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Applicability and Difficulties of Contextualized Competency-Based Interventional Games for Grade 7 Students with Special Needs

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Abstract

Aim: This research aimed to determine the effectiveness, difficulties, and acceptability of interventional games as applied by forty-seven (47) Sped teachers in teaching Algebra among thirty (30) Grade 7 learners with special needs at Batangas Integrated National High School in Batangas City Schools Division during the school year 2023-2024 as the basis for contextualized-interventional games.

Methodology: The descriptive type of research was used in this study, with a questionnaire as the instrument in the contextualization of the content–based interventional games in Algebra. The descriptive statistical tools used were frequency, percentage, and mean average; whereas, inferential statistics included Reliability analysis.

Results: Based on the data gathered, the following are the findings of the study of all topics in Algebra in which interventional games can be applied. All competencies in Algebra, under MELC, were strongly agreed by the respondents that interventional games can be applied. Scores among Mathematics Grade 7 Learners with Special Needs in Lessons-Integrated Games with regards to pre-test results performed very satisfactorily during the post-test showed an outstanding performance. Both teachers and students strongly agreed as they perceived difficulties in Algebra as needed for intervention materials.

Conclusion: There were mathematics interventions addressing difficulties that were frequently used by the teachers where the level of acceptability of the content-based interventional games in algebra was strongly agreed by teachers that the said games are acceptable to be an intervention in teaching as they give the students fun and enjoyment.

Keywords: Special Education, Interventional Games, Algebra, Applicability

Introduction

Math is a cornerstone of education, introduced to students from the very start of their schooling journey. How they grasp math can significantly influence both their personal and professional development. Therefore, the role of teaching math is vital for the comprehensive growth of students, presenting educators with the task of simplifying yet enriching the learning experience.

The process of teaching math is continuous and spans across all educational levels. Starting in kindergarten, students begin to grasp basic numerical concepts and the relationships between numbers, a skill known as 'number sense.' This includes conceptualizing a number line, which is fundamental for performing mental math calculations.

Students must become proficient in common math operations and fundamental arithmetic combinations as they progress through primary school. To successfully solve applied problems, students must be able to comprehend specialized math vocabulary, recognize the pertinent math operations that must be performed while disregarding any extraneous information that may also be present in the written problem, convert the word problem from text format into a numeric equation that contains digits and math symbols, and finally solve the mathematics problem.

Using the descriptive method, Alminiana (2017) revealed the following findings in his study. First, the mathematical skills of elementary student teachers according to overall score are poor in topics like percent, fraction, volume, plane figures and decimals. They are also poor in both computations and non-computational skills. Secondly, there is no significant relationship between elementary student teacher's profile and their level of mathematical skills.

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Third, there is no significant relationship between the attitudes of elementary students and elementary mathematics teachers to the level of their mathematical skills. Finally, Alminiana concluded that there is a need to evaluate the Bachelor in Elementary Education courses. Emphasis should be given to the mastery of the topics on percent, fractions, decimals, geometry, plane figures and volumes. Addition of topics on maps and graphs is valuable in upgrading their mathematical skills.

The study by Sabaruddin, et al. (2020) investigated that the provision of mathematics for autistic students has not gained a special concern. In fact, many autistic children have good mathematical skills, and some are excellent. It forces teachers to formulate and create effective strategies to teach autistic students. This study aimed to determine teacher behavior and how to teach students with autism effectively. This study was designed as a qualitative case study research. It involved a mathematics teacher, assistant teacher, student, and parents. Data were obtained through observations and interviews.

The autistic student's attitudes and behaviors during mathematics learning were investigated. It included examinations on the supporting and inhibiting factors in mathematics learning in a school for students with special educational needs/SLB. The result indicated that mathematics learning for students with autism as performed in inclusive education differed from regular education programs, in which teachers were required to adjust materials to students' psychological conditions.

In the study of Vale and Barbosa (2023), it is stated that learning is an active enterprise, where three dimensions stand out, cognitive, social, and physical, and, in addition, not all students learn in the same way. Grounded on these ideas, this article reports a study that aims to understand and characterize the performance of pre-service teachers when experiencing active learning strategies during their mathematics classes. Active learning provided collaborative work and mathematical communication enabling the emergence of different strategies to solve the proposed tasks. The participants were able to reflect and be aware of their ideas, mistakes, and difficulties, as well as of others, in a non-threatening environment, where movement was highlighted for not being a popular dimension in mathematics classes. Although more research is needed, the results encourage the use of active learning strategies as a valuable approach to teaching and learning.

It also revealed that the students had had focus issues; hence materials were mostly conveyed outside the lesson plan, particularly to introduce the basic material. The supporting factors included parents' motivation for the student to learn and behave appropriately and well-designed learning packages. Meanwhile, limited learning media and school facilities, as well as the absence of special teachers for students with autism, became the inhibiting factors for mathematics learning.

Xin and Tzur (2016) mentioned that one of the factors that affect students' mathematics learning outcomes with special needs is the teacher's role and teaching method, which is significant in improving student achievement in mathematics learning. Students with special needs have different characteristics from those of traditional schools in which they require special assistance in learning mathematics. Learning-teaching plans in SLB include activities to convey materials to students with special needs; hence they will have adequate skills and knowledge for their development.

