J-IAMSTEM
Journal of Innovation, Advancement, and Methodology in STEM Education
Vol. 1, No. 4, pp. 188-199, July-August 2024
https://so13.tci-thaijo.org/index.php/j_iamstem

Students' Perspectives on Integrating Agricultural Concepts into Contextualized Probability Lessons

Asnaifah Saga[1,3*], Joan Rose Luib[1], Alexis Michael Oledan[2] and Mary Joy Luga[2]

[1]Department of Science and Mathematics Education, College of Education,
Mindanao State University Iligan Institute of Technology, Iligan City, Philippines
[2]Integrated Developmental School, College of Education,
Mindanao State University Iligan Institute of Technology, Iligan City, Philippines
[3]Pantao Ragat Agro-Industrial High School, Pantao Ragat, Lanao del Norte, Philippines
*Corresponding author email: asnaifah.saga@g.msuiit.edu.ph

Received: 24 Jun 2024 Revised: 26 Aug 2024 Accepted: 28 Aug 2024

Abstract

This study investigated students' perceptions of contextualized probability lessons integrating agricultural concepts. It is a qualitative descriptive study that collected data using a perception questionnaire and a short interview with 36 students with diverse levels of proficiency and farming backgrounds. The analysis revealed five main themes: engagement, relevant problems, collaborative learning, improved understanding, and challenges in learning. The results highlight the effectiveness of integrating agricultural concepts into probability lessons to increase student engagement. Despite being perceived as challenging, students found the lessons enjoyable and practical, which enhanced their interest. Think-pair-share and group activities that encourage the exchange of knowledge and mutual support emerged as essential factors in collaborative learning that enhance their educational experiences. Moreover, students perceive the lessons as relevant and relatable to real-life experiences, improving their understanding of probability concepts. However, students encountered challenges with calculations, particularly fractions. Although they have expressed, continued practice and teacher support have substantially improved understanding over time. Furthermore, this study emphasized the impact of contextualized teaching in effective learning, making probability concepts more engaging and meaningful to students by integrating real-life context into mathematics instruction.

Keywords: Agricultural concepts, contextualized probability lessons, students' perception

1. Introduction

Contextualization in mathematics education, a crucial aspect of effective teaching, involves creating authentic math problems linked to real-world applications, engaging students, and deepening their understanding of mathematical concepts (Valenzuela, 2018). This approach places the target mathematical concept in a realistic setting, making learning more meaningful for students and improving their analyzing, evaluating, and creating skills (Orozco & Pasia, 2021). Furthermore, contextualization prompts students to see the practical application of the learning content in their daily lives, making the learning process meaningful (Berns & Erickson, 2001).

Agricultural education is not just about farming; it has the transformative potential to equip students with practical skills and knowledge that transcend traditional academic subjects. Participation in agricultural activities fosters the development of critical thinking, entrepreneurship, collaboration, leadership, and problem-solving skills (Lawankar, 2023). Integrative agricultural education aims to illustrate the interdependence of knowledge and skills through real-world applications by integrating agriculture and core academic content, particularly in mathematics (Robinson et al., 2018).

Effective learning requires contextualization that responds to the specific needs of the students regarding their learning environment. The Philippines Republic Act 10533, "Enhanced Basic Education Act of 2013," mandates adherence to standards and principles in curriculum development, emphasizing contextualization, global perspectives, and cultural sensitivity. Rafael and Tamban (2022) note that the Philippines' K to 12 Curriculum emphasizes the significance of localization and contextualization in teaching and learning. Contextualizing mathematics teaching and learning can significantly enhance students' understanding and engagement. For instance, Majengwa (2016) conducted a study where grade 5 and 6 learners learned estimation practically using maize crops. By measuring the length and circumference of maize cobs at the base and counting the number of seeds, students could contextualize learning and allow them to learn using what they were familiar with.

According to Githua (2020), students' mean scores in statistics and probability are lower than in algebra and numbers. Hence, agricultural teachers should look for ways to integrate agricultural examples into their lessons to help students improve their understanding and performance in statistics and probability. This integration enhances students' understanding of probability by connecting abstract mathematical concepts with concrete real-world applications. Studies highlighted the positive impact of interdisciplinary and contextualized lessons on students' problem-solving skills, cultural awareness, and comprehension (Balantes & Tonga, 2020; Dayta, 2022; Fachrunnisa et.al., 2021; Nugraheni and Yuenyong, 2022; Suparee and Yuenyong, 2021). Their agricultural contextual knowledge significantly influenced the students' understanding of mathematical tasks and vice versa (Fatimah et al., 2020).

