Mathematics Education and Entrepreneurial Skills Development, among Junior Secondary School Students in Tai Local Government Area Rivers State

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ABSTRACT

The paper examined Mathematics Education and Entrepreneurial Skills Development, among Junior Secondary School Students' in Tai Local Government Area of Rivers State. Descriptive research design was employed for the study. Three research questions and three hypotheses guided the study. The population of the study consisted of 2000 JSS3 students from ten (10) public secondary schools in Tai Local Government Area of Rivers State. Simple random sampling technique was used to draw a sample of 333 JSS3 students, using Taro Yamane to determine the sample size. Self-structured instrument titled ''Mathematics Education and Entrepreneurial Skills Development Questionnaire'' was used for data collection. The reliability of the instrument was established through Cronbach Alpha which yielded reliability coefficient of 0.84. Mean and Standard Deviation were used to answer the research questions, while simple regression associated with t-test was used to test the null hypotheses at 0.05 level of significance. The findings of the study revealed that there was no significant difference on the extent integrating entrepreneurial skills training into Mathematics education for problem-solving abilities there was no significant difference on the effectiveness pedagogical approaches to merge with mathematics education with entrepreneurial skill development. Finally, there is significant difference on the role hands-on practical application played in enhancing the assimilation of mathematical concepts in entrepreneurial skill development for Junior Secondary School students in Tai Local Government Area. The study recommended school management should encourage collaborative learning and critical thinking by integrating entrepreneurial skills development with mathematics education. This can be done through group projects, allowing students to brainstorm solutions to entrepreneurial challenges using mathematical principles. Teachers with a strong Mathematical foundation who are diverse in content and subject matter should encourage students to explore diverse business ideas, promoting creativity and innovation alongside mathematical proficiency.

Keywords: Mathematics education, Entrepreneurial skills, Innovations in school.

INTRODUCTION

Mathematics holds a prominent place in the school curriculum as a result of its critical role in scientific and technical advancement, and as such, is the foundation for the development of entrepreneurial abilities (Uka, 2015). A solid understanding of Mathematics will improve one's ability to solve complex life challenges. Ale and Adetula (2010), observed that distinction between developed and developing countries is based on their level of mathematical ability and ingenuity. Mathematics is often considered an undeniable driver of economic growth and wealth creation. Mathematics is more than just the science of numbers that professors teach in schools and that many pupils either enjoy or fear. Mathematics plays an important role in people's lives and in the development of any society (Odumosu, 2010). Because we rely on mathematics to address our daily problems, this has become required. In today's increasingly technological culture, Mathematics is also essential for a variety of occupations and work prospects (Odumosu, 2010).

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Udonsa (2015) asserted that the national objectives of secondary education in relation to Mathematics education include laying a solid foundation for the concept of numeracy and scientific thinking; providing opportunities for the child to develop manipulative skills that will enable him to function effectively in society within his capacity; developing in the child the ability to adapt to his changing environment; and providing the basic tools for further learning. With these goals in mind, Oviawe (2010) observed that Nigeria, like most developing countries around the world, faces a slew of issues and harsh realities, including poverty, unemployment, conflict, and sickness. Poverty is one of the repercussions of unemployment. A state of poverty is a general shortage or a lack of a specific amount of material possessions or money. It's a multi-faceted idea with social, economic, and political components. Poverty eradication in all kinds and dimensions, including extreme poverty, is the most pressing global challenge and a prerequisite for national and long-term development.

The learning of entrepreneurial skills for employable individuals is critical to addressing the issue of unemployment and poverty eradication in Nigeria. Mathematics knowledge prepares students to be actively engaged and responsible citizens, creative and imaginative, able to work cooperatively, and fully aware of and conversant with the complex difficulties that society faces (European Commission, 2015). Scientific knowledge aids in describing and comprehending the world around us. Science education is critical for promoting a culture of scientific thinking and inspiring citizens to make decisions based on evidence, ensuring citizens have the confidence, knowledge, and skills to participate actively in an increasingly complex scientific and technological world, and developing problem-solving and innovation competencies, as well as analytical and critical thinking skills, that are required to empower citizens to live personally fulfilling lives. As a result, Mathematics is one of the instruments required for entrepreneurial success.

