IGNATIAN
INTERNATIONAL JOURNAL FOR MULTIDISCIPLINARY RESEARCH
www.icceph.com
ISSN 2984-9942

FACTORS INFLUENCING THE PROFICIENCY LEVEL OF GRADE 9 STUDENTS IN RADICAL EXPRESSIONS

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https://doi.org/10.5281/zenodo.18145587

ABSTRACT

This study aims to find out what affects how well Grade 9 students learn and solve radical expressions at one of the schools in Sariaya, Quezon. It explores how students' attitudes to teacher support and the learning environment shape their math skills. The researchers use a survey research and correlational research design to gain a comprehensive understanding of factors influencing the proficiency level of Grade 9 students in radical expression, and the researchers employ a cluster sampling technique in selecting participants for this research study. In conducting the study, the researchers noticed that there are still students who are confused even with the basic topic about radical expressions, so the researchers created a learning module on radical expressions that contains activities and some reminders that are used when answering questions about radicals from basic topics to difficult topics. Through the material, students will be prepared to answer questions about radicals. The result will be applied to increase the efficacy of math instruction, enhance learning resources, and introduce dynamic teaching methods. Through more detailed explanations and lesson planning, educators can assist students in progressively strengthening their problem-solving abilities and gaining self-assurance in their ability to handle mathematics problems.

Keywords: *learning environment, proficiency level, radical expressions*

INTRODUCTION

Mathematics education is essential to the development of critical cognitive skills in order to help students overcome both academic challenges and real-world applications in everyday life. Among its topics, algebra is one of its many areas, particularly in the study

of radical expressions, in particular it is crucial to developing mathematical skills. Nevertheless, despite its importance, research has shown that students still struggle to learn radical expressions because of conceptual errors, a lack of useful problem-solving strategies, and insufficient instructional support. Students who have trouble comprehending radical expressions may have problems with their mathematical abilities. This could affect their future chances in several occupations that require a mathematics course.

It is necessary to investigate the factors impacting students' understanding of radical expressions to address these issues, especially in Grade 9, when these topics are discussed in greater detail (Alvarez, 2019). Furthermore, effective classroom instruction and quality learning materials play a vital role in concept mastery. According to Sun et al. (2020) problem-based learning techniques increase student interest and comprehension in understanding difficult subjects like radical expressions. These results highlight the necessity of a holistic approach to teaching math by showing that cognitive, instructional, and psychological factors all interact to influence the student's ability to evaluate radical expressions.

As evidenced by international tests, Filipino students have consistently struggled with mathematical competency, as reflected in international assessments. The Philippines' mathematical literacy score in the 2018 Programme for International Student Assessment is 353, compared to the Organization for Economic Co-operation and Development's 489, which is much lower than the average (Organization for Economic Co-operation and Development, 2019). Even though the score increased marginally to 355 in 2022, nearly no Filipino students achieved the highest proficiency levels, and only 16% of students achieved the Level 2 proficiency-much lower than the Organization for Economic Co-operation and Development's average of 69% (Organization for Economic Co-operation and Development, 2022). These results demonstrate the urgent need for interventions aimed at improving mathematics instruction and bridge proficiency gaps.

This study was done in order to evaluate the main elements influencing the ninth-grade students' ability in analyzing radical expression and identify the primary factors impacting their performance. By analyzing students' perceptions of their problem- solving abilities and the effectiveness of educational materials in an effort to provide insights into the creation of targeted intervention to enhance mathematical competency. The results will be useful to educators, curriculum developers and legislators, since they offer methods to address math learnings and improve teaching. Enhancing students' proficiency with radical expressions will ultimately help them with more advanced mathematical learning and real-world problem-solving.

Research Questions

This study aimed to determine the factors influencing the proficiency levels of Grade 9 students in solving radical expressions.

