TEACHING FRACTIONS THROUGH FRACZONES AMONG GRADE 5 PUPILS

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ABSTRACT

Pupils are having difficulty learning mathematics, specifically fractions. With this problem, this quasi-experimental research aimed to determine the effectiveness of FracZones in teaching fractions among Grade 5 students. The data was gathered through researcher-made pre-test and post-test questionnaires, which were responded to by Grade 5 pupils of Cateel Central Elementary School in the academic year 2022-2023. The pre-tests of the control and experimental groups did not meet expectations, which means that both groups had the same level of knowledge in terms of fractions prior to the intervention. The post-test scores between the control and experimental groups show improvement; however, they still did not meet expectations, which means that despite the improvement in the score of the experimental group after the intervention, there is still no significant difference in their scores. The pre-test and post-test results of the participants show a significant difference, which implies that the pupils' performance in the experimental group shows improvement better than the control group. Thus, FracZones could be used in teaching fractions to fifth-grade pupils.

Keyword: *mathematics, fractions, FracZones, Computer-Assisted Instruction*

1. INTRODUCTION

Mathematics is one of the subjects that Filipino students find to be the most difficult (Capuno et al., 2019). Every educational system in the Philippines places a high priority on teaching and learning mathematics. The Philippines was ranked 79th out of 138 countries in terms of science and math education quality in the 2016–2017 Global Competitiveness Report, which indicates that the country's mathematics performance needs improvement. According to the Department of Education's (DepEd) report, the National Achievement Test (NAT) results for high school shows low-performance levels, particularly in Science and Math (Gonzales, 2019).

In the Philippines, fractions are one of the disciplines in which students struggle the most, according to the results of the Grade VI Philippine National Achievement Test (Torio, 2015). Fractions are fundamental but misunderstood mathematical topics taught in elementary schools (Pablo, 2021). Teaching fraction concepts and fundamental operations has proven to be particularly difficult (Faustino, 2021). Fractions are the most prevalent and difficult mathematical concept, as well as a requirement for operations to be effective in significant mathematical processes (Fabros & Ibaez, 2023). Burzynski & Ellis, Jr. (2021) stated that the word "fraction" refers to the idea of dividing a total amount, and the Roman word "fractio," which signifies a breaking or fracture, is where the word "fraction" originates.

Further, in mathematics education, fractions are crucial. They have theoretical significance because they necessitate a greater understanding of numbers than is often gained when working with whole numbers (Siegler, 2013). In addition to functioning as a doorway to a wide range of professions and contexts outside the mathematics classroom, fractions proficiency is a prerequisite for student success in higher-level mathematics (Fennell & Karp, 2017).

The Philippine mathematics curriculum starts teaching fractions in the first grade. Although continuing to teach this concept through secondary school, many students need help with fractions until they enroll in college (Cantoria Jr, 2016). One of the most challenging concepts in school mathematics to understand and teach is the idea of fractions (Getenet & Callingham, 2017, January). As the saying goes, "*Three out of two people have trouble with fractions*," which is a well-known fact about fractions' difficulty to learn (Gabriel et al., 2013). These issues are frequently noticed at all educational levels, starting in the early primary years (Gupta & Wilkerson, 2015). These issues, especially in primary education, have a variety of causes. For instance, bigger mathematical cognitive processes like proportional reasoning and spatial reasoning support the knowledge of fractions.

Numerous studies have shown that fractions are a challenging mathematical concept for students in the Philippines, and students need help appropriately comparing and adding fractions to problems (Lestiana et al., 2017). For instance, in the study of Karaoglan Yilmaz et al. (2018) entitled *"Using digital stories to reduce misconceptions and mistakes about fractions,"* the study found that teaching implementations created with digital stories have eliminated the mistakes and misconceptions that a large majority of students have about fractions. After participating in the digital story-based activities, most pupils who had previously had a limited understanding of the concept of fractions fully understood its concept. The study mentioned above uses digital stories to teach fractions; however, only some came across or utilized FracZones as a teaching tool, particularly in a local setting. Thus, the focus of this study was teaching fractions through Fraczones among grade 5 pupils. This study was implemented at Cateel Central Elementary School, and the respondents to this study are the grade 5 students of the said school.

1.1 Statement of the Problem

The researcher sought to use FracZones in teaching fractions among grade 5 students at Cateel Central Elementary School. More specifically, it aimed to answer the following questions:

1. What is the level of the pre-test score of the control and experimental groups in terms of fractions?
2. What is the level of the post-test score of the control and experimental groups in terms of fractions?
3. Is there any significant difference in the pre-test result between the control and experimental group in terms of fractions?
4. Is there any significant difference in post-test results between the control and experimental group in terms of fractions?
5. Is there any significant difference in the results between the pre-test and post-test scores of the respondents?

1.2 Scope and Limitation

This study was implemented at Cateel Central Elementary School in Cateel, Davao Oriental, in May with two and a half weeks for the grade 5 students of Cateel Central Elementary School. This study focused on the use of FracZones in teaching fractions among Grade 5 students at the said school with three competencies: solving routine and non-routine problems involving addition and/or subtraction of fractions using appropriate problem-solving strategies and tools; visualizing multiplication of fractions using models; and visualizing division of fractions. It was limited to a quasi-experimental research design as an appropriate strategy to meet the objectives of this study.