Doppelt (2003) reviewed the extent integrating entrepreneurial skills into mathematics education enhances problem-solving abilities among junior secondary students. By contextualizing mathematics problems within entrepreneurial scenarios, students engage in real-world applications, fostering critical thinking and problem-solving skills (European Commission, 2017). This integration not only improves mathematical proficiency, but also cultivates creativity, adaptability, and decision-making – essential traits for entrepreneurial success (NCEE, 2020). However, successful implementation depends on the quality of instructional design and teacher training (Guberman & Hativa, 2015).

Various pedagogical approaches, such as project-based learning and experiential learning, have demonstrated effectiveness in merging Mathematics with entrepreneurial skills development in junior secondary schools (Savicevic & Nikolic, 2019). These approaches immerse students in practical experiences, allowing them to apply mathematical concepts to real-world entrepreneurial problems (Ferreira & Quintas, 2020). Furthermore, inquiry-based learning methods promote curiosity and active engagement, fostering a deeper understanding of mathematical principles within an entrepreneurial context (Stolk & Harmsen, 2016).

Hands-on practical application is pivotal in reinforcing mathematical concepts within entrepreneurial skill development (Doppelt, 2003). When students apply mathematical theories to hands-on entrepreneurial activities, they experience firsthand the relevance of mathematics in solving practical problems (Tas, 2017). This direct application not only solidifies mathematical understanding but also instills a sense of ownership and confidence in their problem-solving abilities (Chavez, 2018). Moreover, it bridges the gap between theoretical knowledge and its practical utility in real-life entrepreneurial scenarios (European Commission, 2017).

Adeyemo (2009) noted instructional leadership skills, management skills, communication skills, collaboration skills, vision development skills, change management skills, analysis skills, process skills, assessment skills, and parsimony/economy skills are among the talents learned or acquired. The managerial skills relate to the teacher's communicative abilities, which might be oral or written. Financial talent necessitates an understanding of accounting in a company setting. Marketing and general business skills include the ability to sell items and run various types of businesses to which one is exposed.

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Statement of the Problem

The problem of unemployment is not unique to Nigeria; it is a worldwide problem. The federal Government of Nigeria has implemented a new policy of entrepreneurship education as a compulsory subject and to ensure the realization of self-reliance at all levels of education in Nigeria, notably at the secondary level (Obioma, 2012). These abilities must be acquired, and their growth necessitates a sufficient understanding of mathematics education. Parents, teachers, the government, and the general public are all concerned about this trend. Mathematics, being a universal field that can accommodate various spheres of life, such as science, commerce, accounting, construction, and so on, is the most effective tool for sustaining such realization. The issue may thus lie in the degree to which acquiring mathematical knowledge influences the development of entrepreneurial skills. To reduce poverty, it is therefore necessary to discover techniques that science (Mathematics) education teachers can utilize to foster entrepreneurial abilities in their students. In addition, Boaler (2016) explores the issues in mathematics education, particularly the fixed mindset prevalent among students regarding math abilities. She emphasizes the importance of fostering a growth mindset and creating a positive learning environment to enhance mathematical understanding. Wagner (2012) argues that schools often fail to nurture critical entrepreneurial skills like creativity, adaptability, and problem-solving, which are crucial for success in today's rapidly changing world. Wagner advocates for a shift in education towards fostering innovation and entrepreneurship among students through hands-on learning experiences and real-world challenges.

Purpose of the Study

The purpose of the study is to examined Mathematics Education and Entrepreneurial Skills Development, among Junior Secondary School Students' in Tai Local Government Area of Rivers State. Specifically, the objective of the study includes:

1. Determine the extend integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among Junior Secondary School Students in Tai Local Government Area, Rivers State.

2. Ascertain the effectiveness of pedagogical approaches to merge Mathematics education with entrepreneurial skill development among Junior Secondary School students in Tai Local Government Area, Rivers State.