Specifically, it sought answers to the following research question:

1. What is the proficiency level demonstrated by Grade 9 students in evaluating radical expressions?
2. What are the factors influencing the proficiency level of Grade 9 to evaluate radical expressions in terms of:
   2.1. Understanding of basic concepts of radicals;
   2.2. Problem-Solving skills involving radical expressions; and
   2.3. Instructional Materials?
3. Is there a significant correlation between the proficiency level demonstrated by Grade 9 students in evaluating radical expressions and the factors influencing their proficiency level?
4. What materials can be proposed for the improvement of proficiency level of Grade 9 Students in radical expressions?

METHODOLOGY

Research Locale

This was conducted in a public secondary school in Sariaya, Quezon. Its primary objective is to assess the proficiency level of Grade 9 students in evaluating radical expressions.

The selection of the locale and participating school is grounded in both curricular relevance and the availability of a representative sample. The chosen institution offers a meaningful context for the present study, as it actively implements the Grade 9 Mathematics curriculum, with particular emphasis on radical expressions. This alignment ensures the research is conducted within a setting where the target concepts are being taught, thus enhancing the study's timeliness and applicability.

Furthermore, the school maintains a substantial Grade 9 student population, which provides a sufficient sample size for gathering reliable and generalized data. The selection was made not solely based on student numbers, but with careful consideration of the school's capacity to support a rigorous inquiry into factors influencing the proficiency of the students in radical expressions. This site was purposefully selected to allow a focused evaluation of students' understanding of radical expressions, their problem-solving skills, and the instructional materials. By conducting the study in this context, the researcher seeks to identify variables that may contribute to or hinder student proficiency in this essential component of algebra.

Furthermore, the school accessibility makes data collection more effective and ensuring a thorough investigation of the potential correlations between proficiency levels and influencing factors. This study proposed a learning module about radical expressions to enhance students mathematical skills in evaluating radical equations. This setting provides an appropriate and meaningful context for studying the factors influencing Grade 9 students' proficiency in evaluating radical equations.

Research Population and Sample

The respondents for this study were the Grade 9 sections of one public school in Sariaya, Quezon, with a total of 840 students enrolled in the school year 2024-2025. Using Raosoft Calculator it suggested that 264 out of 840 would be the respondents of the study. The researchers selected these respondents because radicals are included in their MELCs 9 Mathematics-2nd quarter. It includes deriving the laws of radicals, applying these principles to simplify radical expressions, operating on radical expressions, resolving radical expression equations, and resolving radical-related issues.

Researchers used the cluster random sampling technique to choose research study respondents. Researchers concentrated on Grade 9 students as participants. The school has 24 sections for Grade 9. To determine the exact respondents, the researchers consulted the Head Teacher of the Mathematics department for the Mean Percentage Score (MPS). However, due to data privacy regulations, the researchers are only provided with sections that had an average score in MPS. Out of the 24 sections, the researchers selected 8 sections with an average score in Radical Expressions. These sections are Titanium, Tin, Lead, Chromium, Zirconium, Manganese, Iron, and Copper.

After dividing the populations into groupings, such as certain classrooms or sections, the researchers used cluster random sampling, in which entire clusters are chosen at random to take part. This approach makes data collection efficient and can produce a representative sample of the entire population. According to Simply Psychology (2023), cluster random sampling, as a probability sampling technique, is where the researchers produce a sample by randomly selecting from a large population into smaller groups called clusters and then select randomly among the clusters to create a sample. Cluster sampling is typically used in situations where both the target sample size and the population are quite large.

Research Instrument

The researchers utilized a printed self-structured assessment test and a survey questionnaire checklist to gather necessary data. The data was treated confidentially and anonymously.

