THE USE OF DIGITAL GAME-BASED LEARNING ON NUMERACY OF GRADE 7 STUDENTS USING CLASS POINT: AN INPUT TO PROFESSIONAL DEVELOPMENT OF TEACHERS

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ABSTRACT: *This study aimed to determine the effectiveness of digital game-based learning in improving the numeracy skills of grade 7 students in one of the public secondary schools in the province of Sorsogon and to make an input of professional development program out of the result. The researcher utilized a quasi-experimental research design wherein the difference in the pretest and posttest scores of the controlled and experimental groups was evaluated. The sources of data were the 30 students from two sections of the 7th grade of the said school. Based on the normality test from the actual data, it was revealed that the*
distribution is normal and bound to use a parametric test for its inferential problem. The statistical tools used in this study were the mean and t-test for paired samples, as the data was analyzed using SPSS. Results indicate a significant improvement in the numeracy skills on the posttest of the experimental group due to digital game-based learning using ClassPoint after the administration of the pretest. With a p-value of .000 which is less than the alpha value of 0.05, the intervention is implied to be effective. The result was supported by the focus group discussion with the students from the experimental group, having said that it improves their numerical skills and their attitude towards it. Based on the overall outcome, a professional development program for mathematics teachers about the presentation of the quantitative and qualitative data results of the study and the navigation of ClassPoint in numeracy lessons was developed.

Keywords: *ClassPoint, numeracy skills, digital game-based learning, gamification*

INTRODUCTION

Mathematics is mostly considered by learners as boring, uninteresting, and hard. However, some argue that the right teacher can make the learning of this discipline fun and easy, that is why the performance of the students depends largely on the quality of teaching competencies of the teachers. They use a wide variety of techniques to arouse interest from students, and one of the ways is to integrate games in teaching and gamified learning. According to Taclay [1], games can provide students with recreation and enjoyment that will encourage learners to actively engage in classroom activities and discussions. Therefore, for this to be evident one must use this strategy by crafting such games for competitive, conducive, and fun settings. In line with this, the researcher is interested in determining the effectiveness of the use of digital game-based learning on the achievement of students in numeracy using ClassPoint and will be an input for professional development program of educators to make ClassPoint known to them as an effective and interactive tool for teaching in the 21st century and to encourage them to integrate the said digital educational tool on their respective classrooms in teaching.

ClassPoint is a digital game-based learning platform that offers interactive and engaging activities designed to promote mathematics learning. It allows teachers to create gamified lessons, quizzes, and activities, providing students with opportunities to reinforce their numeracy skills through enjoyable and motivating experiences. Chen et al. [2] claim that digital game-based learning has been recognized as an effective instructional strategy for promoting active participation and deep learning among students.

According to Guhl [3], numeracy skills encompass the ability to perform basic arithmetic operations, such as addition, subtraction, multiplication, and division, and apply mathematical concepts to solve real-world problems. Research has shown that students' numeracy skills

significantly impact their academic achievements and overall mathematical proficiency. Numeracy is the ability to understand and use math in the real world and being able to apply it to make the best possible decisions. It is as important as literacy, for it is also known as 'mathematical literacy' and we need both to get on in life. Numeracy skills are split into several definitions, and one of them is the performance of basic arithmetic operations known as addition, subtraction, multiplication, and division. These fundamental operations are the heart of arithmetic. If we can perform the said mathematical operations with integers, we can likely perform them on fractions and decimals. With this, we can make progress in mathematics if we have a strong foundation in our numeracy skills. The development of numeracy is linked to the development of mathematics knowledge and gives purpose to the study of the discipline of mathematics, as per mathematicshub.edu.au [4].

Based on the recent PISA 2018 results, the average across OECD countries, 76 % of students attained Level 2 or higher in mathematics. At a minimum, these students can
interpret and recognize, without direct instructions, how a simple situation can be represented mathematically. However, in 24 countries and economies, more than 50 % of students scored below this level of proficiency. The Mathematics target throughout the globe was not yet achieved.