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2. REVIEW OF RELATED LITERATURE

This chapter reviewed some relevant literature and studies authored by different researchers. These studies generated ideas that helped further conceptualize the present study. It also included defining some commonly used terms that helped clarify practical ideas.

2.1 Mathematics as a Subject

Mathematics is one of the disciplines that Filipino students find the most challenging (Capuno et al.,2019). Most students regard mathematics as a difficult subject because of the aversive teaching style, difficulty in following instructions, difficulty understanding the subject, and difficulty remembering its equations and problem-solving methods (Gafoor & Kurukkan, 2015). Mathematics has been regarded as the most challenging subject in secondary school, particularly among students in rural regions (Vundla, 2012). Most Filipino students believe mathematics to be a challenging subject in school, and national achievement test results from previous years have supported these conclusions (Guce & Talens, 2013). Students' dislike of mathematics can either be predicted to persist, deteriorate, or be reversed under the leadership of the teacher, resulting in a love of mathematics (Langoban, 2020).

Additionally, the primary goal of math instruction is to provide students with the skills necessary to solve problems in everyday life (Phonapichat et al., 2014). However, it has been demonstrated that several curriculum areas are typically described as requiring a lot of mathematical manipulation or visualization but needing concrete examples is difficult for students to comprehend (Erinosho, 2013). One of the key considerations that educators must make is how to make learning fun. This is due to which perception that mathematics is a difficult and uninteresting subject, which generates questions about the subject (Simamora et al., 2018). Further, making students proficient problem solvers is mathematics' primary objective (Torio, 2015), which is why the goal of the mathematics curriculum is to equip students with the knowledge and abilities necessary in the rapidly changing technological world (Ngussa & Mbuti, 2017). Mathematics became crucial to the school curriculum because of its importance (Abe & Gbenro, 2014). Nothing in the world is conceivable without an understanding of mathematics, making it one of the most crucial disciplines in our human lives (Chanarya, 2017). Developing countries have banded together to improve their local communities in response to widespread concern over inadequate mathematics performance among students (Sinyosi, 2015). It is impossible to separate the value of understanding mathematics from its function in all facets of life. (Tinungki, 2015).

Students consistently see mathematics as extremely challenging to learn (Phonapichat et al., 2014). It is generally accepted that some people find mathematics challenging, enigmatic, and uninteresting (Ganal & Guiab, 2014), and even college students find mathematics terrifying and unsettling (Arenillo & Cruzado, 2014). Compared to the other topic, mathematics is harder to comprehend. However, pupils need to take mathematics learning seriously more to do the necessary work (Islip, 2010). Students' poor performance in mathematics can be attributed to several factors, including the students, the instructor, and the quality of instruction, according to Saad et al. (2014). The unwillingness to learn is common among those without prior knowledge. Some math instructors claim that pupils are lazy and unwilling to put in extra effort to master the subject (Abdul Gafoor et al., 2015).

Additionally, inappropriate math class scheduling and having many students in one class are other factors that contribute to pupils' poor math performance, according to Sulieman (2012). The more pupils in the class, the greater the challenge for the students to learn what is being taught. The Federal Republic of Nigeria (2013) reports that students struggle in mathematics, have unfavorable views toward the subject, and avoid it out of concern that it is "difficult" and requires higher-order thinking. Aside from that, the most challenging and complex issue types that students encounter while developing their mathematical thinking at the primary level are word problems (WPs) (Daroczy et al., 2015) and mathematics issues requiring fractions in general (Booth et al., 2014). Mathematics teaching and learning procedures demand a significant investment in acquiring knowledge over a body of incredibly abstract information with numerous real-world applications (da Silva et al.,2019).

Lengthy years of attempts by researchers and mathematics teachers to lower impoverished children's success in mathematics have resulted in adopting teaching methodologies. However, students struggle with this fascinating topic (Martha et al., 2015). Furthermore, even though children attend school, 600 million (56%) still need to reach even the most basic level of reading and mathematics concept understanding (UNESCO Institute for Statistics, 2017). Despite practitioners' access to excellent treatment options, trends in mathematics performance for children reveal that mathematical knowledge and abilities inequities continue (Nelson et al., 2022). Further, despite ten years of No Child Left Behind standards-based education, primary-aged kids' mathematics scores have only marginally improved, and educators have investigated techniques to increase mathematics achievement, particularly among elementary school students (Carr, 2012). Although fractions have been utilized for centuries and are employed in various everyday and mathematical applications, students find them challenging to acquire and master (Gabriel et al., 2013). Teachers should abandon the "telling technique" In the classroom to engage students in developing mathematical concepts (Festus, 2013). Concept understanding is improved when students can put their new knowledge into practice through hands-on experiences (Fraser, 2013).

Mathematics will be less daunting and more fun for pupils when they continue to study it in later years or if the teacher can motivate them to learn it at a young age (Tunner & Betts, 2012). However, even though math is an important science, students find math lectures boring, unappealing, and uninteresting, as seen by their poor mathematical skills (Novriani & Surya, 2017). Mathematics is well known for being a subject where there might be issues with comprehension and maintaining positive attitudes (Ali & Norman, 2012). A pessimistic attitude limits effective learning, lowering future performance (Joseph, 2013). The requirement for a well-organized, disciplined educational atmosphere is widely known (Kudari, 2016). In this regard, fostering a good attitude toward mathematics among pupils is a major objective of mathematics education in many jurisdictions (Ganal & Guiab, 2014).

