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# The Effectiveness of the Utilization of the Strategies in Improving the Problem-Solving Skills of the Grade 4 Learners in Libon East District, Division of Albay

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**ABSTRACT**

This study examined the extent of utilization and perceived effectiveness of instructional strategies in improving the mathematical problem-solving skills of Grade 4 learners in Libon East District, Division of Albay, Philippines, during School Year 2025–2026. Employing a descriptive–evaluative–correlational research design, the study involved 30 Mathematics teachers from 22 public elementary schools. Data were gathered using a validated researcher-developed questionnaire with an overall Cronbach's alpha of 0.75 and analyzed using descriptive statistics, Kendall's Coefficient of Concordance, and the chi-square test. Findings revealed that instructional strategies were extensively utilized (M = 4.45) and perceived as effective (M = 4.43). Improving learners' confidence received the highest utilization rating (M = 4.51), while mathematical communication demonstrated the highest perceived effectiveness (M = 4.67). Significant agreement on strategy utilization was established only in understanding the problem ($W = 0.782$, $p < .05$), whereas no significant agreement was found across perceived effectiveness dimensions. The study concludes that instructional practices were favorably assessed, although error identification, critical thinking, and creativity require further improvement. Accordingly, strengthening diagnostic assessment, targeted remediation, teacher professional development, and instructional monitoring is recommended. The localized setting, teacher-reported assessments, and absence of direct learner performance measurements limit generalizability and causal interpretation. The study provides an empirical foundation for formulating responsive mathematics education policies, supporting SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 17 (Partnerships for the Goals), while promoting educational, institutional, and social sustainability through continuous instructional improvement and stakeholder collaboration.

**Keywords:** *Critical Thinking, Elementary Education, Instructional Strategies, Mathematical Communication, Mathematics Education, Problem-Solving Skills, Teacher Development*

## 1. INTRODUCTION

Mathematics is a fundamental learning area that develops learners' logical reasoning, analytical thinking, decision-making, and problem-solving skills. However, elementary learners continue to experience difficulties in understanding mathematical concepts, interpreting word problems, selecting appropriate solution strategies, and identifying errors. Structured mathematical word-problem interventions have demonstrated favorable effects on the performance of elementary learners experiencing mathematical difficulties (Myers et al., 2022). Effective mathematics instruction requires learner-centered strategies that promote conceptual understanding, active participation, confidence, and the practical application of mathematical knowledge. Pentang et al. (2023) identified difficulties in mathematical problem-solving and mathematics avoidance among Filipino elementary preservice teachers, highlighting the importance of teacher preparation and instructional competence. Similarly, Macapayad et al. (2024) reported improvements in mathematical problem-solving performance following peer tutoring among Grade 10 learners, while Cano and Lomibao (2023) demonstrated the potential of phenomenon-based learning videos to strengthen mathematical self-efficacy, reasoning, and problem-solving skills. In the Philippines, the MATATAG Curriculum provides a contemporary policy framework for strengthening foundational competencies and improving curriculum delivery (Department of Education, 2024). Against this background, the present study examined the extent of utilization and perceived effectiveness of instructional strategies in improving the problem-solving skills of Grade 4 learners in Libon East District, Division of Albay, as a basis for formulating policy recommendations.

### Research Problem

Despite the emphasis on problem-solving in mathematics education, learners continue to encounter difficulties in conceptual understanding, problem comprehension, and the application of appropriate mathematical procedures. Vessonen et al. (2024) identified linguistic and numerical task characteristics that contribute to difficulties in solving mathematical word problems among elementary learners. Furthermore, mathematical proficiency remains a national concern, with only 16% of Filipino learners participating in PISA 2022 attaining at least Level 2 proficiency in mathematics (OECD, 2023). Although previous studies have examined structured problem-solving interventions, collaborative learning, and technology-supported instruction, limited contextualized evidence describes the utilization and perceived effectiveness of these strategies among Grade 4 Mathematics teachers in Libon East District. Specifically, there is a need to examine instructional practices involving mathematical concepts, problem comprehension, error identification, learner confidence, and appropriate instructional methods. Addressing this gap may provide an empirical basis for strengthening mathematics instruction, teacher development, and educational policy implementation.