In research question 1, the researchers employed the assessment tests to assess the student proficiency level, consisting of thirty (30) items of radical expression. For research question 2, the researchers used the survey questionnaire to evaluate the influencing factors—understanding of basic radical concepts, problem-solving skills related to radical expression and instructional materials. Each sub-variable consists of ten (10) statements, for a total of thirty (30) statements. The respondents are guided for the continuous scale value of “4” for Strongly Agree, “3” for Agree, “2” for Disagree, and “1” for Strongly Disagree.
The researchers presented the first instrument to the research adviser to seek approval. The researchers seek guidance from the three (3) experts to conduct a face-to-face validation for research instruments. To test the reliability and validity of the researcher's

instrument, the researchers conducted a pilot test with the Grade 9 students who were not included as respondents. With a Cronbach's Alpha value of 0.532 and an alpha level of 0.519, the results indicate that the reliability and validity of the research instruments about the pilot testing of radical expression are not sufficiently high. As a result, the researchers revised the research instrument, consulted with the research adviser, and sought validation from an expert before finalizing the changes. Following this, the researchers proceeded with data gathering for the research study.

Statistical Treatment

The researchers considered the use of the following statistical treatment to analyze the data.

In research question no. 1, the researcher utilized the frequency and percentage distribution to measure the proficiency level demonstrated by Grade 9 in evaluating radical expressions. The formula is shown below:

$$\%= \frac{f}{N} \text{ x } 100\%$$

Where:

%= Percent
f=score
N=Total score

Level of Proficiency	Equivalent Numerical Value
Beginning	74% and below
Developing	75-79%
Approaching Proficiency	80-84%
Proficient	85-89%
Advanced	90%-100%

In the research question 2, the researchers used the Weighted Arithmetic Mean or WAM to measure the elements that affect the competence level of Grade 9 to evaluate radical expressions. The formula is shown below:

$$\text{WAM} = \frac{\sum_{i=1}^{n} w_i \, x_i}{\sum_{i=1}^{n} w_i}$$

Where:

WAM = Weighted average
n = number of terms to be averaged

W_i = Weights applied to x values
X_i = values of the data to be averaged

Weighted Average	Weighted Interval	Weighted Result
4	3.26-4.00	Strongly Agree
3	2.51-3.25	Agree
2	1.76-2.50	Disagree
1	1.00-1.75	Strongly Disagree

For the research question 3, Spearman rho was used since the normality test shows that the data is not normally distributed in measuring the correlation between proficiency level demonstrated by Grade 9 students in evaluating radical equations and the factors influencing their proficiency level. To ensure accuracy the data was examined using the Kolmogorov-Smirnov test to see if it was regularly distributed in confirming the validity of the relationships among these variables. The formula is between these variables. The formula is shown below:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[\,n\sum x^2 - (\sum x)^2\,][\,n\sum y^2 - (\sum y)^2\,]}}$$

Where:

N = Number of pairs of scores
$\sum x$ = Sum of the x scores
$\sum y$ = Sum of the y scores
$\sum xy$ = Sum of the product paired scores
$\sum x^2$ = Sum of the squared x scores
$\sum y^2$ = Sum of the squared y score

Scope and Limitations

The purpose of this study is to examine the different factors that influence the proficiency levels of Grade 9 students in solving radical expressions. The study focused on students from one of the public schools in Sariaya, Quezon. The factors considered include understanding of basic concepts of radicals, problem-solving skills involving radical equations and instructional materials. To collect data for the study quantitative methods, such as surveys, checklist questionnaires and assessment. The primary goal of this research is to identify the elements that significantly affect students proficiency and to provide recommendations for improving teaching and learning methods. The students are selected using cluster samples, and due to time constraints and the impending end of the school year, this research is only for currently enrolled Grade 9 students in one of the public schools in Sariaya. The data collection process is conducted within the academic calendar, which may limit the scope and depth of the analysis. Furthermore, due to

temporal limitations, only selected factors affecting proficiency in solving radical expressions were examined.