2.2 Difficulties in Learning Fractions

The study of fractions begins in the first grade in the Philippine mathematics curriculum. Despite continued instruction in this subject through secondary school, many students struggle with fractions until they enter college (Cantoria Jr, 2016). Many children and adults struggle greatly with these talents. Over the past three decades, student performance in them has grown little (Lortie-Forgues et al., 2015) because many students, especially those in high school, struggle with fractions and fractional calculations (Pienaar, 2014). Many variables contribute to children's challenges with learning fractions, and one of the notions suggested as contributing to this difficulty is intrinsic contingency (Ndalichako, 2013). Even though understanding fractions is crucial for future mathematical success, statistics reveal that most children in the United States struggle to master them (Riconscente, 2013). The development of children's arithmetic skills requires them to learn about fractions, but many students have trouble understanding fractions, particularly fraction arithmetic (Braithwaite & Siegler, 2021).

Additionally, students who consistently struggled with understanding fractions were far less likely to achieve state criteria on a math achievement test, which hinted at issues with more difficult mathematics (Hansen et al., 2017). Since fractions have been incorporated into the curriculum, many students who struggle with math have long-standing issues with expressing whole numbers in scale (Jordan et al., 2017). Perhaps, one of the hardest subjects to teach and learn in primary school math is fractions (Kor et al., 2018). Elementary pupils begin learning about fractions after the first year of school (Ye et al., 2016). It is necessary to develop appropriate media for students to comprehend the fundamental concepts of fractions (Mardiana et al., 2020, May) since mathematical proficiency in fractions and decimals is necessary for success in many occupations as well as in later mathematics (Siegler & Lortie-Forgues, 2017). Teachers decide whether, when, and how to utilize the various fraction models and manipulatives while teaching fractions (Wilkie & Roche, 2022). It is necessary to modify the learning process so that abstract mathematical concepts can be represented by tangible examples as a gateway into the information, particularly for the fractional subject matter (Ginting et al., 2018).

National standards and guiding principles emphasize how important it is for students to develop a solid understanding of fractions (Hwang et al., 2019). Understanding symbolic fractions is difficult for adults and children (Lewis et al., 2016). Even after receiving years of teaching, many kids still struggle to master fraction math, which makes it harder for them to acquire more difficult math and succeed in their careers (Braithwaite et al., 2017). Instead of seeing "a" and "b" as a ratio that represents an integrated magnitude, many students see "a" and "b" as separate whole numbers (Fazio et al., 2016). Children must understand that many aspects of whole numbers are not true of numbers when learning about fractions (Siegler et al., 2013).

However, many students struggle to become proficient with fractions, especially those who struggle with math and frequently lack a solid foundation in whole numbers (Namkung & Fuchs, 2019). Children find it challenging to learn fractions in general, but children with mathematics difficulties (MD) find it more challenging (Tian & Siegler, 2017). Poor attention and carelessness are two more variables that might contribute to students' poor performance (Lai (2012). Several theories have been put forth to explain these difficulties, including the following: fractions can signify a variety of concepts; understanding them necessitates a conceptual reorganization for natural numbers; and using fractions necessitates the articulation of conceptual knowledge through the complex manipulation of procedures (Gabriel et al., 2013).

2.3 Importance of Educational Technology in Teaching

In this digital age, using ICT in the classroom is crucial for offering students the chance to learn and apply the necessary 21st-century skills (Ghavifekr et al., 2016). Technology has become increasingly important in both classroom and non-classroom learning (Ahmadi & Reza, 2018) because one of education's goals is to help students comprehend the world in which they live, and because we currently live in a technologically advanced society, technology also has an impact on educational content (Nickerson, 2013). ICT is a powerful teaching tool for student learning, creativity, engagement, and knowledge exchange. (Nadeem, et al., 2018). Also, technology has become a subject that is no more "foreign" in any discipline, including the field of education, in this rapidly expanding information and communication technology (ICT) era (Halim & Hashim, 2019). It is crucial in banking, business, health, engineering, and entertainment, just as it is in education (Kaware & Sain, 2015). Learners need to develop skills that will empower them in modern society, and technology plays a significant role (Dhotre & Banubakode, 2021).

Different digital technology platforms and their benefits are introduced in the educational process (Jobirovich, 2021). The new generation of children is prepared to work with these new technologies, which are crucial for children's learning and the acquisition of different types of cognitive information, necessitating the incorporation of educational technology into future curricula (Lazar, 2015). Technology-enhanced learning can revolutionize education by making top-notch, affordable education accessible to more people (Yusuf & Al-Banawi, 2013). Positive remarks typically highlight that education can still be carried out on time and according to plan, even in difficult situations (Hebebci et al., 2020). Computer expertise and supplementary tools are also required in education because they give teachers wonderful chances and pique students' attention (Murati & Ceka, (2017). Additionally, one of the best teaching tools is a multimedia application (Kapi et al., 2017), which enhances learning and teaching, enables a teacher to communicate his lessons engagingly, and can be used by students in educational programs at any level. (Ratheeswari, 2018). In the Philippines, computer-assisted instruction (CAI) is recognized as a beneficial tool for improving student academic accomplishment (Rosali, 2020), understanding (Kabigting, 2020), and teaching (Marquez, 2017). Academic research has shown that computer-assisted instruction (CAI) is an effective teaching tool (Adigun, 2020). This intervention program proved that computer-assisted instruction, in conjunction with traditional classroom instruction, is a better strategy for educating pupils than traditional techniques (Verma, 2016). Computer-assisted education significantly improved student performance. Integrating computer-assisted education into schools should supplement rather than replace present teacher-focused content delivery methods (Kaye & Ehren, 2021). Computer-assisted education gives pupils more opportunities to exhibit their ideas. It gives students a unique learning experience, superior to traditional learning methods (Dalal, 2013). Because of the enhanced participation and engagement, even the least interested students might become engaged in a session (Scott, 2023). Thus, computer-assisted instruction (CAI) is regarded as a good approach for increasing students' learning accomplishment (De Witte et al., 2015), and it will make learning more flexible, allowing students to access it independent of time or geographical constraints (Noor-Ul-Amin, 2013).