This study places a high value on students' feedback, recognizing its importance in shaping the future of education. By investigating students' perceptions of integrating agricultural concepts into contextualized probability lessons, the study aimed to understand how this approach improves their performance, engagement, and understanding of probability concepts. This research also offers insights into how integrating agricultural concepts aligns with the student's interests and is relevant to their learning experiences, paving the way for improved learning outcomes.

2. Methodology

This study employed qualitative descriptive research to investigate students' overall experiences with contextualized probability lessons that integrate agricultural concepts. The study was conducted in a school within an agricultural municipality where students come from farming families, which holds particular significance. Thirty-six (36) Grade 8 students were purposefully selected as participants of the study to represent varied proficiency levels, categorized as advanced proficient (A), proficient (P), approaching proficient (AP), and developing proficient (D), and to provide a broad understanding of how different proficiency levels perceive and respond to the contextualized lessons.

Students were taught using the four (4) probability lessons contextualized using agricultural scenarios and problems familiar to the students, making abstract concepts more relatable and engaging to the students. The study utilized an open-ended questionnaire to obtain data from the students who received the instruction in the probability lessons. After completing the instructional period, all students completed the open-ended questionnaires. A short interview was also conducted with twelve (12) selected participants who either provided brief answers or skipped some questions, allowing these students to elaborate on their responses further.

The data collection and analysis were documented as part of an audit trail to ensure the study's findings were transparent and reliable. This included recording all data handling, from administering the perception questionnaires and conducting interviews to transcribing and analyzing the responses. The student's responses in the perception questionnaire and interview were transcribed and cross-checked with the audio recording to ensure accuracy and analyzed following Braun and Clarke's six-step thematic analysis: familiarizing with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Qualitative data were coded for easier processing of data needed for analysis. Furthermore, Data triangulation using questionnaires and interviews was used to establish credibility and thoroughly understand students' experiences.

3. Results and Discussions

Five themes emerged based on the analyzed data of Grade 8 students' overall experiences with the contextualized probability lessons, integrating agricultural concepts with ten sub-themes. The five main themes were engagement, collaborative learning, relevant problems, improved understanding, and challenges in learning.

3.1 Engagement

Engagement was the first theme from the students' responses to the perceptions questionnaire. Two sub-themes, namely challenging and interest in lessons, support this theme. These sub-themes emphasized how integrating agricultural concepts into probability lessons enables students to engage and understand the concepts.

Students' responses highlighted the challenging nature of learning probability concepts. Despite the challenges, students expressed enjoyment and fulfillment in understanding the probability concepts.

> *"My experience learning probability using agriculture concepts is challenging and interesting. It can help me in daily life. Learning probability was fun, and I enjoyed learning the topic." – A2.*
>
> *"First, I enjoy learning probability using agricultural concepts because of ma'am. I learned a lot about this topic, although it was difficult. The topic was relatable because we have a farm, and I enjoy the group activity with my classmate." – P1.*

Table 1. Themes and Supporting Quotes from Student Responses

Theme: Engagement	
Challenging	A2: "My experience learning probability using agriculture concepts is challenging and interesting. It can help me in daily life. Learning probability was fun, and I enjoyed learning the topic. " P5: "First, I enjoy learning probability using agricultural concepts because of ma'am. I learned a lot about this topic, although it was difficult. The topic was relatable because we have a farm, and I enjoy the group activity with my classmate." P1: " It can provide information about the likelihood of something happening, and the problems were challenging, but I had fun answering it because I understand the scenarios on the problem. "
Interest in Lessons	A5: " Yes, learning probability using agricultural concepts is interesting. It is so easy to understand. I felt involved in the given situations when learning probability using agriculture. D10: "It is interesting because the examples and scenarios given help me understand the lesson because it is more about agriculture, and we experience it, like hot weather and more."

Student A2 shared a personal reflection on using agricultural concepts to learn probability, describing it as a challenging yet enjoyable experience with practical applications in daily life. This statement highlights the dual nature of challenging yet enjoyable learning, indicating a positive engagement with complex mathematical concepts integrated with real-world scenarios. Student P1 acknowledges the difficulty of the problem while finding satisfaction in understanding and solving it. Student P5's perspective also reinforces the challenging aspect of learning while finding relevance in agricultural concepts, which enhances interest in learning probability concepts.