RESULTS

Part I. Proficiency Level of Grade 9 Students in Evaluating Radical Expressions

Table 1
Proficiency Level Demonstrated by Grade 9 Students in Evaluating Radical Expressions

Percentage Score	Frequency	Percentage	Level of Proficiency
74% and below	224	84.84	Beginning
75-79%	16	6.06	Developing
80-84%	21	7.95	Approaching Proficiency
85-89%	2	.75	Proficient
90%-100%	1	.37	Advanced
Mean Percentage Score		**62.42**	**Beginning**

Note. The students obtain a mean score of 18.73 on the given assessment about the evaluation of radical expressions.

Part II. Factors Influencing the Proficiency Level of Grade 9 Students

Table 2
Factors Influencing the Proficiency Level of Grade 9 Students in terms of Understanding of Basic Concepts of Radicals

Indicators	WAM	Verbal Interpretation
1. I understand the basic properties of radical expressions.	3.08	Agree
9. I understand how to apply the properties of radicals in different mathematical contexts.	2.87	Agree
7. I can solve equations that involve radical expressions.	2.84	Agree
4. I understand the relationship between radicals and exponents.	2.82	Agree
5. I can perform operations with radical expressions (addition, subtraction, multiplication, and division).	2.79	Agree
8. I understand the laws of radical.	2.78	Agree
2. I can identify different types of radicals.	2.77	Agree
10. I am able to explain the concept of radicals to others.	2.75	Agree
3. can simplify radical expressions correctly.	2.72	Agree

6. I understand how to rationalize denominators in radical expressions.	2.67	Agree
Average Weighted Arithmetic Mean	**2.81**	**Agree**

Note. The WAM for weighted arithmetic mean was used to interpret the survey responses. In this context, the range of 1.00 - 1.75 indicates Strongly Disagree, the range of 1.76 - 2.50 indicates Disagree, the range of 2.51 - 3.25 indicates Agree, 3.26 - 4.00 indicates Strongly Agree.

Table 3

Factors Influencing the Proficiency Level of Grade 9 Students in terms of Problem-Solving Skills Involving Radical Expression

Indicators	WAM	Verbal Interpretation
9. I find radical equations challenging yet manageable	2.89	Agree
1. I can accurately solve radical expressions.	2.87	Agree
10. I enjoy solving problems that involve radical equations	2.87	Agree
7. I can identify and avoid common mistakes when solving radical expressions.	2.83	Agree
8. I can clearly explain the steps involved in solving a radical expression to others.	2.83	Agree
6. I can identify and avoid common mistakes when solving radical expressions.	2.80	Agree
4. I ensure my solutions to radical expression are accurate by checking them.	2.77	Agree
5. I can analyze the complexity of radical expressions	2.77	Agree
2. I can set up and solve word problems that involve radical expressions.	2.75	Agree
3. I use various strategies to approach solving radical expressions.	2.70	Agree
Average Weighted Arithmetic Mean	**2.81**	**Agree**

Note. The WAM for weighted arithmetic mean was used to interpret the survey responses. In this context, the range of 1.00 - 1.75 indicates Strongly Disagree, the range of 1.76 - 2.50 indicates Disagree, the range of 2.51 - 3.25 indicates Agree, 3.26 - 4.00 indicates Strongly Agree.

Table 4

Factors Influencing the Proficiency Level of Grade 9 Students in terms of Instructional Materials

Indicators	WAM	Verbal Interpretation
1. The instructional materials used in teaching radicals are clear and easy to understand	2.95	Agree
6. The materials provided are current and relevant to my needs in learning about radicals.	2.94	Agree

8. The explanations in the materials are thorough and contain detailed process of solving radical equations.	2.94	Agree
4. The instructional materials are well-organized and logically structured, aiding my learning of radicals.	2.92	Agree
5. The materials offer step-by-step solutions to radical problems.	2.91	Agree
2. The instructional materials comprehensively cover all essential topics on radicals	2.91	Agree
7. The visual aids in the materials enhance my grasp of radical concepts.	2.88	Agree
10. The exercises in the materials reinforce my understanding of radicals.	2.86	Agree
3. The instructional materials include sufficient practice problems on radicals	2.84	Agree
9. The examples provided in the materials effectively illustrate radical concepts.	2.83	Agree
Average Weighted Arithmetic Mean	**2.90**	**Agree**