Further, to give students a chance to understand how to function in the information age, information and communication technology (ICT) must be used in the classroom (Habibu, 2012). Information and communication technology (ICT) is regarded as one of the key tools for making education learner-centric. It aids in closing the digital gap across various socioeconomic groups in a developing nation like India (Singhavi & Basargekar, 2019). Technology has changed our study and teaching (Gilakjani et al.7, 2013). So, learners must use technology in their instruction today (Hashim, 2018). As a result, one of the main goals of higher education is to equip future professionals with the knowledge and skills necessary to deal with issues and find solutions, including digital competence (Bond et al., 2018). Even if they may not like it, today's teachers (at least the majority) are unable to function without one piece of technology or another due to students' needs, their degree of technology exposure, market demands on a worldwide scale, and the benefits technology bring to the classroom (Baba, 2014). Rather than the technology, how well it supports teaching and learning makes a classroom, district, or state successful in its digital conversion (McKnight et al., 2016). The teaching and learning process has become even more enjoyable due to the use of technology (Raja & Nagasubramani, 2018). Because of technological advancements, notably in computers, have significantly transformed teachers' and students' teaching and learning methods (Motamedi, 2019).

Additionally, the educational system and information access have changed due to modern technology (Criollo-C et al., 2021). Every area of contemporary life has been impacted by technology, and this includes classrooms (Cheung & Slavin, 2013). Digital classrooms promote and enhance traditional teaching and learning methods (Mashhadi & Kargozari, 2012). A relatively recent but potentially significant development relevant to 21st-century teaching and learning and teacher education is the increased use of social networking sites to broaden and deepen one's social connections (Greenhow & Askari, 2017). Even though technology is becoming more prevalent in higher education, there is still much to learn about how it can best help students learn (Kirkwood & Price, 2014). Technology adoption is characterized by dynamic transitions between costs and benefits (Aldunate & Nussbaum, 2013).

Furthermore, using ICT in the classroom to provide students with the knowledge and skills they need for the digital age is becoming increasingly popular among educational institutions (Lawrence & Tar, 2018). Teacher educators play an important role in assisting student teachers in learning how to use technology in the classroom (Uerz et al.,2018). Indeed, technology's incorporation into education is unavoidable because it has become necessary for civilization's survival (Ghory & Ghafory, 2021). There is no denying that social media has expanded in acceptance and usage and is now arguably the most significant communication medium for students, particularly those pursuing higher education (Di Serio, Ibáñez, & Kloos, 2013). Technology enhancement learning is a procedure that deepens learning and increases technological expertise (Tawafak et al., 2018), where new and emerging technology has replaced the traditional methods of education teaching and learning (Bhakta & Dutta, 2016).

Moreover, a major objective of upper primary education is the development of fluency and flexibility in mathematics; yet, while fluency may be improved through practice, creating activities that encourage the development of flexibility is more challenging (Mercier & Higgins, 2013). Mobile device users in higher education may have difficulties or even stress due to the development of mobile technology, which offers a wide range of options to enhance teaching and learning (Qi, 2019). The motivation of primary school children appears to be positively impacted by active educational video games (AVGs), which improve learning results (Sun & Gao, 2016). If we want to use digital instructional technology effectively, we need instructional strategies that promote more engagement (Henrie et al., 2015). Mobile technology, including laptops, PDAs, and mobile phones, has emerged as a powerful educational tool with applications in both traditional classroom settings and outdoor learning (Sung et al., 2016). These technological advancements have the potential to vastly improve teaching and learning processes (Hamid et al., 2015).

2.4 Technology in the Teaching-Learning Process

The Philippines' K-12 education program requires technology in classroom instruction (Hero, 2019). In addition to ongoing initiatives to integrate technology into K–12 schools, the past several decades have seen a rapid global expansion of information and communication technology (Gu et al., 2013).

In its most recent Education Blueprint (2013-2025), the Ministry of Education highlights the significance of incorporating technology-based teaching and learning into the national curriculum of schools (Shah, 2022). Due to its advantages in aiding administration operations from data storage to knowledge management and decision-making, ICT applications for administration and management are currently popular in schools (Ghavifekr et al.,2013). Innovative pedagogy is supported by using digital technologies in the curriculum, which also aims to better prepare students for the workforce and civic life (Ng, W. (2015). Also, by assisting teachers and students in achieving the best results in its adoption and use in education, technology has been the driving force behind a massive transformation that has impacted our understanding (Mustapha et al., 2020). Furthermore, the beginning teachers from the school for teacher education that had the best technology preparation helped their graduates integrate technologies more skillfully (Tondeur et al., 2017). Digital tools like video conferencing, mobile apps, and virtual and augmented worlds can offer fresh approaches to engaging students in environmental stewardship (Buchanan et al., 2018).