3. Analyse the role hands-on practical application plays in enhancing the assimilation of Mathematical concepts in entrepreneurial skill development among Junior Secondary Students in Tai Local Government Area, Rivers State.

Research Questions

The study sought answers to the following questions:

1. To what extent do integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among Junior Secondary School Students in Tai Local Government Area, Rivers State?

2. What are the effective pedagogical approaches to merge Mathematics education with entrepreneurial skill development among Junior Secondary School in Tai Local Government Area Rivers State?

3. What role does hands-on practical application play in enhancing the assimilation of Mathematical concepts in entrepreneurial skill development among Junior Secondary School Students in Tai Local Government Area, Rivers State?

Hypotheses

The study sought answers to the following null hypotheses:

1. There is no significant difference on integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among Junior Secondary School Students in Tai Local Government Area, Rivers State.

2. There is no significant difference in merging effective pedagogical approaches to Mathematics education with entrepreneurial skills development among Junior Secondary School Students in Tai Local Government Area, Rivers State.

3. There is no significant difference on the role of hands-on practical application plays in enhancing the assimilation of mathematical concepts in entrepreneurial skill development among Junior Secondary School Students in Tai Local Government Area, Rivers State.

METHODOLOGY

Descriptive research design was employed for the study. The population of the study consisted of 2000 JSS3 students from ten (10) public secondary schools in Tai Local Government Area of Rivers State. (Source: Planning, Research and Statistics Department, RSSSSB Headquarters, Port Harcourt, 2022). Selecting JSS3 students from ten public secondary schools as my study population offers a manageable sample size with sufficient diversity to capture varied perspectives. This choice allows for a representative understanding of academic performance within the context of public secondary education. A sample size of 333 JSS3 students was used for the study.

The sample was established using Taro Yamane to determine the sample size. A stratified random sampling technique was used to select 5 public secondary schools in Tai Local Government Area of Rivers State with total sample 333 JSS3 students whereby 130 JSS3 students were selected from GSS Kpite, 50 JSS3 students were selected from CCSS Nonwa Gbam, 53 JSS3 students were selected from CCSS Botem, 50 JSS3 students were selected from CSS Kporgor and 50 JSS3 students were selected from CSS Kira. After administering 333 copies of the instruments to the respondents, 320 copies were retrieved. Self-structured instrument titled "Mathematics Education and Entrepreneurial Skills Development Questionnaire (MEESDQ)" was used for data collection. The face and content validity of the instruments was determined by the experts. The reliability of the instrument was established through Cronbach Alpha which yielded reliability coefficient of 0.84 and was considered high enough for the study. Mean and Standard Deviation were used to answer the research questions, while simple regression associated with t-test was used for test of null hypotheses at 0.05 level of significance.

RESULTS

Analysis of Research Questions

Research Question One: To what extent do integrating entrepreneurial skills training into mathematics education impact problem-solving abilities among Junior Secondary School Students in Tai Local Government Area, Rivers State?

Table 1: Mean and Standard Deviation Integrating Entrepreneurial Skills Training into Mathematics Education Impact Problem-solving Abilities among Junior Secondary School Students

S/N	Item Statements	Mean	SD	Decision
1.	Integrating entrepreneurial skills into Mathematics education encourages students to apply Mathematical concepts to real-life problems, fostering a practical understanding of problem-solving.	3.37	.57	Accept
2.	Entrepreneurial training within Mathematics classes enhances critical thinking skills, enabling students to approach problems creatively and analytically.	3.27	.52	Accept

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3.	Integration promotes adaptive learning by teaching students to navigate uncertainty.	3.13	.45	Accept
4.	Integration encourages collaboration and teamwork, allowing students to combine mathematical knowledge with entrepreneurial skills, fostering effective problem-solving in group settings.	3.69	.55	Accept
5.	It empowers students to identify challenges as opportunities, fostering a proactive mindset, and developing their confidence to tackle problems independently.	3.36	.60	Accept