Mathematics in Philippine education is seen as a contributing factor to participation in productive life activities, as a means to make sense of the world, as a medium for communication, and as a gateway to national progress. However, statistics from different international assessments reflect Filipino students' low performance in Mathematics. The Trends in International Mathematics and Science Study (TIMSS) in 2003 ranked the Philippines 34th out of 38 countries. Furthermore, data from the Global Competitiveness

Reports in 2011-2012 show that the Philippines ranked 115th out of 142 countries while 67th out of 140 in 2015-2016. In the latest 2016-2017 data, the Philippines ranked 79th out of 138 countries. In his Manila Times article, Makabenta [5] noted that the Philippines withdrew from the 2015 Program for International Student Assessment (PISA). Makabenta argued that the reason the education authorities withdrew from the assessment at the time was their concern that young Filipinos would not be ready for it. PISA assesses the academic aptitude of 15-year-old students in each nation to gauge the quality of their education systems in each of the 70 nations it covers. This is not a call, but rather a push for math teachers in the Philippines to improve mathematics instruction and boost student retention to help Filipino pupils advance in PISA and TIMSS.

In addition, from the results, the Philippines scored in the low 70s in both mathematics and science in the 2018 Programme for International Students Assessment (PISA), which was conducted by the Organization for Economic Co-operation and Development (OECD) on 15-year-old students in 79 nations. This is saddening as the number of non-numerates among our students is increasing.

Turning to Region 5 of the Philippines, the learners, schools, and Albay Division faced several problems and difficulties with numeracy. Without adequately assessing the students using standardized instruments in numeracy, mathematics had the largest number of failures in both elementary and secondary school, according to the 2019 DMEA Report on the Number of Failures. By creating baseline data on the numeracy skill levels of the learners that will provide information for planning and making decisions on instructional adjustments, interventions, and practices in the schools, SDO-Albay created Numeracy Assessment Tools to address the problems and challenges and promote better performance in Mathematics across the division.

The same tool was adapted by the SDO-Sorsogon to address the same gap. Locally speaking, based on the unstructured interview by the researcher, poor numeracy skills have been observed by some teachers to some Grade 7 students of one of the public secondary schools in the province of Sorsogon leading to low academic performance in Mathematics, and they even had a difficulty to perform the 4 basic operations. It is expected that students know how to perform the four basic operations as they enter Junior High School, but this is contrary to what the teachers observed. Enhancing numeracy skills is difficult due to the pandemic as emphasized by Gaviño & Chua [6]. One of the thrusts of the mathematics teachers and the Department of Education is to strengthen the teaching of basic mathematics subjects. Therefore, it is a must that students who would like to make progress as they move up in Junior High School to be skilled enough to perform the four basic operations to understand complex topics in algebra, geometry, and other branches of Mathematics that require learners to be primarily numerate. It is necessary to conduct this inquiry to measure the numeracy skills of Grade 7 students for teachers to conduct an appropriate intervention program and bridge the learning gaps caused by the pandemic. As educators, what we can do is make a variety of intervention programs to capacitate the students in the different mathematical skills including catching their motivation through gamified learning.

The significance of this study lies in its potential to address the persistent challenges in numeracy among Grade 7 students at one of the public secondary schools in the Province of Sorsogon which will be the research locale. Oris and Caballes [7] tested the 11th-grade STEM students' scientific thinking skills and ideas about how we know what we know while they were learning online. The results show that interventions should be made right away to meet the need to include the variables in the lessons, tests, and curriculum. By exploring the effectiveness of digital game-based learning using ClassPoint, the study can offer evidence-based recommendations for educators, curriculum developers, and policymakers to enhance mathematics education. Furthermore, the findings can contribute to the advancement of the MAED-MATH program's goal to equip teachers with cutting-edge approaches to improve mathematics instruction and student outcomes in the Philippines and beyond.