Integrating new technology takes time and preparation (Tyler-Wood et al., 2018). Information, communication, and technology (ICT) integration will help teachers meet the global demand for technology-based teaching and learning tools and facilities to replace traditional teaching techniques (Ghavifekr & Rosdy, 2015). Teachers and students have a greater opportunity to collaborate more effectively in the globalized digital age by adopting and integrating ICT into the teaching and learning environment (Lawrence et al., 2018). The productiveness of instructional processes is increased by the effective use of technology in educational settings and its successful integration (Erişti et al., 2012).

The use of technology in this technological era has made life easier in many areas of endeavor, particularly in the field of education (Pazilah et al., 2019). However, despite the numerous benefits of emerging technologies, their integration into teaching and learning is frequently hampered by several factors that directly or indirectly affect the integration process (Onyema, 2020). Teaching students who are digital natives and expect a much more familiar and casual learning environment is typically challenging for educators (Pazilah & Hashim, 2018). Understanding the challenges instructors encounter when integrating technology into their classrooms is crucial given the rising availability of technology in education yet its continuous underutilization (Blackwell et al., 2013). Since students are now digital and have advanced technology skills while many teachers are digital immigrants, this presents another challenge in the classroom where teachers need to be ready to use digital, technological, and social media to teach the content of the future since the new nature of education in the digital age is the integration of continuous grading, quick feedback, defined goals, incentives, challenges, and positive reinforcement (Hashim, 2018). Further, the nature of technology must be made clear to students so they may decide how it should be utilized in their personal lives and society and how it may affect their thinking, values, and actions (Clough et al., 2013).

3. METHODOLOGY

This chapter discussed the researchers' various methodological steps to collect and obtain the necessary data. These include the research locale and duration, research design, respondents and sampling procedure, research instrument, data gathering procedure, and data analysis.

3.1 Research Locale and Duration

The study was implemented at Cateel Central Elementary School, a DepEd-managed partially urban elementary public school and the mother school of all elementary public schools in Cateel. Also, Cateel Central Elementary School was part of Cateel 1-District, which consists of 21 buildings/structures. This school offered on-site kindergarten through grade 6, SNEd (Special Needs Education), and an ALS (Alternative Learning System) program. It was located on Castro Avenue, Poblacion, Cateel, province of Davao Oriental. This study was implemented within three (3) weeks in April of the school year 2022-2023.

Figure 1. Map of Cateel Central Elementary School

3.2 Research Design

This study used a quasi-experimental research design that covered a control and experimental group to showcase the use of FracZones in teaching fractions. Quasi-experimental research designs employed nonexperimental (or non-researcher-induced) variation in the primary independent variable of interest, simulating experimental conditions in which some individuals received treatment. In contrast, others did not on a random basis (Gopalan et al.,2020). Like randomized trials, quasi-experiments sought to prove the relationship between an intervention and a result. Research using quasi-experiments could include non-randomly selected control groups and pre- and post-intervention evaluations (Harris et al., 2006).

3.3 Research Instrument

The primary tool to collect data was a researcher-made questionnaire, which was validated and tested for reliability. After comparing the questionnaire's content to the curriculum guide, the validity of the questionnaire would be determined using its content validity, which would be certified by an expert teacher in mathematics, and the reliability of the questionnaire would be determined using a pilot test. The pilot test would happen at San Rafael Integrated School with more or less 60 students before being administered to the actual respondents of the research study at Cateel Central Elementary School grade 5 pupils.

On the other hand, the questionnaire focused on fraction knowledge as a learning skill and concentrated on conceptualizing and solving issues involving the four fundamental operations of fractions: addition, subtraction, multiplication, and division. Also, the questionnaire comprises forty questions in total.

3.4 Respondents of the Study

The respondents to the study were the Grade 5 pupils of Cateel Central Elementary School. In a quasi-experimental research design, there were two groups of respondents: 26 pupils in the experimental group and 22 pupils in the control group. The experimental group came from grade 5 section Jacinto, while the control group came from grade 5 section Baltazar. In this study, the researchers and the research adviser toss a coin to identify the two groups. Also, pre-tests and post-tests were given to both sections, and all students who took the pre-test took the post-test. The researchers ensured that only the results of those who took the pre-test and the post-test would be included in the data analysis.

3.5 Data Gathering

The following were the research steps the researcher followed in the data-gathering process.

1. *Seeking ethical clearance from Research Ethics Office (REO).* Before the researcher would conduct the study, the researchers would first seek permission to conduct the study from the Research Ethics Office.
2. *Seeking permission to conduct the study.* After receiving approval from the Research Ethics Office, the researchers would seek permission to conduct the study from the Cateel Central Elementary School principal's office, and the advisers whose students were chosen to take part in the study would give their approval before the study could be carried out.
3. *Reliability and validity testing of the questionnaire.* Following the approval, the researchers would now test the reliability and validity of the questionnaire.
4. *Administration and distribution of the pre-test questionnaires.* The pre-test questionnaires were given to the research respondents after the reliability and validity test.
5. *Conducting the intervention.* The researchers would conduct the intervention with the experimental group, while the control group would receive regular class instruction.
6. *Administration and distribution of the post-test questionnaires.* After the intervention, the post-test questionnaires were given to the study's research respondents.
7. *Retrieval of the questionnaires.* After the distribution of post-test questionnaires, questionnaires were retrieved.
8. *Analyzing the data.* After the post-test questionnaires were retrieved, the collected data were added together, examined, and given the appropriate statistical treatments.