Jackaria et al. (2019) underscore that contextualizing math problems and activities enhances student engagement. This supports the finding that the relevance of these concepts to their daily lives and local context made the lessons easier to understand and stimulated student's interest. For instance, students stated:

" Yes, learning probability using agricultural concepts is interesting. It is so easy to understand. I felt involved in the given situations when learning probability using agriculture." – A5.

"It is interesting because the examples and scenarios given help me understand the lesson because it is more about agriculture, and we experience it, like hot weather and more." – D10.

A5 expressed an increased interest in the lessons, finding them more accessible to grasp because they felt involved in the given situations. This indicates that contextualizing probability with familiar scenarios can significantly increase students' interest in the topics. This was also echoed by student D10, who found the scenarios relatable to their real-life experiences with agriculture, making the abstract concepts of probability easier to understand. These findings underscore the relevance of this approach in enhancing student interest and understanding. These findings are supported by Reyes et al. (2019), who highlighted that contextualization is vital to engaging students in teaching-learning. Their study found that when students can relate their lessons to their situations, their interest and engagement levels increase significantly. Moreover, integrating real-world problems and connecting mathematical concepts in the classroom enhanced students' interest and understanding (Valenzuela, 2018).

3.2 Collaborative Learning

Ahmad et al. (2024) state that integrating collaborative learning activities into mathematics instruction can create a more engaging and supportive learning environment. Collaborative learning is another theme in the students' responses, highlighting the significance of think-pair-share and group activities in enhancing their learning experiences.

Table 2. Themes and Supporting Quotes from Student Responses

Theme: Collaborative Learning	
Teamwork	P3: "I enjoy the topic of the lessons. The groupings were fun because we had teamwork." AP1: "It was interesting because of the group activities, and it felt good when we got it right. They helped me get the correct answer when my answers were wrong." D9: "It was good. It helped us learn new information. It was enjoyable, and I learned a lot, too. I enjoy group activities because we help each other solve problems and do other activities."
Think and Share	AP8: "I enjoyed the activities we did in group activity and pair share activity. I did not know some things, but they helped me learn to solve the problem." A4: "I enjoyed learning probability because of the group activity and pair activities."

Group activities were essential to improving students' learning experiences and Group activities were essential to improving students' learning experiences and engagement as they fostered a collaborative learning environment where students helped each other solve problems and learn from one another, making learning enjoyable and improving comprehension and retention of knowledge. Students stated:

"It was interesting because of the group activities, and it felt good when we got it right. They helped me get the correct answer when my answers were wrong." AP1.

"It was good. It helped us learn new information. It was enjoyable, and I learned a lot, too. I enjoy group activities because we help each other solve problems and do other activities." – D9.

Kocak et al. (2009) emphasized that group activities can enhance students' critical thinking, problem-solving skills, and ability to express themselves effectively, further demonstrating the benefits of this pedagogical approach. This aligned with student D9 and student AP1's statement, who value group activities' mutual support and learning opportunities. Student AP1 supported Student D9 in emphasizing the benefits of peer assistance in correcting mistakes during group work, which fosters a more encouraging and productive learning environment.

Moreover, students expressed that think-pair-share activities enhanced their engagement and helped them understand the lessons better. As stated by students:

"I enjoyed learning probability because of the group activity and pair activities." – A4.

"I enjoyed the activities we did in group activity and pair share activity. I did not know some things, but they helped me learn to solve the problem." – AP8.

Student A4's statement indicates that the collaborative nature of the activities made learning more enjoyable. The student appreciated the opportunity to engage with peers, facilitating a better understanding of the lessons. The Think Pair Share cooperative method positively influenced group establishment, learning environment, achievement,

participation, information exchange, and interpersonal relations (Ardiyani et al., 2019). Similarly, student AP8 recognized that working with peers helped them fill gaps in their understanding and develop problem-solving skills. These responses show that collaborative learning activities made the lessons more engaging and fostered a supportive environment where students could develop their social and teamwork skills, leading to a deeper understanding of the lessons.

3.3 Relevant Problems

The third theme, relevant problems with two sub-themes, real-life application and usefulness to students' lives, stressed the practical applications and relevance of the problems and scenarios included in the lessons. Students perceive the lessons as relevant to their real-life experiences. Buan et al. (2021) found that students viewed contextualized lessons as comprehensive and relevant, emphasizing how activities that connect emotionally and build on existing knowledge aid in neural connections and memory storage. This finding aligns with the student's responses, where they expressed how agricultural examples, scenarios, and problems made probability concepts easier to understand because they could relate them to their experiences.