This study aimed to determine the effectiveness of game-based learning on numeracy to Grade 7 students using ClassPoint in one of the public secondary schools in the Province of Sorsogon during the school year 2022 – 2023. Specifically, it attempted to provide answers to the following questions:

1. What are the pretest and post-test scores of the experimental and controlled groups?
2. How significant is the difference between the pretest and posttest scores of the experimental group and the controlled group?
3. What other aspects of ClassPoint may be identified and recommended for utilization and enhancement to further support numeracy learning based on the experiences and perceptions of Grade 7 students?
4. What professional development program for mathematics teachers may be crafted out of the result?

Below are the hypotheses of this study:

H_0: There is no significant difference between the pretest and posttest mean scores of the experimental and control groups.

DIGITAL GAME-BASED LEARNING ON NUMERACY
The goal of the inquiry of Moral-Sanchez [8], is to make it clear how a game-based learning technique and employing ICT as a vehicle through digital breakout may be used to set up pedagogical alternatives that build mathematical thinking through meaningful experiences. Based on these results, and what other authors have already said about how committed the students are to the activities, math involvement is higher when it is gamified. Educational breakouts are a great opportunity to use gamification concepts like recognition, success, competition, cooperation, and self-expression to improve focus, effort, and motivation. It's engaging, which makes it easier for students to remember what they've learned in a way that's interesting and fun. This stimulates them and gives them good experiences. So, using digital breakouts to add visual aspects to math explanations is a way to help people learn math in a meaningful way.

Reyes & Caballes [9] analyzed the use of digital technology as a mode of instruction. According to the mentioned researchers, the removal of educational barriers is a result of technology use in education. Both students and educators can communicate in real time thanks to modern digital tools. However, we must make sure that educators only use technology to supplement instruction, never to take the place of instructors. The systematized cycle of teaching and learning is hampered by extensive technological use. A questionnaire created by the researcher and given to 30 teachers served as the basis for the study. Results showed that using digital technology as a teaching tool has a positive effect and is widely accepted. The study suggested emphasizing adequate instruction and execution in the use of digital technology for both teachers and students. A school was also suggested by the study to facilitate leadership and support for its effective implementation.

According to Antipolo [10], Game-based learning will help students become more confident, independent thinkers who are more prepared to take on challenging projects and see them through to completion; they will learn about procedures and the importance of taking different routes; and they will become more engaged in a course. Additionally, it can produce a dynamic that encourages students to advance their knowledge and abilities while concentrating on the game's actions. Teachers should use game-based learning to make mathematics lessons more engaging and participatory.

To help students learn and adjust to changes in education, the abovementioned study was similar to the study of Canilao & Gurat [11] which largely evaluated students' math proficiency utilizing a mobile educational application. A public high school in Nueva Vizcaya, the Philippines, selected some of its Grade 9 students for the study. A posttest control group design, in particular, was used in this work as a quasi-experimental technique. Results showed that utilizing the application significantly improved pupils' mathematical achievement. The use of educational mobile applications also affects students' math achievement more favorably than the conventional method of instruction. Problem-solving is stressed as a top priority for teachers. Overall, using the mobile educational application can improve learning mathematics, so it is encouraged to keep doing so.

The research of Go et al. [12] focuses on analyzing how students' fundamental mathematical abilities across four different academic programs are affected by digital math games. A case study is undertaken in a state university in the Philippines for undergraduate programs in education, industrial engineering, hotel management, and information technology to demonstrate the recommended plan. It was discovered that students' proficiency in fundamental mathematics can be enhanced by the use of digital games. Because of the good benefits of digital games on conventional skill-building programs, the educational system may be revised as well.