Table 1 summarized the mean and standard deviation of responses regarding the impact of integrating entrepreneurial skills training into Mathematics education on Junior Secondary School Students' problem-solving abilities. Items 1, 2, 3, 4 and 5 shows mean values of 3.37, 3.27, 3.13, 3.69 and 3.36 respectively indicates positive perceptions across all statements. These mean scores are greater than the criterion mean of 2.50. The standard deviations (ranging from .44962 to .60217) suggest relatively low variability in responses, implying a moderate level of agreement among participants. Overall, the data suggests that integrating entrepreneurial skills into math education positively influences problem-solving abilities among junior secondary school students. The responses consistently indicate agreement that this integration encourages practical application of math concepts, enhances critical thinking, promotes adaptive learning, fosters collaboration, and empowers students to approach challenges proactively and independently.

Research Question Two: What are the effective pedagogical approaches to merge mathematics education with entrepreneurial skill development among junior secondary school students in Tai Local Government Area Rivers State?

Table 2: Mean and Standard Deviation of the Responses of the Effective Pedagogical Approaches to Merge Mathematics Education with Entrepreneurial Skill Development in Junior Secondary School Setting

S/N	Item Statements	Mean	SD	Decision
6.	Integrate practical math problems rooted in entrepreneurial scenarios to show how math is used in business settings.	3.43	.57	Accept
7.	Engage students in projects that require mathematical concepts to solve entrepreneurial challenges, fostering critical thinking and problem-solving skills.	3.39	.59	Accept
8.	Encourage teamwork and collaboration among students to simulate real entrepreneurial environments, promoting communication and leadership skills.	3.43	.57	Accept
9.	Create opportunities for students to experience entrepreneurship firsthand through simulations, role-plays, or visits to local businesses.	3.44	.58	Accept
10.	Encourage students to think innovatively by linking math concepts to creating and developing new business ideas, fostering entrepreneurial thinking.	3.48	.61	Accept

Table 2 presented the mean and standard deviation for various statements regarding the integration of mathematics education with entrepreneurial skill development in a junior secondary school setting. Items 6, 7, 8, 9 and 10 shows mean values of 3.43, 3.39, 3.43, 3.44 and 3.48 respectively. These mean scores are greater than the criterion mean of 2.50. These means suggest a generally positive perception or agreement with the

effectiveness of these pedagogical approaches. The standard deviations (a measure of how spread out the responses are) are relatively consistent, ranging from around 0.56 to 0.61. This indicates a moderate level of agreement or consistency among the respondents in their ratings for these statements. All the statements received favorable mean ratings (above 3.39), and the relatively low standard deviations suggest a consensus among respondents, indicating that these approaches, which include integrating practical math problems in entrepreneurial scenarios, engaging students in projects, fostering teamwork, providing real-world experiences, and encouraging innovative thinking, are perceived as effective in merging mathematics education with entrepreneurial skill development in junior secondary school settings.

Research Question Three: What role does hands-on practical application play in enhancing the assimilation of mathematical concepts in entrepreneurial skill development among junior secondary students in Tai Local Government Area Rivers State?

Table 3: Mean and Standard Deviation of the Responses of the Hands-on Practical Application Play in Enhancing the Assimilation of Mathematical Concepts in Entrepreneurial Skill Development for Junior Secondary Students

S/N	Item Statements	Mean	SD	Decision
11.	Hands-on activities help students see how math concepts apply in everyday entrepreneurial situations, making the learning more tangible and relevant.	3.58	.59	Accept
12.	Engaging in practical tasks encourages students to apply mathematical thinking to solve problems they might encounter in business scenarios, fostering critical thinking and innovation.	3.66	.59	Accept
13.	Practical applications allow students to visualize and experience abstract mathematical concepts in action, aiding in a deeper understanding.	3.41	.55	Accept
14.	By actively using math in entrepreneurial tasks, students develop transferable skills that can be applied in various real-life situations, enhancing their adaptability and versatility.	3.63	.58	Accept
15.	Hands-on activities create memorable learning experiences, reinforcing mathematical concepts by allowing students to experiment, make mistakes, and learn from them in a practical setting.	3.60	.61	Accept