Table 3. Themes and Supporting Quotes from Student Responses

Theme: Practical Applications and Relevance	
Real-Life Application	AP7: "Yes, it is interesting because it can help us know the chances of things happening, and the lessons involve real-life examples that I can easily understand, like farming, gardening, etc." AP1: "I had a good experience. I learned a lot about finding the right time to plant, how to get the sample space, outcome, and the experimental and theoretical probability." D8: " It was fun because what was used in the lessons are real-life scenarios in our barangay, just like farming and others that usually occur in our barangay."
Useful to Students' Lives	P5: "Because we get to know what is happening to our plants. It makes me understand the lesson more. It is easier compared to the usual math. Solving probability was not difficult because I can relate to it. It is useful in daily life because when we have a problem with farming, this can help us." AP2: "It made it easier for me, and I could relate. I can apply it to myself or in other ways." AP7: " The scenarios help us understand the lessons ma'am taught us well. It makes the lessons easier and useful in our daily lives, and we can relate to them."

The real-life application sub-theme indicates students' perception of how using agricultural examples improves their understanding of probability concepts by relating them to everyday situations and making abstract concepts more relevant. For instance,

> *"Yes, it is interesting because it can help us know the chances of things happening, and the lessons involve real-life examples that I can easily understand, like farming, gardening, etc."* - AP7.
>
> *" It was fun because what was used in the lessons are real-life scenarios in our barangay, just like farming and others that usually occur in our barangay."* - D8.

Student AP7 and D8 statements vividly illustrate the benefits of contextualized lessons using agricultural concepts. AP7 finds familiar examples like farming and gardening helpful in understanding probabilities, making the lesson engaging and

understandable. Similarly, D8 appreciates the lessons' relevance, as they include real-life scenarios from their local 'barangay,' including everyday agricultural activities. These student responses highlight that contextualized lessons make abstract concepts tangible and relatable, thereby enhancing student engagement by directly linking content to their everyday experiences and community practices. This response of students supports Kristidhika et al. (2020), who found that students find it easier to understand abstract concepts when they can independently relate to and identify concrete examples.

Indriani and Julie (2017) assert that students will find mathematics learning more Indriani and Julie (2017) assert that students will find mathematics learning more meaningful if the mathematical concepts are connected to situations from everyday life. The usefulness of the lessons to students' lives was another critical factor that enhanced their learning experience. Students found that relating probability to agriculture increased their personal engagement and practical understanding of mathematical concepts. Student mentioned:

> *"It made it easier for me, and I could relate. I can apply it to myself or in other ways." – AP2.*
>
> *" The scenarios help us understand the lessons ma'am taught us well. It makes the lessons easier and useful in our daily lives, and we can relate to them." – AP7.*

Student AP2 mentions that the lessons are easier to understand and more relatable, allowing for practical application in personal and other contexts. Similarly, AP7 emphasizes that the teaching scenarios make the lessons easier to grasp, useful in daily life, and relatable. These insights underscore that contextualized lessons resonate with students' experiences and daily activities, enhancing comprehension, relevance, and the ability to apply learned concepts to real-life situations. This result is supported by Cubillas (2020), who found that contextualized learning materials significantly enhance students' conceptual understanding, as the material's examples, tasks, and items are relatable.

3.4 Improved Understanding

Another emerging theme underscores the significant strides the students have made in their understanding of probability concepts. It is a testament to their perseverance and hard work that they have overcome their initial confusion and demonstrated substantial progress in their comprehension and application of the content.

Many students initially found probability challenging, but their understanding improved as they engaged with the lessons. For instance,

> *"This was hard for me before, but if you already know how to solve or do it, it feels good because you learned how to do it."* -D1.
>
> *"It was a good learning probability because it challenges our brains. If you do not think well about what you do, you will regret just like in farming; if it had been raining for two days, would you still plant? It might be useless if you do not think of it well."* - AP4.