On the contrary, the investigation of Lopez [13] sought to assess and validate the produced numeracy mobile game to assist in enhancing the performance of junior high school students on the operations of integers in a public national high school in Antipolo City, Philippines. It was discovered that there was no significant difference between the two sets of respondents' assessments of the generated numeracy mobile game in integer operations in terms of game mechanics, aesthetic design, narrative design, incentive system, musical scores, content, and skills. It is advised that the game's user interface be improved, including the controls for the up and down arrows and the tutorial section that appears before the main game or at the beginning of each level.

The effect of egamification assessment on the processes of teaching and learning is examined by Deabanico and Caballes [14]. The study looked at how evaluation affected student learning outcomes and classroom participation. The statistical study revealed a strong correlation between student motivation and participation in the classroom and the use of eGamification assessments. While more research is required to determine whether these findings can be applied generally, the findings suggest that eGamification Assessment can be an effective method for formative assessment and can help students develop the skills they need to succeed in today's environment of rapid change. Using eGamification Assessment may completely transform education, and all students will benefit from an environment that is more engaging and effective.

On the other hand, Teachers' professional development experiences were investigated by Hunter et al. [15] in a study on digital game-based learning in five high-poverty primary schools in the Philippines. The study's research was conducted as part of a university-industry collaboration with the developer of a new platform designed to provide teachers and students with hands-on experience with an integrated Science, Technology, Engineering, Arts, and Mathematics (STEAM) curriculum in an innovative digital game-based format incorporating coding, robotics, and project-based learning. The findings indicate that teachers believed it to be highly beneficial for engaging pupils more in learning, with fewer student absentees recorded throughout the five-week intervention. While teachers expressed significant satisfaction with the program in terms of the in-class effectiveness of digital game-based learning and the professional learning provided to up-skill themselves in the platform before program implementation, it was discovered that significant contextual and language improvements could enhance the overarching goals of this digital game-based resource for STEAM teaching and learning.

Gamification serves as essential to the educational process. The purpose of the study of Tiria & Caballes [16] was to illustrate how gamification affected the academic performance of senior high school physical science students. This survey covered 40 senior high schools for students in grade 11. The experimental group was exposed to a gamified classroom using a gamification platform, while the control group was exposed to traditional education in the 21st century using multimedia instruction. The intervention was followed by a 30-item test. Using SPSS software, the findings were tabulated and statistically tested. Independent t-test results for

the control and experimental groups' pretests revealed that the two groups were equivalent. Gamification appears to have enhanced the student's academic performance, according to the results of the t-test for the independent sample for the posttest for the two groups. The controlled group's pretest and posttest results had both improved according to the Wilcoxon Signed Rank Test, which was used to compare the two tests' results. To further assess the efficiency of gamification on students' academic achievement, it is advised to employ it throughout all subject areas.

Abenes et al. [17] created a mobile game that was gamified, reviewed by experts, and utilized as an intervention tool to improve these students' academic achievement in physics. Eighth-grade pupils, including one with a hearing disability, benefited from the gamified mobile application, which improved their educational experience and sparked their interest in challenging topics. The study emphasizes how crucial it is for educators to use gamified technologies to promote proactive learning.

CLASSPOINT ON NUMERACY

According to Bong & Chatterjee [18], because ClassPoint was first established in 2015, there is insufficient literature on its usefulness as an engaging tool during lessons. ClassPoint enables teachers to swiftly integrate interactive quizzes into their current Microsoft PowerPoint presentations and deliver these questions without having to switch to another program during a lesson. The experience of teachers and students using ClassPoint in both real and virtual lessons was investigated in this study. According to survey data, more than 80% of students believed that ClassPoint was a successful platform for promoting student involvement and participation in class. Students respond more frequently to interactive quizzes offered via ClassPoint than they do to spoken responses in class, according to all teachers' participants (60% agreed and 40% strongly agreed). Overall, both instructors and students appreciated using ClassPoint because it encourages student interaction throughout both online and in-person classes.