### Assumptions of the Study

The study assumed that the extent of utilization of mathematics teaching strategies and their perceived effectiveness in improving learners' problem-solving skills could be systematically assessed and that relevant policy recommendations could be formulated based on the findings. Accordingly, the study tested two null hypotheses: that there is no significant agreement on the rank orders of the extent of utilization of mathematics teaching strategies and that there is no significant agreement on the rank orders of their perceived effectiveness in strengthening learners' problem-solving skills.

**Objectives of the Study**

This study aimed to determine the extent of utilization and perceived effectiveness of instructional strategies in improving the mathematical problem-solving skills of Grade 4 learners in Libon East District, Division of Albay, during School Year 2025–2026. Specifically, it sought to assess the utilization of strategies in identifying key mathematical concepts, understanding problems, identifying errors, improving learners' confidence, and using appropriate instructional methods. Furthermore, it evaluated their perceived effectiveness in developing critical thinking, creativity and innovation, decision-making, collaboration and teamwork, and mathematical communication. The study also examined significant agreement on the rank orders of strategy utilization and effectiveness among the different respondent groups. Ultimately, the findings served as the basis for formulating policy recommendations to strengthen mathematics instruction and learners' problem-solving competencies.

**Theoretical or Conceptual Basis**

The study was anchored in George Pólya's Problem-Solving Theory, Jean Piaget's Cognitive Development Theory, Lev Vygotsky's Social Constructivist Theory, Jerome Bruner's Discovery Learning Theory, and the Information Processing Theory associated with Richard Atkinson and Richard Shiffrin. Pólya's framework emphasizes understanding the problem, devising a plan, implementing the plan, and evaluating the solution (Chusna et al., 2024). Cognitive Development Theory emphasizes developmentally appropriate learning experiences, while Social Constructivist Theory and Discovery Learning Theory highlight guided participation, collaboration, exploration, and active knowledge construction (Skene et al., 2022). Furthermore, Information Processing Theory emphasizes attention, memory, and the processing of information, which are relevant to the cognitive demands of mathematical problem-solving (Vessonen et al., 2024). Conceptually, the study examined the utilization of instructional strategies through five dimensions: identifying key mathematical concepts, understanding the problem, identifying errors, improving learners' confidence, and using appropriate instructional methods. Correspondingly, perceived instructional effectiveness was assessed through critical thinking, creativity and innovation, decision-making, collaboration and teamwork, and mathematical communication. These dimensions reflect complementary competencies necessary for mathematical reasoning and problem-solving (Myers et al., 2022; Cano & Lomibao, 2023; Macapayad et al., 2024). The study is further supported by Republic Act No. 11713, or the Excellence in Teacher Education Act of 2022; Republic Act No. 12028, or the Academic Recovery and Accessible Learning (ARAL) Program Act of 2024; the Basic Education Development Plan 2030 (Department of Education, 2022); and the Policy Guidelines on the Implementation of the MATATAG Curriculum (Department of Education, 2024). Collectively, these foundations emphasize teacher competence, responsive instruction, foundational numeracy, and continuous educational improvement, supporting the formulation of evidence-based policy recommendations.

The study primarily aligns with SDG 4 – Quality Education, particularly Targets 4.1 and 4.c, through its emphasis on mathematical proficiency, effective instruction, and teacher professional development. Furthermore, it supports SDG 10 – Reduced Inequalities through the promotion of responsive instructional strategies that address diverse learning needs and difficulties in mathematics. It also aligns with SDG 17 – Partnerships for the **Goals** through the proposed collaboration among teachers, school administrators, educational policymakers, and other stakeholders. Collectively, the study supports educational, institutional, and social sustainability through continuous instructional improvement, equitable learning opportunities, teacher capacity-building, and evidence-informed educational governance.

## 2. METHODOLOGY

### Research Design

The study utilized a descriptive–evaluative–correlational research design. The descriptive component identified the instructional strategies utilized by Grade 4 Mathematics teachers, while the evaluative component assessed their perceived effectiveness in improving learners' problem-solving skills. The inferential component examined the significant agreement among respondent groups regarding the rank orders of strategy utilization and perceived effectiveness.

### Research Locale or Study Setting

The study was conducted in 22 public elementary schools in Libon East District, Division of Albay, Philippines, during School Year 2025–2026. The district comprises large, medium, and small schools serving learners from diverse educational and socioeconomic backgrounds. The setting provided an appropriate context for examining instructional practices in elementary mathematics education.