Student D1 recognizes the initial difficulty but also emphasizes the satisfaction of overcoming it, which illustrates the transition from initial difficulty to eventual mastery. Student AP4, on the other hand, compares learning probability to making farming decisions, emphasizing the importance of careful thinking. These responses demonstrate that contextualized lessons helped students move from initial difficulties to a better understanding of probability by making abstract concepts more relatable and easier to understand. Integrating learning into real-life situations is not unique to probability. For instance, using localized STEM-based learning materials in teaching typhoons has improved students' understanding and performance, as indicated by the significant differences in pre-test and post-test scores (Catipay et al., 2024). As mentioned by

(Kristidhika et al., 2020), contextual teaching and learning improve students' conceptual understanding of the lesson as they can connect the lesson concepts with their own experiences at home as family members, at school as students, among peers, and as a member of the society which made it easier for them to understand the lesson.

Table 4. Themes and Supporting Quotes from Student Responses

Theme: Improved Understanding	
Overcoming Initial Confusion	D1: "This was hard for me before, but if you already know how to solve or do it, it feels good because you learned how to do it."
	AP4: "It was a good learning probability because it challenges our brains. If you do not think well about what you do, you will regret just like in farming; if it had been raining for two days, would you still plant? It might be useless if you do not think of it well."
	A4: "I had a good experience learning probability because I had learned a lot I did not know before. I got much good information."
Teacher's Role	A5: "It was wonderful learning probability using agricultural concepts because we also have a wonderful teacher who can discuss the topic easily. I am thankful to have learned this topic; it can help me in the future."
	P7: " I enjoyed our teacher's discussion because the way our teacher discussed made it easier for me to understand. It is enjoyable because it relates to real life, and you can use it in the future."
	D10: "I had a good experience learning probability because of how you teach, and I have learned a lot from it. I am happy because I learned a lot that I can use in my other subject."

The role of the teacher emerged as a significant factor in overcoming confusion, resulting in an improved understanding of concepts. Cubillas (2020) asserts that the teacher's attitude toward mathematics and their pedagogical approach is vital in enhancing and developing students' conceptual knowledge. Students highlighted how teachers were crucial in helping them overcome difficulties, understand complex ideas, and create a supportive and engaging learning environment:

"It was wonderful learning probability using agricultural concepts because we also have a wonderful teacher who can discuss the topic easily. I am thankful to have learned this topic; it can help me in the future." – A5.

" I enjoyed our teacher's discussion because the way our teacher discussed made it easier for me to understand. It is enjoyable because it relates to real life, and you can use it in the future." – P7.

Student A5's statement emphasizes the importance of having a teacher who can effectively discuss complex topics and highlights the teacher's role in fostering a supportive learning environment. Additionally, student D10 emphasizes the teacher's role in providing a positive learning experience that extends beyond a single subject, enabling students to apply learned concepts in various contexts, thus contributing to a comprehensive understanding. These responses collectively demonstrate the significant influence of the teacher in creating an effective and supportive learning environment. Johnson (2017) further supports these findings by emphasizing teachers' crucial role in influencing students' learning motivation. While students possess innate learning abilities, the quality of their learning experiences is greatly influenced by teachers. Teachers are responsible for establishing a supportive learning environment that facilitates learning and enhances students' enthusiasm and drive for the subject matter. They achieve this by supporting students' autonomy, making lessons relevant to their lives, fostering positive relationships, promoting feelings of competence, demonstrating passion for their subject, and exhibiting confidence in their teaching abilities

3.5 Challenges in Learning

The fifth theme revealed in students' responses to the perception questionnaire was challenges in learning. This theme encompasses the difficulties students faced, particularly with fractions and their efforts and persistence in overcoming these challenges.

Table 5. Themes and Supporting Quotes from Student Responses

Theme: Challenges in Learning	
Difficulty with Fractions	AP5: "Solving probability is a little bit challenging because I need to calculate to get the answers and simplify the fraction to the lowest term, which is hard for me, but I understand it because our teacher discussed it properly." AP7: "Expressing the answers into the lowest term was the challenge." D13: "Solving was hard because of fractions, but with the help of my partner and groupmates, I learned how to solve the problems, and I now know how to solve them."
Effort and Persistence	AP5: "Solving probability is a bit challenging because I need to calculate to get the answers and simplify the fraction to the lowest term, which is hard for me, but I understand it because our teacher discussed it properly." D13: "Solving was hard because of fractions, but with the help of my partner and groupmates, I learned how to solve the problems, and I now know how to solve them."