Elementary school students encounter a variety of Mathematical concepts such as basic operations, fractions, negative numbers, equations, geometry, and problem-solving skills. These foundational topics are critical for their success in more advanced mathematics courses like Elementary Algebra and trigonometry in high school. Challenges in mastering applied mathematical problems can arise from difficulties in reading, understanding, and performing basic arithmetic operations, as well as a lack of familiarity with mathematical operations and vocabulary.

The study by Ngiamsunthorn (2020) mentioned that in the context of mathematics learning for students with special needs, teachers must provide the best support to optimize autistic students' skills in learning mathematics. Nevertheless, the materials must be tailored specifically and appropriately for students with diverse special needs. It is very influential in every stage of student learning development. The development of students with autism, in fact, is distinguished in terms of behavior, social communication, and social interaction between students, depending on the level of the obstacles.

Tailoring math interventions to fit each student's unique needs is essential, considering their current abilities, the local curriculum requirements, and their overall skill set including reading comprehension. Innovative teaching methods, including the use of visual aids, technology, and games, can enhance student engagement and understanding in mathematics. Games create a competitive yet educational environment by emulating real-life scenarios within a structured setting, aiming to combine learning with entertainment.

Mathematics teaching instills mathematics knowledge with the use of different teaching methods and strategies. One way is the problem-based learning approach, which develops problem–solving skills. In this method,

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the students deal with concepts, exhibit conceptual understanding when they recognize, and label and generate examples about the problem solving. Students also demonstrate procedural knowledge when they select and apply procedures correctly – that is when they recognize addition and find the correct sum.

Educators cannot dispute the reality that students today like playing persistently engaging games, such as those found on the internet. Since it brings them comfort and happiness when they are not in school, they are demonstrating involvement. Because they may play with different groups at the same time as well as alone, students are participating in the variety of games that the modern world has to offer. This fosters a mood of relaxation and friendship.

These days, certain internet games are regarded as sports. The reason they chose this as a competition was because they found that it increases student participation by releasing them from vices like drug and smoking usage, and it also relieves tension since it provides comfort and satisfaction.

Students with disabilities are required to have access to the general education curriculum in the least restrictive environment (LRE) according to federal special education regulations in the United States, such as the Individuals with Disabilities Education Act (IDEA). According to the legislation, kids with disabilities must get their education with their usually developing peers as much as possible, unless learning in a general education classroom is not possible, even with additional support and aids.

Indeed, there are studies conducted to determine the learner's academic performance in Mathematics as a whole, the researchers came up with the idea of contextualizing an interventional game in Algebra to be specific since it is the foundational skill that every learner to master so that they may be able to strive hard as they are encountering other higher mathematics. Despite the disability that they have, they still need to learn and surpass the competencies as it is part of the curriculum in general.

In the study of Minoza (2017) the determinants in the performance of first year students in Mathematics were identified. Generally, it was found out that the performance of students in mathematics was affected by their negative attitude in the subject thus, their poor performance. It was revealed that predictors in mathematics performance among students of the six high school included were the grade six (as Foundation) income of parents, type of schools where students are studying, and educational attainment of parents.

It was recommended that teachers must exert effort in teaching Mathematics subjects. Teachers should have developed strategies that will motivate students to study and like the subject better. Parents – teachers' role in guiding and teaching must developed so that the students can be helped and monitored for better performance. And school Administrators should initiate livelihood program among parents of students to augment their income. This will be done through extension program.

The teacher observes students during process modeling to verify that they are correctly applying the cognitive strategy. Performance feedback. Students get regular performance feedback about their level of mastery in learning the cognitive strategy. That feedback can take many forms, including curriculum-based measurement, timely corrective feedback, specific praise and encouragement, grades, and brief teacher conferences. Review of mastered skills or material.

Success in high school algebra is gaining increased importance for all students, including those identified as having learning disabilities (LD). Despite its importance, we know little about what students with and without LD say about their algebra classes. This study examined findings from a survey of 410 general education students and 46 peers with LD. The survey established data relative to the participants' favorite and least favorite classes, most difficult (and best) parts of algebra class, and ideas for helping more students to succeed. In addition, student participants reported whether selected interventions and accommodations were helpful (Kortering, et al., 2015).

Once the student has mastered a cognitive strategy, the teacher structures future class lessons or independent work to give the student periodic opportunities to use and maintain the strategy. The teacher also provides occasional brief 'booster sessions', reteaching steps of the cognitive strategy to improve student retention (Montague, 2019)

These situations directed the researchers to conduct a study prioritizing the development of content-based intervention games in mathematics for the students, as they are more inclined to different games influenced by modern technologies. Another basis for the conduct of this study was the new trend nowadays, which is that students, especially those with special needs, are fond of using online games that they are engaged with. The researchers may find ways to align with their needs so that they will be able to play while learning through the intervention game material in algebra.