Table 3 presents the mean and standard deviation (SD) for responses regarding the role of hands-on practical application in enhancing the assimilation of mathematical concepts in entrepreneurial skill development among junior secondary students. Items 11, 12, 13, 14 and 15 shows mean values of 3.58, 3.66, 3.41, 3.63 and 3.60 respectively. The standard deviations are relatively low, ranging from 0.55249 to 0.60974, suggesting a moderate level of agreement among respondents regarding the impact of hands-on activities. The decision column indicates that all item statements are accepted, affirming that respondents believe hands-on activities contribute significantly to students' understanding and application of mathematical concepts in entrepreneurial contexts. The findings suggest that practical tasks help students relate math to real-life scenarios, foster critical thinking, deepen understanding of abstract concepts, and develop transferable skills for real-world adaptability.

Test of Null Hypotheses

Ho_1: There is no significant difference on integrating entrepreneurial skills training into mathematics education impact problem-solving abilities among junior secondary school students in Tai Local Government Area Rivers State.

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Table 4: Simple Regression Analysis on the Extent Integrating Entrepreneurial Skills Training into Mathematics Education Impact Problem-solving Abilities among Junior Secondary School Students

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.672	.130		12.824	.000
	Integration	.407	.036	.537	11.342	.000
a. Dependent Variable: Problem-solving						

Table 4: Presented the results of a simple regression analysis examining difference on the extent integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among Junior Secondary School Students. The coefficient for "integration" is 0.407. This indicates that for every one-unit increase in integrating entrepreneurial skills training into Mathematics education, there is an associated increase of 0.407 units in problem-solving abilities among Junior Secondary School Students. The standardized coefficient (Beta) of 0.537 suggests that the integration of entrepreneurial skills training has a moderately strong positive impact on problem-solving abilities. Both coefficients are statistically significant, ($p < 0.001$), indicating a high level of confidence that the difference in integrating entrepreneurial skills training and improved problem-solving abilities among Junior Secondary School Students is not due to chance. The result further showed that there is no significant difference on integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among Junior Secondary School Students in Tai Local Government Area Rivers State.

Ho$_2$: There is no significant difference in merging effective pedagogical approach to mathematics education with entrepreneurial skill development among junior secondary school students in Tai Local Government Area Rivers State.

Table 5: Simple Regression Analysis on the Effectiveness Pedagogical Approaches to Merge Mathematics Education with Entrepreneurial Skill Development among Junior Secondary School Setting

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.136	.130		8.771	.000
	Pedagogical	.734	.038	.738	19.504	.000
a. Dependent Variable: Entrepreneur						

Table 5: Presented the results of a simple regression analysis for examining the difference on the effectiveness pedagogical approaches to merge mathematics education with entrepreneurial skill development among Junior Secondary School students. The coefficient value of 0.738 indicates that for every unit increase in the use of these pedagogical approaches, there is an expected increase of 0.738 units in the effectiveness of merging Mathematics education with entrepreneurial skills. Both the coefficient (0.738) and the associated t-value (19.504) are statistically significant ($p < 0.001$), suggesting a strong relationship between the pedagogical

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approaches and the effectiveness of integrating math education with entrepreneurial skills. The constant term (1.136) represents the expected effectiveness when the pedagogical approaches are zero, but in practical terms, it might not have a direct interpretation in this context. In addition, the results revealed that There is no significant difference in merging effective pedagogical approach to mathematics education with entrepreneurial skill development among junior secondary school students in Tai Local Government Area Rivers State.

Ho_3: There is no significant difference on the role hands-on practical application play in enhancing the assimilation of mathematical concepts in entrepreneurial skill development among junior secondary students in Tai Local Government Area Rivers State.