### Participants or Data Sources

The respondents comprised 30 Grade 4 Mathematics teachers from 22 public elementary schools, including five teachers from one large school, ten teachers from six medium schools, and fifteen teachers from fifteen small schools. Purposive selection criteria were applied to identify teachers directly involved in Grade 4 Mathematics instruction. All identified eligible teachers were included in the study. They served as the primary sources of information regarding instructional strategy utilization and perceived effectiveness.

### Research Instruments or Materials

The study utilized a researcher-developed questionnaire consisting of 76 items divided into two sections. The first section comprised 39 items assessing strategy utilization in identifying key mathematical concepts, understanding problems, identifying errors, improving learners' confidence, and using appropriate instructional methods. The second section consisted of 37 items assessing perceived effectiveness in critical thinking, creativity and innovation, decision-making, collaboration and teamwork, and mathematical communication. Both sections employed a five-point Likert scale. The instrument underwent validation, revision, and pilot testing among individuals with characteristics similar to the actual respondents. Cronbach's alpha coefficients were 0.72 for strategy utilization, 0.78 for perceived effectiveness, and 0.75 for the overall instrument, indicating acceptable internal consistency.

### Data Gathering Procedure

The researcher secured permission from the Public Schools District Supervisor and coordinated with the concerned school authorities before conducting the study. Following instrument validation and pilot testing, the questionnaires were personally administered to the Grade 4 Mathematics teachers. Completed questionnaires were subsequently retrieved, organized, tabulated, analyzed, and interpreted. The findings served as the basis for drawing conclusions and formulating policy recommendations.

### Data Analysis

Frequency count, percentage, weighted mean, ranking, and standard deviation were employed to describe instructional strategy utilization and perceived effectiveness. Weighted means were interpreted using five numerical ranges: 4.50–5.00 (Very Much Utilized/Effective), 3.50–4.49

(Much Utilized/Effective), 2.50–3.49 (Utilized/Effective), 1.50–2.49 (Fairly Utilized/Effective), and 1.00–1.49 (Not at All). Kendall's Coefficient of Concordance (W) and the chi-square test were employed to determine the strength and statistical significance of agreement on the rank orders among respondent groups at the 0.05 significance level.

**Ethical Consideration**

The researcher obtained formal authorization from the concerned educational authorities before administering the questionnaires. Respondents were informed of the academic purpose of the study and assured that their responses would remain confidential. Providing respondents' names was optional, and the collected information was treated confidentially without identifying individual respondents in the final research report.

## 3. RESULTS AND DISCUSSION

### 3.1 Extent of Utilization of Strategies in Teaching Mathematics

#### 3.1.1 Identifying Key Mathematical Concepts

Identifying key mathematical concepts obtained an overall weighted mean of 4.47, interpreted as Much Utilized. Collaborative problem-solving and group discussions received the highest rating (4.69), followed by identifying and analyzing given information before solving (4.67). Allowing learners to explain and justify their solutions received the lowest rating (4.31). The findings demonstrate substantial utilization of collaborative and analytical strategies in mathematics instruction. However, opportunities for learners to explain their reasoning and justify solutions require further reinforcement. Structured problem-solving instruction and conceptual understanding are important foundations for developing mathematical competence (Myers et al., 2022).

#### 3.1.2 Understanding the Problem

Understanding the problem obtained an overall weighted mean of 4.44, interpreted as Much Utilized. Encouraging learners to read and understand problems thoroughly before solving received the highest rating (4.85), followed by mathematical vocabulary development (4.65). Distinguishing relevant from irrelevant information received the lowest rating (3.98). The findings emphasize the importance of reading comprehension and mathematical vocabulary in problem-solving. However, identifying relevant information requires further instructional reinforcement. Stevens et al. (2023) demonstrated the benefits of integrating explicit vocabulary instruction into structured word-problem interventions, particularly in developing mathematical vocabulary. Similarly, Vessonen et al. (2024) emphasized the relevance of linguistic and numerical task characteristics in mathematical problem-solving.