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Objectives:

This study aimed to determine the effectiveness, difficulties, and acceptability of interventional games as applied by Sped teachers in teaching Algebra among Grade 7 learners with special needs at selected schools in Batangas City Schools division during the school year 2023-2024 as basis for a contextualized-interventional games.

Specifically, it sought answers to the following queries:

1. What specific competencies in Algebra are interventional games applicable?
2. What is the score among Mathematics Grade 7 learners with special needs in lessons-integrated games as to:
    a. Pretest; and
    b. Posttest?
3. As perceived by the respondent-groups, to what level of difficulties are felt by:
    a. teachers in teaching Algebra; and
    b. students in learning Algebra?
4. To what degree are Mathematics interventional games utilized to address the difficulties felt by both respondent-groups?
5. What is the level of acceptability of the contextualized content–based interventional games?
6. Based on the findings of the study, what contextualized interventional games may be formulated.?

Hypothesis:

Given the stated research problem, the following hypotheses were tested on 0.05 level of significance:
Hypothesis 1: There is a significant difference between the pre-test and posttest in determining the level of acceptability of the contextualized content–based interventional games.

Methods

Research Design

The researchers used the descriptive method of research. This design helped the researchers gather important facts and data regarding the overall logical presentation of the study.

Population and Sampling

The respondents of the study were both Grade 7 Special Education learners and Mathematics teachers in the Schools Division Office (SDO) - Batangas City. There were thirty (30) grade 7 learners in Batangas Integrated National High School served as the respondents of this study since they were the only ones who were catering to the Special education program. There were forty (47) Mathematics teachers handling Garde 7 in the four big integrated high schools in the SDO – Batangas city.

Instrument

This study used a questionnaire as the instrument in gathering the data. said questionnaire was composed of four parts. Part I. Composed of 13-item competencies in Grade 7 algebra in which interventional games can be applied. This was a checklist form of questionnaire that respondents may choose the competencies as they can. Part II. Composed of 15-item indicators for teaching and 11-item indicators for learning difficulties in Algebra. Teaching, for teachers and learning for students. These difficulties were answered by teachers specifically in learning difficulties since they were the ones who identified the said difficulties among students. Part III. Composed of 15-item indicators developed competency-based interventions used in addressing students' difficulties. Part IV. Composed 14-item indicators on the level of acceptability of the competency-based instructional games. `

Data Collection

The researchers wrote a letter to the Schools Division Superintendent of Schools Division Office of Batangas City to ask permission to conduct the study. Experts were asked to validate the questionnaire attached to the letter. After the validation, it was administered to the rest of the grade 7 mathematics teachers in the said schools of the division for pilot testing.

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Treatment of Data

To describe and interpret the data objectively, the following statistical measures, both descriptive and inferential, were used such as frequency, percentage, ranking, weighted mean, and t-test. These were used to determine the number of responses made by teachers in the checklist regarding topics in mathematics where instructional games can be applied and the teaching and learning difficulties they met, the intervention measures they used to address the difficulties, and the level of acceptability of the developed content-based instructional games.

Ethical Considerations

The researchers adhered to universal practices and research ethics in conducting the study. Letters of consent were provided to respondents along with an invitation to participate in the study. Through google meet or zoom application, the goal of the study will be explained to the respondents, and the researchers promptly reacted to any concerns they may have about how the study is being conducted. Additionally, respondents were informed during the orientation that they may withdraw from the study at any point if being a respondent will cause discomfort to them or felt it would be damaging to their well-being.

RESULTS AND DISCUSSION

Specific Competencies in Algebra where Interventional Games are Applicable

Mathematics transcends the confines of the classroom and school, infiltrating every aspect of life regardless of age or circumstance, underscoring its indispensable value. Consequently, acquiring a profound and comprehensive understanding of mathematics as an academic discipline is imperative. The structure of the mathematics curriculum is designed to foster learning through inquiry and exploration, encouraging students to pose pertinent questions and embark on a journey of discovery.

Through this approach, known as Discovery and Inquiry-based learning, students leverage their personal experiences to unearth facts, relationships, and concepts. Mathematics is akin to both a science and a language, equipped with its own notations, symbols, and grammatical rules, which facilitate the effective communication of concepts and ideas. The curriculum encompasses various domains, including Numbers and Number Sense, Measurement, Geometry, Patterns and Algebra, and Statistics and Probability. Within these domains, Geometry focuses on the properties and relationships of two- and three-dimensional figures, spatial visualization, reasoning, and the application of geometric modeling and proofs.

Meanwhile, Patterns and Algebra delve into the examination of patterns, relationships, and transformations among shapes and quantities. This area emphasizes the utilization of algebraic notations and symbols, equations, and notably, functions, to represent and scrutinize relationships.

Table 1 presents the data on this variable.

