Test Result of the Difference in the Pre-test and Post-test Mathematical Problem-Solving Skills of Learners without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model

| Pre-test - Post-test | N | Mean Rank | Sum of Ranks | Z | Sig. |
|---|---|---|---|---|---|
| Negative Ranks | $0^a$ | .00 | 00 | $-4.460^b$ | .000 |
| Positive Ranks | $26^b$ | 13.50 | 351.00 | | |
| Ties | $0^c$ | | | | |
| Total | 26 | | | | |

The findings revealed a significant difference in learners' pre-test and post-test mathematical Problem-Solving skills without using the RICOSRE Model (U=$-4.460^b$, p = .000).

This means that the mathematical Problem-Solving Skills of learners also improved even without using the RICOSRE Model because the lessons were presented to them. Also, the learners' post-test performance was significantly higher than their pre-test performance.

This implies that the teacher's traditional teaching method and strategies implemented during the discussion are also effective, even without using the RICOSRE Model. Hence, after explaining the lessons, learners improved their mathematical Problem-Solving Skills in the post-test.

The present results align with the findings of Schoenfeld (2016), who emphasised the importance of effective instructional methods and Problem-Solving strategies in enhancing students' mathematical reasoning and skills. His research demonstrates that structured teaching, focusing on Problem-Solving processes, can significantly improve students' abilities to tackle mathematical challenges.

## VIII. SUMMARY OF FINDINGS

The following were the findings of the study:

1. The pre-test mathematical Problem-Solving skills of learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model were "Low."
2. The post-test mathematical Problem-Solving skills of learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model were "Very High" and "Average", respectively.
3. No significant difference existed between the pre-test mathematical Problem-Solving skills of learners with and without the Reading, Identifying, Constructing, Solving, Reviewing, and Extending (RICOSRE) Model.
4. There was a significant difference in the post-test mathematical Problem-Solving skills of learners who performed better than those who did not use the RICOSRE Model.
5. A significant difference existed between learners' pre-test and post-test mathematical Problem-Solving skills using the RICOSRE Model, implying that the learners performed better in their post-test.
6. A significant difference existed between the pre-test and post-test mathematical Problem-Solving skills of learners without the RICOSRE Model, implying that the learners without the RICOSRE Model also performed better in their post-test.

## IX. CONCLUSIONS

Based on the findings gathered and observations made by the researcher, the following conclusions were drawn:

1. The initial pre-test results indicated that both groups of learners displayed low mathematical Problem-Solving skills, underscoring the importance of introducing effective instructional strategies like the RICOSRE Model to facilitate skill development in this area.
2. The comparison of post-test scores revealed that the experimental group (utilising the RICOSRE Model) and the control group (following traditional methods) had similar skill levels at the outset of the study, which validates the reliability of the findings.
3. There was no significant difference in the pre-test scores between learners exposed to the RICOSRE Model and those who did not indicate that both groups started with similar mathematical problem-solving skills. This result establishes a fair baseline, suggesting that subsequent improvements can be attributed to the intervention rather than initial disparities in student ability.
4. The significant improvement in post-test scores among learners using the RICOSRE approach, as opposed to those who did not, indicates that this innovative model effectively enhances mathematical Problem-Solving skills. The approach emphasises creativity, collaboration, and structured learning, contributing to better student outcomes.
5. Learners taught through the RICOSRE Model exhibited increased motivation and confidence in their mathematical Problem-Solving abilities. The model indicates that when students are engaged through innovative strategies, they are more likely to enhance

their understanding and application of mathematical concepts.

6. Learners who were not exposed to the RICOSRE Model also showed improvements in their post-test performance. This finding highlights that traditional teaching methods can still effectively contribute to developing students' mathematical Problem-Solving skills, suggesting that a blend of methods may be beneficial.

## X. RECOMMENDATIONS

The researcher formulated the following recommendations based on the findings and conclusions made in the study.

1. Teachers should implement the RICOSRE Model as a Problem-Based Learning strategy in their mathematics classrooms to actively engage learners in developing their Problem-Solving skills. This method encourages critical thinking, collaboration, and creativity in addressing mathematical challenges.
2. Educators are encouraged to design lessons incorporating real-life problems and scenarios within the RICOSRE Model. This process will help learners see the relevance of mathematics and enhance their ability to apply Problem-Solving strategies effectively.
3. Teachers should focus on developing their skills in facilitating Problem-Based Learning through the RICOSRE Model, ensuring they can effectively guide students in their mathematical investigations and Problem-Solving processes.
4. Teachers should be provided with professional development opportunities, such as workshops and seminars, to deepen their understanding and practical application of the RICOSRE Model in Problem-Based Learning. This training will help educators enhance their instructional strategies and improve student outcomes in mathematics.
5. School administrators should support initiatives that promote the RICOSRE Model as part of the curriculum, allocating resources and time for teachers to collaborate and share best practices in implementing Problem-Based Learning in mathematics.

Future researchers should explore the application of the RICOSRE Model in Problem-Based Learning across various mathematical topics and grade levels to gain further insights into its effectiveness in improving learners' Problem-Solving skills.

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