#### 3.1.3 Identifying Errors

Identifying errors obtained an overall weighted mean of 4.42, interpreted as Much Utilized. Providing immediate feedback received the highest rating (4.72), followed by maintaining records of learners' errors (4.67) and using diagnostic assessments (4.58). Designing remedial or enrichment activities to address recurring misconceptions received the lowest rating (4.08). The findings indicate that teachers prioritize identifying and correcting mathematical errors, although targeted remediation requires further strengthening. Mabansag and Verzosa (2024) identified problem comprehension and evaluation difficulties as important sources of mathematical problem-solving errors. Furthermore, Peltier et al. (2022) emphasized structured schema-based instruction in supporting learners experiencing difficulties with mathematical word problems.

#### 3.1.4 Improving Learners' Confidence

Improving learners' confidence obtained an overall weighted mean of 4.51, interpreted as Very Much Utilized. Motivational strategies involving praise, rewards, and recognition received the highest rating (4.66), followed by encouraging independent problem-solving (4.62). Allowing learners to share and discuss their solution strategies openly received the lowest rating (4.20). The findings demonstrate that teachers prioritize motivation, confidence, and persistence in mathematics instruction. Nevertheless, providing greater opportunities for learners to communicate their solutions may further support confidence development. Zakariya (2022) identified instructional interventions that support mathematical self-efficacy, emphasizing the importance of appropriate learning experiences and motivational support.

#### 3.1.5 Using Appropriate Instructional Methods

Using appropriate instructional methods obtained an overall weighted mean of 4.43, interpreted as Much Utilized. Maintaining a positive and engaging learning environment received the highest rating (4.75), followed by using manipulatives, visual aids, and technology (4.63). Inquiry-based and discovery learning approaches received the lowest rating (4.23). The findings indicate substantial utilization of supportive and resource-based instructional methods. However, inquiry-based learning and differentiated instruction require further reinforcement. Structured problem-solving interventions and appropriate instructional support contribute to mathematical learning, particularly among elementary learners experiencing difficulties (Myers et al., 2022; Vessonen et al., 2025).

#### 3.1.6 Overall Extent of Utilization of Strategies

Instructional strategy utilization obtained an overall weighted mean of 4.45, interpreted as Much Utilized. Improving learners' confidence ranked highest (4.51), followed by identifying key mathematical concepts (4.47), understanding the problem (4.44), using appropriate instructional methods (4.43), and identifying errors (4.42). The findings indicate that teachers employ diverse strategies addressing cognitive, motivational, and instructional aspects of mathematical problem-solving. Nevertheless, error analysis, targeted remediation, and appropriate instructional methods remain priority areas for improvement. Systematic problem-solving interventions and mathematical self-efficacy support provide complementary opportunities for strengthening learners' mathematical competencies (Myers et al., 2022; Zakariya, 2022; Vessonen et al., 2025).

### 3.2 Significant Agreement on the Rank Orders of Instructional Strategy Utilization

Kendall's Coefficient of Concordance revealed significant agreement only in understanding the problem ($W = 0.782$, $\chi^2 = 16.42$, $p < .05$). No statistically significant agreement was established in identifying key mathematical concepts ($W = 0.177$, $\chi^2 = 3.72$), identifying errors ($W = 0.537$, $\chi^2 = 11.28$), improving confidence ($W = 0.456$, $\chi^2 = 8.21$), and using appropriate instructional methods ($W = 0.593$, $\chi^2 = 12.45$). Accordingly, the null hypothesis was rejected only for understanding the problem. The findings indicate that teachers across school classifications demonstrated significant agreement regarding strategies supporting problem comprehension but differed in their prioritization of other instructional practices. This emphasizes the need for coordinated professional development and consistent instructional guidance while accommodating

individual classroom needs. Explicit vocabulary instruction and structured mathematical problem comprehension provide important foundations for word-problem instruction (Stevens et al., 2023; Vessonen et al., 2024).

### 3.3 Perceived Effectiveness of Strategies in Improving Learners' Problem-Solving Skills

#### 3.3.1 Critical Thinking

Critical thinking obtained an overall weighted mean of 4.14, interpreted as Much Effective. Encouraging learners to ask questions that promote deeper understanding and using open-ended questions received the highest ratings (4.50). Comparing, contrasting, and classifying information, together with reflecting on the accuracy of reasoning, received the lowest ratings (3.75). The findings indicate favorable perceptions of strategies supporting questioning and mathematical reasoning. However, reflective thinking, information analysis, and evaluation of solutions require further instructional attention. Structured mathematical problem-solving activities provide opportunities for developing analytical reasoning and evaluating alternative solutions (Myers et al., 2022; Vessonen et al., 2025).