Table 1
Algebra Competencies Where Interventional Games are Applicable

	Competencies in Algebra	Frequency	Percentage
1.	evaluates algebraic expressions for given values of the variables	47	100.00
2.	adds and subtracts polynomials.	47	100.00
3.	derives the laws of the exponent.	47	100.00
4.	multiplies and divides polynomials.	47	100.00
5.	uses models and algebraic methods to find the: (a) product of two binomials; (b) product of the sum and difference of two terms; (c) square of a binomial; (d) cube of a binomial; (e) product of a binomial and a trinomial.	47	100.00
6.	solves problems involving algebraic expressions.	47	100.00
7.	differentiates algebraic expressions, equations and inequalities.	47	100.00
8.	illustrates linear equation and inequality in one variable.	47	100.00
9.	finds the solution of linear equation or inequality in one variable.	47	100.00
10.	solves linear equation or inequality in one variable involving absolute value by: (a) graphing; and (b) algebraic methods.	47	100.00

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11.	solves problems involving equations and inequalities in one variable.	47	100.00
12.	factors completely different types of polynomials (polynomials with common monomial factor, difference of two squares, sum and difference of two cubes, perfect square trinomials, and general trinomials).	47	100.00
13.	solves problems involving factors of polynomials.	47	100.00
	Total	47	100.00

Shown in Table 1 are the competencies in Algebra in which interventional games can be applied. It can be gleaned also from the table that all competencies in Algebra under MELC are applicable to be considered as games in teaching Mathematics. This implies that teachers may not concentrate only on some traditional strategies in teaching Mathematics but also prepare lesson activities in terms of games. Students, when given activities through games, are more participative, as observed by the researchers. Having games is very enjoyable for the learners. Time is so fast that students just do not notice it is time for the next subject.

Students in the 21st century needed to be given attention in class, where different activities must be given as they are mandatorily included in their lesson plan since it focuses on the 4As, which simply mean Activity, Analysis, Abstraction, and Application. In every A, an activity like games will be emphasized and used.

According to Dossey (2019), games and puzzles supply a little extra spark to begin and end a class period. They are an enjoyable way to practice skills, an effective enrichment of remedial lessons, and an interesting catch for the mathematics program. Games offer dessert for a mathematics meal that can be enjoyed by all.

This researcher concurs with Dossey's (2019) claim that games and puzzles supply a little extra spark to begin and end a class period. The researchers had used these games in his math classes, and the students found the results interesting.

Montague (2019) concluded that particular games and their variation are not important. More important is the idea of involving students in the evolution of a game and directing that evolution to supplement and extend the regular mathematics program. Montague's (2019) claim is very true. Students are more motivated in the lesson if they are involved in the different Math activities.

Score among Mathematics Grade 7 LSENS in Lessons-Integrated Games

In this study, the mathematics Grade 7 LSENs scores were considered specifically on competencies where interventional games were applied. The pre-test and post-test scores were acquired with permission from the concerned schools.

Pre–Test Score Among Mathematics Grade 7 Learners with Special Needs in Lessons without Integrated Games

An assessment was conducted before the introduction of a condition, therapy, modification, or intervention. Before they participate in a study, research volunteers may, for instance, be given a pretest. Pretest scores are in Table 2.

Table 2
Pre–Test Score Among Mathematics Grade 7 Learners with Special Needs in Lessons-Integrated Games

Descriptors	Grading Scale	Pre - Test	
		Frequency	Percentage
Outstanding	90-100	2	6.67
Very Satisfactory	85-89	1	3.33
Satisfactory	80-84	2	6.67
Fairly Satisfactory	75-79	13	43.33

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Did Not Meet Expectations	Below 75	12	40.00
	Total	**30**	**100.00**

Reference: *DO 58, 2017*

As depicted in Table 2, only 2, or 6.67 percent got an Outstanding grade for the pretest, while 13, or 43.33 percent, and 12, or 40.00 percent, fall under the Fairly Satisfactory and Did not meet categories, respectively. The data is very alarming since the LSENs seemed to have not learned the competencies as expected.

It can be gleaned from the table that most of the learners performed fairly satisfactorily during the first quarter, which was defined as pre-test relative to this study. According to the teacher respondents, Algebra was considered the hardest part of the Garde 7 mathematics curriculum. Being special education teachers, they do modifications and accommodations relative to this matter. Learners were given ample time to do their work or tasks through differentiated instructions accordingly.

It has become more and more crucial for today's learners to succeed in high school algebra. Some experts argue that algebra acts as a gatekeeper for admission to universities. The importance of algebra classes as prerequisites for success in higher education and lucrative careers justifies their role as gatekeepers. Consequently, students who fail in or access algebra are at risk of not pursuing postsecondary education and becoming ineligible for numerous high-paying positions. This situation underscores special educators' need to collaborate with general educators in implementing strategies that enable more students with learning disabilities (LD) to access and excel in algebra courses during their high school years.

Research conducted by Kortering, et al. (2015) highlighted various interventions aimed at enhancing student performance and grades in algebra. These interventions encompassed employing peer or senior tutors, engaging in group or pair activities, utilizing graduate students from adjacent universities as class assistants, offering daily candy rewards, providing music store gift certificates for achieving a B average or demonstrating grade improvement, and imparting skills for test-taking and learning strategies. Additionally, Kortering et al. identified specific accommodations that contributed to student success, such as increased teacher support, minimizing classroom distractions, providing more targeted individual or small-group assistance, and extending deadlines for tests or assignments.