4. RESULTS AND DISCUSSION

This chapter presents the results and discussion of the study. The results are discussed thoroughly, and the order is based on the study's problem statement.

4.1 Pre-test Score of the Control and Experimental Groups

The data was obtained by administering a pre-test. This was to determine the level of the pre-test score of the control and experimental groups in terms of fractions. Table 2 shows the level of pre-test scores between the control and experimental groups.

Table 2. Level of pre-test scores between the control and experimental groups

Group	Total Score	Standard Deviation	Mean	Grade Percentage	Remarks
Control	34	4.09	9.19	63.51	Did Not Meet Expectations
Experimental	34	2.84	9.41	63.84	Did Not Meet Expectations

As shown in Table 2, the mean score for the control group was 9.19, and the grade percentage achieved by the control group was 63.51, which fell below the expected standards. The mean score obtained by the experimental group in the pre-test was 9.41, and the grade percentage was 63.84%. This indicates that, on average, the participants in the group did not meet expectations in the pre-test. The grade percentage serves as a measure of the overall level of achievement within the group, with higher percentages typically indicating better performance. Based on these results, the performance of the control and experimental groups in the pre-test did not meet expectations. This implies that the level of knowledge of mathematics among pupils was quite low (Simamora et al., 2018), and students who have been taught fractions without an adequate teaching technique will do poorly (Martha et al., 2015).

Similarly, the study's results showed that the mean test scores for the two groups were low, indicating that the pupil's mathematical skill in solving fractions was poor. The study's findings by Tambaoan and Gaylo (2019) showed that learners needed to live up to established expectations about the lessons in the mathematical topics it covered, negatively impacting their academic performance results. Many factors are behind this problem, and one of the ideas mentioned contributing to children's struggles with learning fractions is inherent contingent (Ndalichako, 2013). Learning rational number arithmetic imposes inherent sources of difficulty, such as complex relationships between fraction arithmetic operations (Lortie-Forgues et al., 2015). All students, wherever, face inherent sources of difficulty that stem from the very nature of fractions. The notation used to express fractions is one inherent challenge. The notations used to denote numbers make understanding specific rational numbers more challenging. Typically, fractions are written as a/b. Instead of seeing "a" and "b" as a ratio that represents an integrated magnitude, many students see "a" and "b" as separate whole numbers (Fazio et al., 2016). Poor attention and carelessness are two other factors that could contribute to pupils' poor performance, according to Lai (2012). Teachers must first evaluate how well the curriculum, students' abilities, and activities are aligned to solve this issue. Another factor is students' attitudes toward the topic (Mazana et al.,2019). A pessimistic attitude prevents effective learning, which in turn impairs performance going forward (Joseph, 2013). The need for a well-organized, disciplined school setting is established (Kudari, 2016). Consequently, attitude is a crucial component that must be considered because attitude may have a favorable or negative impact on mathematics achievement, depending on the learners. Those factors impact how well pupils learn and succeed in mathematics.

The knowledge of teachers, language, and textbooks are examples of culturally contextual variables that impact how well children learn fractions (Seigler, 2017). One of the crucial factors that teachers must consider is the use of engaging teaching techniques. This is due to the misconception among students that mathematics is a difficult and uninteresting subject, which causes problems (Simamora et al., 2018). As a result of the widespread concern over low mathematics performance among pupils, developing nations have joined efforts to improve their local communities (Sinyosi, 2015).

4.2 Post-test Score of the Control and Experimental Groups

The data was obtained by administering a post-test. Table 3 shows the level of the post-test score between the control and experimental groups.

Table 3. Level of post-test scores between the control and experimental groups

Group	Total Score	Standard Deviation	Mean	Grade Percentage	Remarks
Control	34	3.14	15.85	73.31	Did Not Meet Expectations
Experimental	34	4.27	17.73	76.07	Fairly Satisfactory

As shown in Table 3, the mean score obtained by the control group was 15.85, which can be considered the average performance of the participants in this group. Furthermore, the grade percentage achieved by the control group was 73.31%. This percentage represents the proportion of correct answers or successful completion of tasks within the post-test. However, despite these efforts, the control group's performance did not meet the expectations set for this research. This suggests that the control group did not perform as anticipated or desired. The group that was not exposed to the intervention gained low scores, supporting the claim of Braithwaite et al. (2017) that even after receiving years of teaching, many kids still struggle to master fraction math, which makes it harder for them to acquire more difficult math and succeed in their careers. The control group received conventional teaching, where they were just taught the step-by-step process of solving four fundamental operations of factions. The majority of the information for instruction comes from textbooks or other central sources, and memorization is expected to be the main method of learning (Hidalgo-Cabrillana & Lopez-Mayan, 2018).