#### 3.3.2 Creativity and Innovation

Creativity and innovation obtained an overall weighted mean of 4.24, interpreted as Much Effective. Integrating technology to enhance creativity and problem presentation received the highest rating (4.55), while encouraging experimentation and risk-taking without fear of failure received the lowest rating (4.00). The findings demonstrate favorable perceptions of technology-supported creative instruction. Nevertheless, independent exploration, experimentation, and the development of original solution strategies require further encouragement. Nordby et al. (2022) identified creativity, exploration, communication, and engagement as important process-oriented components of computational thinking activities in primary mathematics education.

#### 3.3.3 Decision-Making

Decision-making obtained an overall weighted mean of 4.51, interpreted as Very Much Effective. Encouraging learners to weigh alternative solutions received the highest rating (4.65), followed by making evidence-based decisions and identifying necessary information (4.60). Considering the possible consequences of decisions received the lowest rating (4.33). The findings indicate that teachers perceive mathematical activities involving alternative solutions and evidence-based judgments as highly effective. However, evaluating possible consequences and reflecting on decisions require further reinforcement. Pamaos et al. (2024) established a significant relationship between critical thinking and decision-making among senior high school students, highlighting the relevance of analytical and reflective competencies, although their study involved a different educational level.

#### 3.3.4 Collaboration and Teamwork

Collaboration and teamwork obtained an overall weighted mean of 4.57, interpreted as Very Much Effective. Teaching learners to listen actively and respect others' opinions received the highest rating (4.82), followed by cooperative learning activities promoting equal participation (4.67). Group problem-solving involving individual contributions and managing disagreements respectfully received the lowest ratings (4.43).The findings highlight the perceived importance of cooperative learning, mutual respect, and shared responsibility in mathematical problem-solving. Nevertheless, ensuring meaningful individual contributions and managing

disagreements remain areas for improvement. Macapayad et al. (2024) demonstrated the potential of peer tutoring to strengthen mathematical problem-solving among secondary learners, supporting the broader relevance of peer-assisted instruction.

#### 3.3.5 Mathematical Communication

Mathematical communication obtained an overall weighted mean of 4.67, interpreted as Very Much Effective. Encouraging learners to express their thoughts and solutions clearly received the highest rating (4.78), followed by explaining how answers were obtained (4.75) and providing feedback to improve communication clarity (4.73). Active listening and respectful dialogue received the lowest rating (4.57), although it remained Very Much Effective. The findings demonstrate strong perceived effectiveness of instructional strategies supporting mathematical expression, explanation, and communication. Providing opportunities for learners to articulate their reasoning, discuss solutions, and receive constructive feedback remains important in mathematics education. Nordby et al. (2022) similarly emphasized communication and exploration as relevant components of process-oriented learning activities in primary mathematics.

#### 3.3.6 Overall Perceived Effectiveness of Instructional Strategies

The perceived effectiveness of instructional strategies obtained an overall weighted mean of 4.43, interpreted as Much Effective. Mathematical communication ranked highest (4.67), followed by collaboration and teamwork (4.57) and decision-making (4.51), all interpreted as Very Much Effective. Creativity and innovation (4.24) and critical thinking (4.14) were interpreted as Much Effective. The findings demonstrate favorable teacher assessments of instructional strategies, particularly those supporting communication and collaborative competencies. Nevertheless, critical thinking and creativity require greater instructional attention through structured problem-solving, independent exploration, and reflective activities. Contemporary research emphasizes the relevance of systematic problem-solving interventions and process-oriented mathematical learning (Nordby et al., 2022; Myers et al., 2022; Vessonen et al., 2025).