Indeed, Kortering et al.'s (2015) findings are true, as this study's findings showed that learners' performance has a vital role in moving forward to the next level of their academic achievement. Most learners perform fairly since the interventional games are not yet administered, and teachers are merely giving them accommodation and modification of the Algebra competencies.

Posttest Score Among Mathematics Grade 7 Learners with Special Needs in Lessons-Integrated Games

After the administration of the pre-test, a post-test was conducted on the student respondents. A posttest is a test given to students after completing a course, training, or lesson. Posttests are often used in conjunction with a pretest to measure student achievement and the effectiveness of the program.

Table 3 also shows that there were five (5) or 16.67 percent of the learners who performed outstanding, three (3), or 3.33 percent were very satisfactory, eight (8) or 26.67 percent were satisfactory, twelve (12) or 40.00percent were fairly satisfactory, and two (2) or 6.67 percent did not meet expectations during the pre-test.

It can be gleaned from the table that most of the learners performed fairly satisfactorily during the posttest where 3.33 percent were eliminated from the said category. Based on the results comparing the pre-test to the post-test, the learners improved when the interventional games were used. Through the initial interview among the learners, while executing the interventional games, they learned a lot with the concepts as they were not just learning but they are also enjoying.

Table 3 shows the posttest score among mathematics grade 7 learners with special needs in games-integrated lessons.

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Table 3
Posttest Score Among Mathematics Grade 7 Learners with Special Needs in Games-Integrated Lessons

Descriptors	Grading Scale	Post Test	
		Frequency	Percentage
Outstanding	90-100	5	16.67
Very Satisfactory	85-89	3	10.00
Satisfactory	80-84	8	26.67
Fairly Satisfactory	75-79	12	40.00
Did Not Meet Expectations	Below 75	2	6.67
Total		30	100.00

Reference: *DO 58, 2017*

It is important to highlight that the usage of interventional games not only thrilled instructor responders but also enlightened and delighted learners who, via playing, retained the rules and applied the ideas of algebraic skills. They also mentioned that although the students eagerly exercised the skills, the games taught them how to do the algebraic skills in a step-by-step manner.

Effective high school algebra interventions should include more group work, sympathetic teachers who try to clarify algebraic ideas and problems, student access to materials and activities that are relevant and interesting, and more. Furthermore, a small majority of participants suggested the employment of software, general or specific incentives, and teaching in learning strategies and test-taking methods.

Sabaruddin, et al. (2020) supported the findings of this study, highlighting the lack of targeted investigation into mathematics education for students with autism. Despite many autistic children displaying proficiency or even excellence in mathematics, educators need to develop and implement strategies that effectively cater to these students. This research focused on examining teacher behaviors and identifying effective methods for instructing students with autism.

It is indeed true that the findings were acquiesced by the researchers that during the administration of the games, the learners with special needs with autism did a great job winning the game and performed well in the administration of the teacher-made test. They were the majority of all the learners who did a great job on the said administration.

Xin and Tzur (2016) accentuated the current study that the role and teaching style of the teacher is important in raising student accomplishment in mathematics learning and that it influences the mathematics learning outcomes of students with special needs. The features of students with special needs differ from those of students in typical schools in that they need extra help to learn mathematics.

This is true that extra help or interventional materials suited to the learners' needs will be given to them. It was gleaned from the findings that through the interventional games, the learners excelled and performed well in Algebra competencies that they had taken during the first quarter.

Perceived Level of Difficulties in Algebra by both Respondents

It is commonly observed that students fear Mathematics, struggling to grasp its fundamental concepts and methodologies for various reasons. Compared to other academic subjects, the challenges encountered in learning Mathematics appear to be fewer. However, for the average student, it becomes a more arduous subject, leading them to shy away from it. Difficulties with Mathematics are not exclusive to students but are also experienced by teachers.

Teachers' Perceived Difficulties in Algebra

Most mathematics teachers are unaware of alternative, simple methods of teaching mathematics and different skills for solving the same problem. Hence, there is a need to study in detail the problems students and teachers face in learning and teaching mathematics.

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As shown in Table 4, all indicators were **Strongly agreed** by the respondents. In this case, it is really in need of intervention materials to be given to teachers specifically to those indicators with a weighted mean of 4.00 such as lacking materials to be used in teaching Algebra like application of technology inside the classroom, providing opportunities for the students to think aloud while they solving problems in Algebra, using the native language to explain mathematical ideas in the class, interpreting word problem in connection with Algebraic expression, and managing discussions and interpretations of word problems.

Table 4 is the result of teachers' teaching difficulties commonly met in Algebra.