Based on the scores achieved, the grade percentage for the experimental group was calculated to be 76.07. This value signifies the proportion of the total marks or points earned by the group in relation to the maximum achievable score. It serves as an indicator of the overall performance level. Considering the results, the experimental group's post-test scores were deemed "fairly satisfactory." This remark suggests that while the group's performance was adequate, there is still room for improvement. It implies that the participants achieved a moderate level of success but may benefit from further refinement or intervention to attain higher proficiency levels. Based on the provided information, the experimental group outperformed the control group regarding mean score and grade percentage. The experimental group's performance improves by using FracZones, as Pajo (2022) stated, which is supplemental material that can teach four essential fractional operations. According to the study's findings, FracZones assist pupils in moving from failing to fairly satisfactory performance.

Numerous academic studies demonstrated the efficiency of computer-assisted instruction (CAI) as a teaching method (Adigun, 2020). Due to its individualized, self-pacing, and interactive nature, this intervention program showed that computer-assisted instruction and traditional classroom instruction are the best techniques for teaching students than conventional approaches (Verma, 2016). Additionally, computer-assisted instruction is seen as a useful tool in the Philippines for enhancing student academic achievement (Rosali, 2020), enhancing comprehension (Kabigting, 2020), and teaching (Marquez, 2017). Students' performance was greatly enhanced by computer-assisted instruction. Integrating computer-assisted instruction into schools should support current teacher-focused content delivery systems rather than replace them (Kaye & Ehren, 2021). More chances for students to express their creativity are provided by computer-assisted instruction. It provides pupils with a novel experience, making it superior to the traditional learning technique (Dalal, 2013). Even the least interested students can become interested in a session thanks to its increased interactivity and engagement (Scott, 2023). Thus, computer-assisted instruction (CAI) is a good technique to increase students' learning achievement (De Witte et al., 2015).

4.3 Significant Difference in Pre-test Results Between the Control and Experimental Groups

Table 4 shows the mean comparison between the pre-test scores of the control and experimental groups. The data obtained in this table were from the pre-test administered by the researcher, both the control and experimental group. This was to determine the significant difference in the pre-test result between the two groups in terms of fractions.

Table 4. Mean comparison between pre-test scores of control and experimental group

Group	Mean	Standard Deviation	t-value	p-value	Interpretation
Control	9.19	4.09	-0.216	0.835	Pre-test scores between the two groups do not differ significantly.
Experimental	9.41	2.84			

The control group had a mean score of 9.19 and a grade percentage 63.51, as indicated in Table 4. The level of the control group's pre-test score indicates that the group's performance failed to live up to expectations. The experimental group's mean score on the pre-test was 9.41, resulting in failing remarks and a grade percentage of 63.84. This indicates that the experimental group's performance in the pre-test was below average. It means that all of the respondents who belong to the control and experimental groups have had difficulty responding to situations involving fractions. Based on the provided information, the pre-test scores between the control and experimental groups do not differ significantly. As a result, the initial knowledge capacity of the two classes toward mathematics is the same (Wijaya & Purnama, 2020), and children do poorly on mathematics issues requiring fractions in general (Booth et al., 2014).

Students consistently see mathematics as extremely challenging to learn (Phonapichat et al., 2014). Compared to the other topic, mathematics is harder to comprehend. However, pupils must take mathematics learning seriously enough to do the necessary work (Islip, 2010). Students’ poor performance in mathematics can be attributed to several factors, including the students, the instructor, and the quality of instruction, according to Saad et al. (2014). The unwillingness to learn is common among those without prior knowledge. Some math instructors claim that pupils are lazy and unwilling to put in extra effort to master the subject (Abdul Gafoor et al., 2015).

Additionally, inappropriate math class scheduling and having many students in one class are other factors that contribute to pupils' poor math performance, according to Sulieman (2012). The more pupils in the class, the greater the challenge for the students to learn what is being taught. The Federal Republic of Nigeria (2013) reports that students struggle in mathematics, have unfavorable views toward the subject, and avoid it out of concern that it is "difficult" and requires higher-order thinking. Thus, the study of mathematics does not only concentrate on the various mathematical expressions but also calls for the students to use higher-order thinking techniques for the many topics covered.

Significant Difference in Post-Test Results Between the Control and Experimental Groups

Table 5 shows the mean comparison between the post-test scores of the control and experimental groups. The data obtained in this table were from the post-test administered by the researcher both in the control and experimental group. This answers the question about any significant difference between the control and experimental groups in the post-test.

Table 5. Mean comparison between post-test scores of control and experimental group

Group	Mean	Standard Deviation	t-value	p-value	Interpretation
Control	15.85	3.14	-1.755	0.086	Post-test scores between the two groups do not differ significantly.
Experimental	17.73	4.27			

The result shows that the mean post-test score for the control group is 15.85, with a standard deviation of 3.14. With this, the level of the post-test score of the control group did not meet the expectations. In contrast, the experimental group has a mean post-test score of 17.73 and a standard deviation 4.27. With this result, the level of the post-test scores of the experimental group was deemed "Fairly Satisfactory." This indicates that the respondents in the experimental group passed and improved their mathematical skills in fractions after the intervention.

In contrast, the control group only slightly improved based on their mean score, but still lacking. Based on the results, the control group still struggles with learning fractions. In contrast, the experimental group has improved how to solve and visualize fractions by utilizing FracZones as a supplemental tool. However, despite the improvement, the two groups still have no significant difference in the post-test results. The performance of the experimental and control groups was almost at the same level even after the intervention. It implies that the students failed to gain an outstanding average in their post-test about fraction-related problems even after the intervention was presented.