### 3.4 Significant Agreement on the Rank Orders of Perceived Instructional Effectiveness

Kendall's Coefficient of Concordance revealed no statistically significant agreement across the five dimensions of perceived instructional effectiveness. The computed results were critical thinking ($W = 0.427$, $\chi^2 = 7.69$), creativity and innovation ($W = 0.667$, $\chi^2 = 14.01$), decision-making ($W = 0.310$, $\chi^2 = 5.58$), collaboration and teamwork ($W = 0.429$, $\chi^2 = 9.01$), and mathematical communication ($W = 0.276$, $\chi^2 = 4.97$). All computed chi-square values were below their respective critical values at the 0.05 significance level. Accordingly, the null hypothesis was not rejected. The findings indicate that although teachers generally perceived instructional strategies as effective, their rankings were not statistically consistent across school classifications. This emphasizes the importance of strengthening instructional coordination, professional development, and systematic monitoring. Differences in implementation characteristics are relevant considerations in evaluating mathematical problem-solving interventions (Vessonen et al., 2025).

### 3.5 Basis for Policy Recommendations

The findings identified improving learners' confidence as the most utilized instructional dimension and mathematical communication as the dimension with the highest perceived

effectiveness. Conversely, identifying errors, critical thinking, and creativity and innovation emerged as relative priorities for improvement. Furthermore, significant agreement among respondent groups was established only in understanding the problem, while no significant agreement was established across the perceived effectiveness dimensions. These findings served as the basis for formulating policy recommendations emphasizing learner-centered instruction, continuous teacher professional development, differentiated learning, diagnostic assessment, targeted remediation, collaborative problem-solving, and technology-enhanced instruction. Furthermore, school-based monitoring, Learning Action Cell sessions, stakeholder involvement, and systematic evaluation are recommended to strengthen the consistency of instructional practices. These priorities are consistent with contemporary evidence supporting structured mathematical problem-solving, vocabulary development, mathematical self-efficacy, and process-oriented learning (Stevens et al., 2023; Zakariya, 2022; Nordby et al., 2022; Vessonen et al., 2025).

## 4. CONCLUSIONS AND RECOMMENDATIONS

The study concludes that instructional strategies in teaching Mathematics were extensively utilized and perceived as effective in strengthening the problem-solving skills of Grade 4 learners in Libon East District, Division of Albay. Improving learners' confidence emerged as the most utilized instructional dimension, while mathematical communication demonstrated the highest perceived effectiveness. However, error identification, critical thinking, and creativity and innovation remained priority areas for instructional improvement. Significant agreement on the rank orders of strategy utilization was established only in understanding the problem, whereas no significant agreement was found across the dimensions of perceived instructional effectiveness. These findings indicate that although teachers generally assessed their instructional practices favorably, differences in prioritizing strategies existed across school classifications. Collectively, the findings emphasize the importance of consistent instructional practices, responsive teaching methods, and continuous professional development, establishing an empirical foundation for formulating policy recommendations to strengthen mathematics instruction and learners' problem-solving competencies.

Teachers should strengthen the consistent utilization of learner-centered instructional strategies, particularly those addressing mathematical concepts, error identification, critical thinking, and creativity. Diagnostic assessments, targeted remediation, contextualized problem-solving activities, open-ended questions, and reflective learning exercises should be integrated into classroom instruction. Furthermore, mathematical communication, collaborative learning, and positive reinforcement should be sustained to support learners' confidence and active participation. School administrators should strengthen instructional monitoring, provide appropriate learning resources, and support differentiated instruction. Meanwhile, Department of Education officials and division supervisors should facilitate continuous professional development, mentoring, and Learning Action Cell sessions focused on effective mathematics teaching strategies. The formulated policy recommendations should be implemented, monitored, and periodically evaluated to assess their contribution to instructional improvement. Future researchers should examine additional factors, including teacher competence, instructional resources, learner backgrounds, and technology-enhanced instruction, while conducting comparative and longitudinal studies to assess the effectiveness of problem-solving strategies across diverse educational contexts.

The study was limited to 30 Grade 4 Mathematics teachers from 22 public elementary schools in Libon East District during School Year 2025–2026, restricting the generalizability of the findings.

Moreover, the assessment relied on teachers' reported instructional practices and perceived effectiveness rather than direct measurements of learners' mathematical performance. The descriptive–evaluative–correlational research design and rank-order agreement analysis did not establish causal relationships or actual improvements in problem-solving skills. Furthermore, external factors, including learners' home environments and prior knowledge, were beyond the study's scope. Future investigations may employ broader samples, direct performance assessments, experimental interventions, and longitudinal approaches to strengthen empirical evidence.

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