Table 4
Teachers' Perceived Difficulties in Algebra

	Indicators	WM	VI
1	Lacking of materials to be used in teaching Algebra like the application of technology inside the classroom	4.00	SA
2	Using visual representations systematically and explicitly instruction	3.96	SA
3	Developing vocabulary and terms needed for learning algebra	3.64	SA
4	Using of structured peer-assisted learning activities in teaching Algebra as a whole	3.51	SA
5	Using appropriate teaching strategies in teaching integers	3.98	SA
6	Providing opportunities for students to think aloud while they solve problems in Algebra	4.00	SA
7	Executing student's ability to identify different procedures in solving Algebra problems	3.89	SA
8	Maintaining the focus of the students in teaching and evaluating algebraic expression	3.93	SA
9	Conceptualizing strategies in addressing students that fraction or use of division is almost the same in finding its quotient.	3.98	SA
10	Using the native language to explain mathematical ideas in the class.	4.00	SA
11	Interpreting word problems in connection with Algebraic expression	4.00	SA
12	Managing discussions and interpretations of word problems	4.00	SA
13	Students have grown up on something totally wrong but they see it as correct. (like transpose" x to the right side to get -x)	3.91	SA
14	Involving students in class discussions/activities and explaining their output in front of the class	3.89	SA
15	Putting in student's mind about the difference of variable and constants	3.78	SA
	Composite Mean	**3.90**	**SA**

Legend: **WM** = Weighted Mean **VI** = Verbal Interpretation
SA = Strongly Agree (3.26 - 4.00) **A** = Agree (2.51 - 3.25)
D = Disagree (1.76 - 2.50) **SD** = Strongly Disagree (1 - 1.75)

On the other hand, it should be noted that the indicator that says "Developing vocabulary and terms needed for learning algebra" got the lowest mean of 3.64. This implies that such an aspect was not too difficult for the teachers. The teachers must already have experience in the vocabulary development of the LSENs. This is a good indicator that teachers have acquired this specific skill, and they should maintain or even enhance this for the benefit of the learners.

Gardner (2015) highlighted that the teaching strategies most valued by science and mathematics teachers in schools, which serve as exemplary standards for teaching and learning, include hands-on experiences that maximize students' learning potential through self-reliance, cooperative learning that fosters superior knowledge sharing in group settings compared to solo efforts, and self-discovery, which significantly boosts students' ability to learn.

The researchers agreed that Gardner's (2015) study revealed that hands–on experience was identified as the most effective teaching strategy. However, the findings of this study revealed that teachers faced constraints in teaching mathematics not only to students with learning disabilities but also to students who were not included.

Vale and Barbosa (2023) investigated those different approaches to completing the given objectives emerged because of collaborative effort and mathematical communication made possible by active learning. Movement was emphasized as a factor that isn't often included in math lectures, and participants were allowed to reflect and become aware of their thoughts, errors, and challenges as well as those of others in a non-threatening setting. The results

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support the use of active learning procedures as an effective teaching and learning strategy, even if further study is necessary.

Students utilize technology to delegate complex calculations to the calculator, freeing them valuable time for critical thinking. Computers, movies, and other resources help students engage in critical thinking activities, including interpretation, analysis, prediction, generalization, and thoughtful decision-making.

Indeed, technology is very important nowadays as part of teaching and learning. Based on the findings of this study, all teachers considered the lack of materials to be used in teaching algebra, like the application of technology inside the classroom, as one of the constraints they have faced in teaching. This is especially true for graphing the linear, quadratic, and polynomial equations, where, supposedly, the teacher can show the learners how accurate the graph is and its application to the real world.

Student's Perceived Difficulties in Algebra

The concept of attitude towards Algebra reflects a person's level of interest or feelings about engaging in mathematical studies. This disposition can differ among individuals, manifesting as a preference for or aversion to learning Mathematics. Such attitudes can be positive or negative and are influenced by a person's aptitude, interests, and capabilities in problem-solving, evaluating concepts, and decision-making, particularly in students with special needs.

Algebra was considered as the soul of all higher mathematics that students will take starting from grade 7 up to grade 10. Students encountered difficulties as they started learning it from grade 7 which was a great factor when they turned grades 8 to 10.

Table 5 shows the students' learning difficulties commonly met in Algebra. It also shows that all indicators were **Strongly agreed** upon by the respondents based on what they observed as they handled grade 9 students. Indicators with a perfect weighted mean of 4.00 were visualizing algebraic expression, exhibiting poor study habits towards algebra, lacking the ability of their mind to think critically and logically in solving word problems, exhibiting attitude on the notion in algebra which is not applicable in real life situation, and performing well in solving on hand problems involving algebraic expression but not in explaining which needed action to be given by the teachers.

Table 5 shows the students' learning difficulties commonly met in terms of algebra.

Table 5
Student's Perceived Difficulties in Algebra

	Indicators	WM	VI
1	Visualizing algebraic expression	4.00	SA
2	Lacking of retentions of formulas and concepts	3.93	SA
3	Exhibiting poor study habits toward algebra	4.00	SA
4	Lacking the ability of their mind to think critically and logically in solving word problems	4.00	SA
5	Lacking of basic skills in the subject itself	3.89	SA
6	Confusing between variables and constants	3.91	SA
7	Exhibiting attitude on the notion in algebra which is not applicable in a real-life situation	4.00	SA
8	Evaluating algebraic expression	3.91	SA
9	Having fraction difficulty	3.87	SA
10	Coping on step-by-step procedures in evaluating algebraic expression	3.93	SA
11	Performing well in solving on-hand problems involving algebraic expression but not in explaining	4.00	SA
	Composite Mean	**3.95**	**SA**