Note. The WAM for weighted arithmetic mean was used to interpret the survey responses. In this context, the range of 1.00 - 1.75 indicates Strongly Disagree, the range of 1.76 - 2.50 indicates Disagree, the range of 2.51 - 3.25 indicates Agree, 3.26 - 4.00 indicates Strongly Agree.

Part III. Correlation between Proficiency Level and the Influencing Factors

Table 5

Significant Correlation between the Proficiency Levels Demonstrated by Grade 9 Students in Evaluating Radical Expressions and the Factors Influencing Their Proficiency Levels

Variable	*r*	*p* value	Decision	Interpretation
Understanding basic concepts	.666	.000	Reject H_o	Significant
Problem-solving skills	.666	.000	Reject H_o	Significant
Instructional materials	.424	.000	Reject H_o	Significant

Note. Proficiency levels of the students on radicals and the factors influencing them are considered the dependent and independent variables in assessing the correlation.
$p < .01$

DISCUSSION

Table 1 shows the proficiency levels demonstrated by the Grade 9 students in evaluating radical expressions. The computed Mean Percentage Score (MPS) is 62.42%, which falls within the Beginning level of proficiency. This finding implies that Grade 9 students

generally have a poor comprehension of radical expressions and may find it difficult to complete activities that call for conceptual and procedural fluency in this domain. The average raw score of 18.73, which indicates that the majority of students are performing below the anticipated mastery threshold, supports this interpretation even more. This is in line with other research, Hanifa et al. (2023), and Indriani and Hidayanto (2018), which emphasize difficulties with problem-solving and fundamental knowledge, especially when students are not aware of the properties and structure of radicals.

Additionally, 224 out of 264 pupils, or 84.84%, have scores of 74% or lower, placing them at the Beginning level of competency. This strong focus at the lowest level shows that just a tiny portion of students are progressing towards competence or higher, indicating a significant learning gap. As explained by Erbaş and Didis (2015), students frequently struggle with symbolic algebra when they don't have enough conceptual foundation and contextual knowledge. In order to close these gaps, the research emphasizes how urgent it is to put specific instruction and focused interventions into place. This is especially important when it comes to helping students understand radical operations and boosting their confidence and metacognitive techniques when solving mathematical problems. In Table 2, the survey results on the factors influencing the proficiency level of Grade 9 students, specifically their understanding of basic concepts of radicals, are presented. The computed Average Weighted Arithmetic Mean (AWAM) is 2.81, which corresponds to a verbal interpretation of Agree. This indicates that students generally perceive themselves as having a foundational grasp of radical expressions, including simplifying, identifying properties, and applying operations. This perception aligns with the findings of Hanifa et al. (2025), who emphasized that students' prior mathematical knowledge significantly shapes their ability to engage with algebraic structures. Similarly, Rakes et al. (2020) noted that bridging rational exponents and radicals through scaffolded instruction enhances students' conceptual clarity and confidence in symbolic manipulation.

The consistent "agree" responses across all indicators suggests that students have developed a uniform level of familiarity with radical concepts, likely due to repeated instructional exposure and structured practice. This pattern may reflect the effectiveness of lesson designs that emphasize procedural fluency and reinforce conceptual understanding through guided examples and routine exercises. This aligned with Indriani and Hidayanto (2018), structured exposure to radical operations helps students internalize problem-solving strategies, even if deeper conceptual reasoning remains underdeveloped. Moreover, Garcia and Smilack (2016) highlighted that students often feel confident in their skills when instructional materials provide clear steps and opportunities for verification factors that may explain the observed agreement in this study.