Many students identified fractions as a primary challenge in solving probability. Their responses highlighted how fractions made solving problems more complex, yet they also noted how support from teachers and peers helped them overcome these obstacles. For example,

"Solving probability is a little bit challenging because I need to calculate to get the answers and simplify the fraction to the lowest term, which is hard for me, but I understand it because our teacher discussed it properly." -AP5.
"Expressing the answers into the lowest term was the challenge." -AP7

Student AP5 recognizes that fractions are challenging, mainly when calculating probabilities that involve simplifying fractions to their lowest terms. Student AP7 expressed a similar sentiment, stating that simplifying fractions is complex and that practice or support is needed. These claims highlight the difficulty of fractions in probability computations. They highlight a common learning difficulty where students would require more assistance and practice to improve their mathematical competency in this area. This finding aligns with Arum's (2018) study, indicating that students often experience probabilistic problem-solving challenges due to computation difficulties, including arithmetic processes with fractions.

Despite the difficulties, many students demonstrated significant effort and persistence in mastering probability concepts. Teachers often supported their determination. As stated by the students:

" ...but I understand it because our teacher discussed it properly." – AP5.
" Solving was hard because of fractions, but with the help of my partner and groupmates, I learned how to solve the problems, and I now know how to solve them." – D13.

Student AP5, who found expressing fractions into their lowest term was challenging, overcame this challenge with his hard work, supported by the teacher's clear explanations,

making it possible and demonstrating the teacher's role in helping students understand complex mathematics concepts. Similarly, student D13's experience shows the benefits of working with classmates to solve problems. Even though fractions were initially tricky, working in groups and getting help from partners made it easier to understand and solve the problems. These responses demonstrate that persistence and teamwork can help students succeed in learning challenging concepts.

4. Conclusion

This study contributes to advancing best practices in mathematics education through contextualized learning by demonstrating the impact of integrating agricultural contexts into probability lessons as the students perceive. By making probability concepts relevant and applicable, integrating agricultural concepts improved student engagement and deepened their understanding of probability. The challenging nature of these concepts piqued the interest of students, who thought they were engaging and enjoyable, especially when linked with real-life scenarios. In addition, students' learning experiences were further enhanced by collaborative learning activities, such as think-pair-share and group activities, which created a supportive learning environment for mutual learning and knowledge exchange. The relevance of these lessons to students' daily lives emerged as an essential factor in improving their understanding, allowing them to easily relate probability concepts to situations they were familiar with. Despite encountering challenges, such as dealing with fractions in calculations, Students showed perseverance and effort in the face of challenges, with the significant help of fellow learners and effective teaching strategies. This study emphasizes the significance of integrating contextualized instructional approaches into mathematics education to enhance student engagement, deepen understanding, and promote the practical application of mathematical concepts in context.

References

Ardiyani, S. M., Gunarhadi, G., & Riyadi, R. (2019). The impact of think pair share model on mathematics learning in elementary schools. *Journal of Education and Learning (EduLearn)*, *13*(1), 93-97.

Arum, D. P., Kusmayadi, T. A., & Pramudya, I. (2018, March). Students' difficulties in probabilistic problem-solving. In *Journal of Physics: Conference Series* (Vol. 983, No. 1, p. 012098). IOP Publishing.

Balantes, C. & Tonga, D. (2020). Lessons in grade 11 mathematics using graphing calculator applications. *People International Journal of Social Sciences*, 5(3), 793-813. https://doi.org/10.20319/pijss.2020.53.793813

Berns, R.G., & Erickson, P.M. (2001). Contextual Teaching and Learning: Preparing Students for the New Economy. *The Highlight Zone: Research @ Work No. 5*. https://files.eric.ed.gov/fulltext/ED452376.pdf

Buan, A.T., Ali, A.Z., & Gomez, R.G. (2021). Development and validation of contextualized lesson in mathematics. *Journal of Physics: Conference Series, 1835*. https://doi.org/10.1088/1742-6596/1835/1/012100

Catipay, J., Salic-Hairulla, M., Nabua, E., Magsayo, J., & Bagaloyos, J. (2024). Integration of a Localized STEM-based Learning Material in Teaching Typhoons for Grade 8 Learners. *Journal of Innovation, Advancement, and Methodology in STEM education*, *1*(2), 90-101.

Cubillas (2020). Cubillas, T.E. (2020). Contextualized Learning Material (CLM) in Developing Conceptual Understanding of Grade 7 Mathematics. *International journal of scientific and research publications*, 10, 9967.