Legend: **WM** = Weighted Mean **VI** = Verbal Interpretation
SA = Strongly Agree (3.26 - 4.00) **A** = Agree (2.51 - 3.25)
D = Disagree (1.76 - 2.50) **SD** = Strongly Disagree (1 - 1.75)

Table 5 shows the students' learning difficulties commonly met in Algebra. It also shows that all indicators were **Strongly agreed** upon by the respondents based on what they observed as they handled grade 9 students. Indicators with a perfect weighted mean of 4.00 were visualizing algebraic expression, exhibiting poor study habits towards algebra, lacking the ability of their mind to think critically and logically in solving word problems, exhibiting

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attitude on the notion in algebra which is not applicable in real life situation, and performing well in solving on hand problems involving algebraic expression but not in explaining which needed action to be given by the teachers.

Alminiana (2017) revealed the following findings in his study. that mathematical skills of the students according to overall scores are poor in topics like percent, fraction, volume, plane figures, and decimals which were basic skills needed to take algebra. They are also poor in both computations and non-computational skills which were considered as learning difficulties. Emphasis should be given to the mastery of the topics on percent, fractions, decimals, geometry, plane figures, and volumes. The addition of topics on maps and graphs is valuable in upgrading their mathematical skills.

The researchers strongly agreed with Alminiana's findings. Indeed, the learner's foundational skills were still poor as they still struggling with some basic concepts of elementary mathematics skills. During the interview with the teachers' respondents that the learner's achievement test at the beginning of the school year, there are lots of learning competencies that will be pre-requisite skills to analyze algebraic expressions. Learners were confused when there were letters or variables to be included in every number or numerical coefficient. The said difficulties led the learners also to become lazy or have poor study habits.

Mathematics Intervention Addressing Difficulties in Algebra

Identifying students' needs early and appropriately is crucial across all achievement levels. Regardless of their performance level, students might need intervention during their mathematics education. It is common for students to excel in certain areas while needing extra support in others. When students face difficulties, educators are encouraged to employ a range of assessments to pinpoint specific areas where improvement is needed. Educators can then select appropriate interventions using the insights gained from these assessments. These interventions are aimed at guiding students in a focused and systematic manner toward enhancing their understanding and skills in critical mathematical concepts.

Teachers have their own ways and means of teaching students with successful learning outcomes. Engaging students is viewed as a top priority; interventions typically emphasize distinctive qualities.

Table 6
Mathematics Intervention Addressing Difficulties

	Indicators	WM	VI
1	Giving a group activity	4.00	FU
2	Applying think, pair, and share strategies	1.89	AN
3	Using Math Flash	3.42	FU
4	Using Math Drill	3.84	FU
5	Using of role-playing	1.56	NU
6	Using keyword mnemonics	2.56	AET
7	Using Peer tutoring	3.89	FU
8	Mapping out a strategy to solve the problem	3.93	FU
9	Performing math computation and explicit time-drills	4.00	FU
10	Evaluating the student's problem-solving skills assessment	4.00	FU
11	Performing of guided Practice	3.84	FU
12	Using of performance feedback	4.00	FU
13	Reviewing of mastered skills or material.	4.00	FU
14	Conducting of re-teaching	4.00	FU

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15	Using mathematics storytelling	1.80	AN
	Composite Mean	**3.38**	**FU**

Legend: **WM** = Weighted Mean **VI** = Verbal Interpretation
FU = Frequently Use (3.26 - 4.00) **AN** =Almost Never (1.76 - 2.50)
AET = Almost Every time (2.51 - 3.25) **NU =** Never Use (1.00 – 1.75)

Table 6 shows the intervention measures faculty members utilize to address mathematics difficulties. It also shows that among the indicators from the table, giving a group activity, performing math computation and explicit time drills, evaluating the student's problem-solving skills assessment, using performance feedback, reviewing mastered skills or material, and conducting of re-teaching were verbally interpreted as frequently used with a perfect weighted mean of 4.00 were frequently used by the respondents.

It can be gleaned also from the table that among the indicators, "using keyword mnemonics" with a weighted mean of 2.56 was only verbally interpreted as always, every time where teachers used it for the students to easily understand the definition of a certain word in both algebra and trigonometry.

According to the data presented, the techniques of "Applying think, pair, share strategies" and "Using mathematics storytelling" received weighted means of 1.89 and 1.80, respectively. These findings suggest that educators infrequently employ both methods during classroom discussions. The think-pair-share approach is highlighted for its effectiveness in integrating cognitive and social learning aspects. This strategy encourages critical thinking and knowledge building and is well-suited for incorporation into Guided Reading sessions. Such sessions benefit from emphasizing meaningful dialogue about the text and enhancing comprehension skills and strategies.

According to Ngiamsunthorn (2020), enhancing the mathematical learning abilities of individuals with autism requires that educators provide optimal support specifically tailored to the needs of students within the mathematics education framework for those with special needs.

However, the resources must be specially and suitably adapted for pupils with a range of special requirements. This has a significant impact on students' learning growth at every level. Depending on the severity of the challenges, the development of kids with autism differs in terms of behavior, social communication, and interpersonal interactions.