Table 6: Simple Regression Analysis of the Role Hands-on Practical Application Play in Enhancing the Assimilation of Mathematical Concepts in Entrepreneurial Skill Development for Junior Secondary Students

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.132	.135		8.384	.000
	Hand on practical	.724	.039	.724	18.719	.000
a. Dependent Variable: Assimilation						

Table 6: Displayed the results of a simple regression analysis examining the role hands-on practical application play in enhancing the assimilation of Mathematical concepts in entrepreneurial skill development among junior secondary students. The coefficient for hands-on practical application (0.724) suggests that for every unit increase in hands-on practical activities, there's an estimated 0.724 increase in the assimilation of Mathematical concepts. The different is statistically significant ($p < 0.001$), implying that practical engagement significantly contributes to better understanding Mathematical concepts in entrepreneurial skill development among junior secondary students. The result further revealed that there is significant difference on the role hands-on practical application play in enhancing the assimilation of Mathematical concepts in entrepreneurial skill development among Junior Secondary Students in Tai Local Government Area Rivers State.

DISCUSSION OF FINDINGS

The findings from research question one agreed that integration encourages practical application of mathematics concepts, enhances critical thinking, promotes adaptive learning, fosters collaboration, and empowers students to approach challenges proactively and independently while findings from hypotheses one revealed that there is no significant difference on integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among junior secondary school students in Tai Local Government Area, Rivers State. This finding confirms by Smith and Jones (2020) which found that when students engage in entrepreneurial activities linked with Mathematical concepts, they tend to develop better problem-solving skills. This integration encourages critical thinking, creative problem-solving, and practical application of Mathematical concepts in real-life scenarios.

The findings from research question two indicates that integrating practical mathematics problems in entrepreneurial scenarios, engaging students in projects, fostering teamwork, providing real-world experiences, and encouraging innovative thinking, are perceived as effective in merging Mathematics education with entrepreneurial skill development among Junior Secondary School students. Also, findings from hypothesis two revealed that there is no significant difference in merging effective pedagogical approaches to

Mathematics education with entrepreneurial skill development among junior secondary school students in Tai Local Government Area, Rivers State. This result corroborates with Brown et al. (2019) which highlighted the effectiveness of project-based learning and inquiry-based methods. These approaches engage students in hands-on activities, fostering collaboration, communication, and decision-making skills alongside Mathematical problem-solving. Additionally, interdisciplinary approaches that combine math with business simulations or real-world challenges have shown promising results in enhancing entrepreneurial thinking.

The findings from research question three affirms that respondents believe hands-on activities contribute significantly to students' understanding and application of mathematical concepts in entrepreneurial contexts. Thus, findings from hypothesis three revealed that there is significant difference on the role hands-on practical application play in enhancing the assimilation of Mathematical concepts in entrepreneurial skill development among junior secondary students in Tai Local Government Area, Rivers State. Research conducted by Garcia and Patel (2021) supports this result, and emphasized that when students engage in practical activities, such as creating business plans, managing budgets, or designing products, they not only understand mathematical concepts better, but also learn how to apply them in real-world contexts. This hands-on experience enhances their mathematical understanding and entrepreneurial mindset simultaneously.

CONCLUSION

Based on the findings of this study, it was concluded that there is no significant difference on integrating entrepreneurial skills training into Mathematics education impact problem-solving abilities among Junior Secondary School Students; there is no significant difference in merging effective pedagogical approach to Mathematics education and entrepreneurial skill development among Junior Secondary School students; and there is a significant difference on the role hands-on practical application play in enhancing the assimilation of Mathematical concepts in entrepreneurial skill development among Junior Secondary School Students in Tai Local Government Area, Rivers State.

RECOMMENDATIONS

Based on the major findings of this study, the following recommendations were made:

1. School management should encourage collaborative learning and critical thinking by integrating entrepreneurial skills development with Mathematics educator. This can be done through group projects, allowing students to brainstorm solutions to entrepreneurial challenges using Mathematical principles.

2. Teachers with a strong Mathematical foundation with sound pedagogical approaches should employ diverse content and subject matter to encourage students to explore diverse business ideas, promoting creativity and innovation alongside mathematical proficiency.

3. Rivers State Government, through the Ministry of Education, should begin a general evaluation and implementation process that would promote the use of technology hands-on application and relevant software to solve entrepreneurial challenges, reinforcing Mathematical understanding in practical contexts.

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