Dayta, D. (2022). Developing a localized and context-driven approach for improving the instruction of statistics and probability in the secondary level in the Philippines. https://doi.org/10.52041/iase.icots11.t14a1

Enriquez, E., Kilag, O. K., Llurag, S., Villanueva, K., Samutya, M., & Rabi, J. I. I. (2024). Enhancing Problem-Solving Skills in Mathematics Education: A Study on Realistic Mathematics Education in the Philippines. *International Multidisciplinary Journal of Research for Innovation, Sustainability, and Excellence (IMJRISE)*, *1*(4), 75-80.

Fachrunnisa, R., Suwono, H., Yuenyong, C., Sutaphan, S. and Praipayom, N. (2021). Eco-friendly fashion: A STEM sandpit project in Indonesian senior high school. *Journal of Physics: Conference Series* 1835 (1), 012046

Fatimah, A. T., Wahyudin, W., & Prabawanto, S. (2020). The role of agricultural contextual knowledge on the mathematical understanding of vocational students. *Journal of Physics: Conference Series*, 1521 (3), p. 032020).

Jackaria, P. M., Buan, A., & Yuenyong, C. (2019, October). Students' Performance in Context–Based Lessons in Mathematics Classroom. *Journal of Physics: Conference Series*, 1340 (1), p. 012047).

Johnson, D. (2017). The Role of Teachers in Motivating Students to Learn. *BU Journal of Graduate studies in education*, *9*(1), 46–49.

Githua, S. W., & Ricketts, J. C. (2020). Agricultural education and mathematics performance among secondary students. *Online Journal of Workforce Education and Development*, 10(1).

Indriani, N., & Julie, H. (2017). Developing learning trajectory on the circumference of a cycle with realistic mathematics education (RME). Paper presented at the AIP Conference Proceedings 1868, 050022.

Kristidhika, D. C., Cendana, W., Felix-Otuorimuo, I., & Müller, C. (2020). Contextual teaching and learning to improve conceptual understanding of primary students. *Teacher in Educational Research*, *2*(2), 71-78.

Koçak, Z. F., Bozan, R., & Işık, Ö. (2009). The importance of group work in mathematics. *Procedia-Social and Behavioral Sciences*, *1*(1), 2363-2365

Lawankar, M., Shelar, R., & Pote, N. (2023). Agricultural Education in School Curriculum. *New Era Agriculture Magazine*, 1(12).

Nugraheni, A. R. E., and Yuenyong, C. (2022). Developing the Smog Problem in Indonesia STEM Education Learning Activity. *Asia Research Network Journal of Education*, 2 (3), 127-134

Orozco, L. R., & Pasia, A. E. (2021). Enhancing Student's Higher Order Thinking Skills Through Contextualization of Sociocultural Mathematics Teaching. *IOER International Multidisciplinary Research Journal*, 3(2). https://ssrn.com/abstract=385980

Majengwa, C. (2016, March 24). *Contextualization: Teaching estimation to grade five and six learners using maize crop*. https://www.ajol.info/index.php/zjer/article/view/132692

Memnum, D. (2019). A Qualitative Research on the Difficulties and Failures about Probability Concepts of High School Students. *Journal of Educational Issues*, 4(1). https://doi.org/10.5296/jei.v5i1.14146

Rafael, S. & Tamban, V. (2022). Effectiveness of localized English reading materials in enhancing the reading skills of the grade two pupils. *Journal of English as a Foreign Language Teaching and Research*, 2(2), 67-77. https://doi.org/10.31098/jefltr.v2i2.1126

Reyes, J.D., Insorio, A.O., Ingreso, M.L., Hilario, F.F., & Gutiérrez, C.D. (2019). Conception and Application of Contextualization in Mathematics Education.

International Journal of Educational Studies in Mathematics, 6(1), 1-18. https://dergipark.org.tr/tr/download/article-file/664590

Robinson, K., Westfall-Rudd, D., Drape, T., & Scherer, H. (2018). Conceptualizing integrative agricultural education: introductory framework for integrating mathematics in agricultural curriculum. *Journal of Agricultural Education*, *59*(4), 253-269

Suparee, M., and Yuenyong, C. (2021). Enhancing Grade 11 Students' Learning and Innovation Skills in the STS Electric Unit. *Asia Research Network Journal of Education*, 1 (2), 96-113

Valenzuela, H. (2018). A multiple case study of college-contextualized mathematics curriculum. *MathAMATYC Educator*, 9(2), 49-55. Retrieved from http://www.amatyc.org/?page=MathAMATYCEducator