The researchers concur with what Ngiamsunthorn mentioned about providing intervention to learners, especially those with special needs. Modification and accommodation must be given to them so that they can also be given an equal opportunity to learn despite their disabilities, where reteaching happens. Based also on the FGD conducted, teachers mentioned that those interventions were given to students to increase their performance in mathematics.

Level of Acceptability of the Content-Based Interventional Games in Algebra

. A set of established benchmarks concerning the functionality of a specific product, service, or system is designed to facilitate the assessment of the subject's efficiency in executing its intended purpose within an acceptable limit. Acceptability criteria additionally serve to gauge an acceptable level of risk.

Table 7 shows the content–based interventional games' level of acceptability. It also shows that all indicators were verbally interpreted as acceptable with a composite mean of 3.98 which simply means that the developed content–based interventional games in mathematics can be an interventional material needed by teachers in teaching with fun and enjoyment.

According to the respondents who played the games, these developed content–based interventional games specifically in terms of algebra were exciting and a good source of boosting self–esteem among students. It is also an alternative way of enhancing students' skills in solving problems involving it. Through these games, their foundation on the said subject will be best enhanced as students play the game with fun and enjoyment. It can also be a way of decreasing cutting classes, specifically those who are fond of playing computer games.

Table 7
Level of Acceptability Content-Based Interventional Games

Indicators ***Interventional games are .....***	**WM**	**VI**
1. useful to you as a mathematics teacher	3.96	A
2. composing of contents/structures related to teaching algebra and trigonometry	3.98	A

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3. best application in teaching algebra and trigonometry	3.96	A
4. good source of enjoyment and fun when teaching algebra and trigonometry	4.00	A
5. beneficial as a teacher during class discussion	4.00	A
6. beneficial to the students to learn more in algebra and trigonometry	4.00	A
7. helpful for students to uplift their knowledge in solving mathematical problems specifically in algebra and trigonometry	4.00	A
8. best alternative instruction in teaching algebra and trigonometry	3.96	A
9. good motivational strategies so that students will not cut their classes for computer games purposes.	4.00	A
10. best teaching tools for students' learning	3.98	A
11. appropriate enhancer of students' basic skills in applying problems to real-life situations involving Algebra and Trigonometry	4.00	A
12. good form of camaraderie for students	4.00	A
13. good booster of self–esteem	3.96	A
14. enhancer of cooperative learning or individual practice activities in which students must successfully conceptualize solution for a particular mathematics problem	4.00	**A**
Composite Mean	**3.98**	**A**

Legend: **WM** = Weighted Mean **VI** = Verbal Interpretation
A =Acceptable (3.26 - 4.00) **SA** =Slightly Acceptable (2.51 - 3.25)
SU =Slightly Unacceptable (1.76 - 2.50) **U** = Unacceptable (1.00 – 1.75)

Minoza (2017) emphasized the crucial role of teachers in considering a wide range of factors such as the students' backgrounds, their understanding of mathematics, any special needs, and cultural aspects when selecting and implementing curriculum materials. This approach underlines that teachers are not just facilitators but are central to the curriculum development process within their classrooms, tailoring and redefining educational content to meet the unique needs of their students. The essence of teaching, according to Minoza, lies not in the materials used but in the teachers' perceptions, beliefs, and actions, which significantly influence students' educational experiences and learning outcomes.

Similarly, Lambert et al. (2016) highlighted the effectiveness of using response cards in mathematics instruction to enhance student engagement and improve classroom behavior. This instructional strategy, which provides each student with an erasable tablet for answering questions during group activities, not only facilitates active participation but also minimizes disruptions, making it a valuable tool for increasing the effectiveness of group learning in math.

In addition, the indicator that says content-based interventional games are "good motivational strategies so that students will not cut their classes for computer games purposes" is a very enlightening insight for teachers. These researchers and even some teachers, if not all, have observed that some students cut classes just to go to computer stores around the school premises to play computer games.

With all these findings on the Acceptance of games-integrated lessons, students' attitudes toward Mathematics may change positively and ultimately improve their performance in Math subjects.

Conclusion

Based on the findings, the following conclusions are drawn:

1. The content-based interventional games applied to the topics in algebra, specifically to linear, quadratic, and polynomials, resulted in improved performance of the students during the post-test with contextualized interventional games.
2. Teaching difficulties and students' learning difficulties can be minimized with intervention strategies to help the pupils who have trouble in mastering algebra.
3. Contextualized content–based interventional games in algebra are very acceptable to be used in Math lessons.

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Recommendations

The following recommendations are hereby endorsed:

1. Teachers could find more mathematical topics, including geometry and statistics, where educational games might be used.
2. In several disciplines, teachers can assess students' learning and teaching challenges.
3. It is also recommended to conduct a study on the modification and accommodation relative to the developed content - based interventional games in algebra among students with special needs.
4. Future researchers may enhance the developed content-based interventional games by applying the topics of exponential, logarithmic, differential, and integral calculus for future use.
5. The formulated interventional games are recommended for use by Mathematics teachers in teaching the subject.

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