Table 3 shows the survey results on the factors influencing the proficiency level of Grade 9 students in terms of problem-solving skills in radical expressions. The results of the computed Average Weighted Arithmetic Mean (AWAM) is 2.81, corresponding to the verbal interpretation Agree. This suggests that students generally recognize their ability to engage with radical expressions, although certain competencies, such as using varied

strategies and rationalizing expressions still reflect lower confidence. These findings are consistent with the Department of Education (2024), which notes persistent student struggles with rationalization and application of the laws of radicals, despite repeated instructional exposure.

Moreover, the general agreement among students across all indicators suggests that they perceive themselves as capable of solving radical expressions and equations due to their exposure to sustained instruction and repeated practice. This consistent Agree rating may be attributed to lesson structures that reinforce procedural fluency and offer routine engagement with symbolic manipulation tasks. As stated by, Indriani and Hidayanto (2018), such structured exposure helps students internalize problem-solving processes, even if deeper verification or conceptual justification is often underemphasized. Moreover, Hanifa et al. (2023) emphasized that students' prior mathematical knowledge significantly contributes to their confidence and perceived competence, which likely explains why they report positive self-assessments—even when performance data may reveal lingering conceptual gaps.

Table 4 shows the survey results on the factors influencing the proficiency level of Grade 9 students in terms of instructional materials. The computed Average Weighted Arithmetic Mean (AWAM) is 2.90, corresponding to a verbal interpretation of Agree. This indicates that students generally perceive the instructional materials as supportive of their understanding, particularly in terms of clarity, structure, and content accessibility. The highest mean score (2.95) reflects agreement on the clarity of the materials, while the lowest (2.83) centers on the usefulness of examples in explaining radical operations. To support this, the Virginia Department of Education (2023) stated that instructional tools that emphasize conceptual depth and progressive scaffolding significantly improve student comprehension, especially in algebraic topics like radicals.

Table 4 presents the respondents collective perceptions of various instructional factors influencing their proficiency in radical expressions. The computed Average Weighted Arithmetic Mean (AWAM) is 3.52, corresponding to the qualitative interpretation of "Agree." This suggests that students generally recognize the effectiveness of the instructional elements reflected in the items such as the clarity of conceptual explanations, the structure of learning activities, and the relevance of instructional support. Bayarcal and Tan (2023) emphasized that well-aligned instructional design contributes directly to student confidence and performance, while the Virginia Department of Education (2023) further supports the importance of integrating purposeful teaching strategies to improve mathematical outcomes.

The overall agreement across all statements points to a cohesive experience among students, suggesting that their instructional environment successfully integrates foundational clarity, problem-solving practice, and access to helpful materials. As noted by Hanifa et al. (2023), prior knowledge plays a pivotal role in enabling learners to build connections with new content. Similarly, Alifa (2022) highlighted that instructional strategies rooted in learners' existing frameworks lead to more effective reasoning and

deeper mathematical understanding, especially in complex topics like radical expressions.

Table 5 on the next page shows the results on the examination of significant correlation between the proficiency levels of the students on radical expressions and the factors influencing them, considering their understanding of basic concepts, problem-solving skills and perceptions on instructional materials. The results of the correlation analysis revealed a strong and statistically significant positive relationship between students' proficiency in radical expressions and the elements affecting their performance, specifically their understanding of basic concepts and problem-solving skills, each marked by a correlation coefficient (r) of 0.666. Given the 1% significance level and a p-value of .000, the null hypothesis was rejected, indicating that improvements in conceptual understanding and problem-solving are closely associated with enhanced proficiency. This finding aligns with Jordan et al. (2016), who emphasized that foundational competencies reliably predict future success in mathematical problem-solving. It underscores the need to continually strengthen students' grasp of core concepts and problem-solving strategies to boost their overall performance.