After ten years of No Child Left Behind standards-based education, primary-aged pupils' mathematics scores have only minimally improved, and educators have explored strategies to raise mathematics success, particularly among elementary school students (Carr, 2012). Although fractions have been used for centuries and are handled in various everyday life and mathematical contexts, they are difficult for students to learn and master (Gabriel et al., 2013). In the same manner, long years of efforts by researchers and mathematics instructors to reduce poor kids' achievement in mathematics have resulted in the usage of teaching approaches. However, pupils struggle with this intriguing topic (Martha et al., 2015). Also, even though children attend school, approximately 600 million (56%) still need to achieve even the most basic level of reading and mathematical concept knowledge (UNESCO Institute for Statistics, 2017). Even though practitioners have access to resources for effective treatments, trends in mathematics success for children show that disparities in mathematical knowledge and skills persist (Nelson et al., 2022). Furthermore, concept understanding is improved when students can put their new knowledge into practice through hands-on experiences (Fraser, 2013).

4.4 Significant Difference in the Results Between the Pre-test and Post-Test Scores of Participants

Table 6 shows the comparison between the pre-test and post-test scores of the experimental and control groups. This is to determine the significant difference in the results between the pre-test and post-test scores of the control and experimental groups.

Table 6. Mean comparison between pre-test and post-test scores

Type of Test	Mean	Standard Deviation	t-value	p-value	Interpretation
Pre-Test	9.29	3.54	13.674	0.000	Pre-test and post-test differ significantly.
Post-Test	16.71	3.78			

The table distinguishes between a pre-test and a post-test. The result was reflected in the combined main pre-test scores of both control and experimental groups, which have 9.14 and 9.41, which shows no significant difference between the two groups. As a result, the respondents got a mean pre-test score of 9.29 with a standard deviation of 3.54, as indicated in the table. The combined main pre-test scores differ significantly. The result was reflected in the combined mean post-test scores of the control and experimental groups, which have 15.85 and 17. 73, which shows no significant difference between the two groups. As a result, the respondents got a means post-test score of 16.71 with a standard deviation of 3.78, as indicated in the table, which means that combined pre-test scores differ significantly. This means the experimental group got a higher score through intervention than the control group, which used conventional teaching.

Based on the overall results, the respondents got a mean score for the pre-test 9.29, while the mean for the post-test was 16.71 with a standard deviation of 3.78, as indicated in the table. These values indicate the average performance of the participants on each test. Based on the information presented, the results demonstrated a significant difference in the mean scores of the control and experimental groups (Thambi & Eu, 2013). Furthermore, using the traditional method enhances students' mathematics knowledge (Yuanita et al., 2018), as does teaching using the intervention. This means that whether with or without intervention, the pupils' performance improved. This indicates that the use of strategic material had a good impact on the academic achievement of the pupils (Arpilleda, 2021).

Based on the pre-test and post-test results, the pupils' performance in the experimental group differed significantly, which means that Fraczones improved the mathematical skill in fractions of grade 5 pupils. Moyer-Packenham and Suh (2012) state that by employing virtual manipulatives, students improved their performance by developing conceptual knowledge of fraction concepts. A manipulative is a teaching tool created so students can manipulate it to grasp mathematical concepts (Istiandaru et al., 2017). To ensure that students meaningfully meet the intended learning objectives, various teaching methods in the classroom and the right instructional tools are essential (Azid et al., 2020). One of the key considerations that educators must make is how to make learning fun. This is due to students' perceptions that mathematics is a difficult and uninteresting subject, which generates questions about the subject (Simamora et al., 2018). In order to engage students in the development of mathematical concepts, teachers should abandon the "telling technique and instead choose strategies that encourage active learning in the classroom (Festus, 2013). That is why it is necessary to develop appropriate media for students to comprehend the fundamental concepts of fractions (Mardiana et al., 2020).

Furthermore, computer-assisted instruction enhanced learning more than conventional methods (Kumar, 2014). It enhances the learning percentage, meaning students may acquire the same knowledge in less time than conventionally instructed pupils (Suleman et al., 2017). Also, students exposed to computer-assisted instruction scored much higher than those who were not (Hamzat et al., 2017), and it positively impacted students' performance in school (Etim et al., 2016). In conclusion, computer-assisted instruction (CAI) enables students to acquire knowledge more successfully, accurately, and intrinsically (Karakis et al., 2016).

5. CONCLUSION

Based on the findings, the researcher concludes the following:

1. The level of the pre-test scores between the experimental and control group did not meet the expectations, which implies that it has failed. This means that both groups lack mathematical skills in answering fraction-related problems.
2. The level of post-test results in the control group still did not meet expectations. In contrast, the experimental group got the remarks fairly satisfactory, which revealed that pupils from the experimental group gained mathematical skills in terms of fractions.
3. The pre-test scores between the control and experimental do not differ significantly. This means that both groups struggled to answer fraction-related problems.
4. The post-test scores between the two groups do not differ significantly. This means that even after the discussion and the intervention was presented, the students failed to gain an outstanding average in their post-test about fraction-related problems.
5. The pre-test and post-test scores between the control and experimental groups revealed a significant difference in their performance during and after the intervention implementation. This implies that the student's performance improved from very poor to average after exposure to intervention material. This also implies that the activities included in the material helped students comprehend fraction-related topics better than if they had been taught traditionally.

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