In addition, the study found a statistically significant positive correlation between student proficiency and the use of instructional materials, with an *r* value of 0.424 and a p-value of .000. This demonstrates that access to well-structured, developmentally aligned materials plays a meaningful role in shaping student outcomes in radical expressions. The rejection of the null hypothesis in this context suggests that thoughtfully designed resources that scaffold understanding and promote independent learning serve as essential tools in reinforcing mathematical concepts. Hanifa et al. (2023) support this view, asserting that prior knowledge, when built upon through accessible and coherent materials, facilitates stronger connections between new content and existing understanding.

Taken together, the results reveal a consistent pattern in which students perceive their learning progress to be shaped by an interplay of conceptual clarity, strategic problem-solving practice, and quality instructional support. This convergence points to the effectiveness of instructional approaches that prioritize developmental alignment, addressing prior knowledge while cultivating critical reasoning skills. When these instructional elements are integrated holistically, students not only demonstrate improved proficiency but also express greater confidence in their learning process. These findings reinforce the value of designing comprehensive instructional strategies that nurture foundational understanding and enable sustained growth in mathematical competence.

Conclusions

The findings have led the researchers to the following conclusions. After analyzing the data, the current researchers arrived at the following conclusions:

1. The performance of students in Grade 9 revealed an inadequate level of understanding in assessing radical expressions. Despite having a solid

understanding of the fundamentals, many students still have difficulty correctly applying the radical concepts and techniques. This suggests that their present understanding is insufficient to be applied consistently and correctly in situations involving problem-solving for consistent and correct application in problem-solving contexts.

2. The student's comprehension of fundamental radical concepts, their problem-solving skills, and the instruction materials used are factors that affect their competence level. Students agreed that they understood the concepts and operational of radicals, thought that they could solve problems moderately well, and thought the teaching materials were useful. However, these self-assessments did not always correspond to their actual skill levels, suggesting a discrepancy between perception and performance.
3. The understanding level of the learners and the determined influencing factors showed a strong positive association. This means that students' ability to assess radical expressions tends to improve along with their comprehension of fundamental ideas, problem-solving skills, and the quality of instructional materials.
4. The findings resulted in the creation of intervention materials in the form of a Radical Expressions Module. This module was created to fill in knowledge gaps, improve conceptual clarity, and provide students with supervised exercise to help them advance their abilities. By promoting individualized and interactive learning, the content seeks to enhance students understanding of radical expressions in a more significant and useful way.

Recommendations

Considering the findings of this study and concerning the stakeholders identified in the significance of the study, the following recommendations are proposed:

1. Students may actively assess their abilities and weaknesses in evaluating radical expressions. The researchers strongly recommend the adoption and implementation of the proposed Instructional Module on Radical Expressions as a supplemental resource in Grade 9 mathematics instruction. This module is not merely a set of activities, but a learning module crafted to address the specific learning gaps identified in students' proficiency. Its carefully designed content with clear explanations, structured examples, and Polya-based problem-solving guidance aims to strengthen students' conceptual foundations while nurturing their analytical reasoning and self-confidence.

2. Teachers are encouraged to assess these challenges and modify their teaching methods accordingly. Reiterating concepts, practicing under supervision, and using radical expression in real-life situations are all prioritized. In order to adapt lessons to the requirements and skill levels of their students, teachers could also consider integrating differentiated instruction and utilizing the suggested learning module.

3. School administrators may conduct frequent training sessions, seminars, or professional development workshops for mathematics teachers. These focus on giving teachers access to modern teaching methods and interventions that are in line with the study's findings. The establishment and dissemination of well-designed educational resources that encourage students' active learning and conceptual comprehension should also be a priority for the institutions.

4. Future researchers may utilize these studies' results, approach, and resources as a resource while carrying out a comparable study. They are encouraged to explore further variables or apply the study in different contexts—such as across different grade levels or school types—to enrich the literature on student proficiency in mathematics. Continued research in this area can greatly advance the enhancement of teaching mathematics and learning outcomes.

Intervention Material:

A Comprehensive Guide to Radical Expressions

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A Comprehensive Guide to Radical Expressions was developed to address students' difficulties in understanding radical expressions. Many learners struggle with identifying the parts of a radical—such as the radical sign (√), index, and radicand—making operations and problem-solving challenging. The guide focuses on building foundational understanding of these components to support confidence and mastery.

To enhance engagement, the guide incorporates interactive activities like matching games, crosswords, mazes, and snake and ladder games. These tools reinforce concepts in enjoyable ways, fostering both independent and collaborative learning.

Compliance with Ethical Standards

The researchers strictly adhered to ethical standards in conducting the study. Informed consent was obtained from all respondents, and participation was voluntary and they had the right to withdraw at any time. The researchers also maintained the anonymity and confidentiality of the respondents, and the data were handled in accordance with the Data Privacy Act. The welfare of the participants was safeguarded throughout the research process. The study was conducted for academic purposes only, without conflict of interest, plagiarism, or bias in the interpretation of the results.

Acknowledgments

This study would not be possible without the guidance and the support of several individuals who, in one way or another, contributed and extended their valuable assistance in the preparation and completion of the study

To Mrs. Mariane Hanna Garra, MAEd the research adviser and statistician, who is more than generous at providing invaluable guidance, support, advice, comments, and suggestions that help the researchers in the completion and success of this study.

To Mrs. Josephine O. Amandy, the research instructor, for helping, supporting, guiding and for sharing her knowledge. The researchers are grateful for her comprehensive comments for the development of this study.

The panel members of the Oral Examination Committee, Dr. Angela N. Lustanas, and Mrs. Anabel S. Solano, for their time and effort to review the study and providing feedback, suggestions, and recommendations to improve the contents of the study.

To Ms. Nicole P. Hernandez, the research grammarian, for sharing her valuable time and long patience in reading the study carefully and correcting its grammar.

To Mrs. Yolanda Villadiego, the Head teacher of Mathematics and Mrs. Feliza V. Quevada, the Principal of one of the public schools here in Sariaya where the researchers conducted the studies, for a warm welcome to the researchers and for approving to conduct the studies in their school.

To Ms. Nieves Landicho, the researcher's out-campus validator, for assisting and accompanying the researchers to the areas where the questionnaires are supposed to be distributed, and to Mr. James Marvin B. Arnigo, the researcher's in-campus validator, for sharing your time in validating the research questionnaire of the researchers. Without the help of those validators, the completion of this study would not be possible.

The researchers would like to express their sincere gratitude to Mr. Arjay San Jose, for his financial support and sacrifices so that we could finish these studies properly. Appreciation is also extended to Mr. John Arnold Salvador, thank you for your advice, understanding. The researchers appreciate your helpfulness to finish this study.

To Mrs. Jocelyn C. Gonzalvo, thank you for your financial assistance, and unwavering support throughout the researchers' academic career,. Additionally, the researcher would like to thank Ms. Krisel Ann C. Gonzalvo for providing access to essential resources such as a printer and laptop, as well as for her financial support. Which helps to progressively complete the research.

To the researchers Parents who gave encouragement and moral support throughout the process of the study.

To the Respondents, the 264 Grade 9 students of Lutucan Integrated National Highschool for their full cooperation in responding and answering the questionnaires used in the study; and

Most importantly, they thank Almighty God for giving them the knowledge, wisdom, patience, strength and determination to finish this research.

-The Researchers

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APA Citation:

San Jose, A. U., De Asis, K. M. C., & Garra, M. H. (2025). FACTORS INFLUENCING THE PROFICIENCY LEVEL OF GRADE 9 STUDENTS IN RADICAL EXPRESSIONS. Ignatian International Journal for Multidisciplinary Research, 3(12), 1364–1380. https://doi.org/10.5281/zenodo.18145587

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