Several types of interactive platforms have been used to improve students' engagement, interest, and learning satisfaction in English as a foreign language (EFL) learning. Similarly, Abdelrady and Akram [19] developed a quasi-experimental study to explore the function of ClassPoint tool-integrated activities in enhancing the e-learning satisfaction of undergraduate female EFL learners in Saudi Arabia. The intervention, which was ClassPoint tool-integrated education for the experimental group, lasted around one month, whereas students in the control group got non-ClassPoint integrated lessons. Following that, the data from both groups was statistically examined using a t-test. According to the findings, using ClassPoint tool activities resulted in a considerable rise

in the e-learning satisfaction enrichment of EFL learners when compared to non-ClassPoint conventional instruction. As a result, the study recommends using the ClassPoint application at all educational levels and in all modalities of learning to keep

students interested, motivated, and happy with their education.

The preceding investigations were backed by Fitriana's [20] research, which aims to boost student productivity via the use of the presentation medium ClassPoint and educational games Quizziz and Kahoot in the learning process. The findings revealed that the usage of the presenting medium ClassPoint, as well as the educational games Quizziz and Kahoot, can boost student productivity throughout the learning process.

The same investigators, Akram & Abdelrady [21], carried out a quasi-experimental study to assess the impact of ClassPoint tool-integrated activities in lowering test anxiety in Saudi female undergraduate EFL learners. The intervention, which included ClassPoint tool-integrated training for the experimental group, lasted around one month, whereas students in the control group got non-ClassPoint integrated instruction. According to the findings, the usage of ClassPoint tool activities had a substantial influence on the decrease of test anxiety among EFL learners when compared to non-ClassPoint

conventional instruction. As a result, the study recommends adopting the ClassPoint technology at all educational levels and types of learning to keep students interested and decrease test anxiety.

Teachers who are not experienced in leveraging technology as a creative learning medium may result in pupils being bored with their studies. So, Karim [22] focuses on teaching students how to create interactive learning material with the ClassPoint program, making learning more enjoyable. The methods used in this training activity are the Presentation Method for introducing software, its benefits, and its application in creating interactive learning media, the Demonstration Method for demonstrating the program's operationalization, and the Practice Method for creating learning media directly by participants using Class Point applications. The training session went successfully, and now participant educators may use the tool to make learning media more interactive.

In this regard, teachers must grasp technology to adapt to learners. Kurniawan and Yatri's [23] development research attempts to construct interactive quizzes utilizing ClassPoint programs. Based on the findings, it is possible to infer that interactive quizzes are suitable for use as a medium for teachers and students to undertake learning assessment activities. This study implies that it will boost student motivation and excitement for taking quizzes, as well as teachers' and researchers' understanding.

According to Jeklin [24], using ClassPoint presentation media is one of the instructional tools that is intended to increase student learning accomplishments. The goal of this study was to see if using ClassPoint presentation material may increase student learning results. Based on the steps completed, it is possible to infer that using the ClassPoint presentation medium can increase the learning outcomes.

Turning to the local context in the Philippines, Yusi [25] conducted Action Research that intends to examine the efficiency of adopting ClassPoint in teaching Business

Mathematics to Grade 11 ABM learners in the Mataas Na Paaralang Neptali A. Gonzales. The purpose of this study was to determine the degree of performance in Business Mathematics of Mataas Na Paaralang Neptali A. Gonzales Grade 11 ABM students before and after utilizing ClassPoint to teach the subject. This study employed a quasi-experimental design. Respondents were drawn from 11 ABM at Mataas Na

Paaralang Neptali A. Gonzales. The Pretest data were used to determine the learners' prior knowledge before utilizing the Classpoint. Weekly assessments in the form of teacher-created learning activity sheets that were subjected to a quality assurance method to verify students' performance while using Classpoint to teach Business Mathematics and Statistics. After utilizing Classpoint, a posttest was given to measure the learners' competence in Business Mathematics. There is a significant difference between the pretest and posttest mean scores after utilizing Classpoint to teach Business Math. This implies that properly using ClassPoint has a positive influence on students' achievement in exams.

Moreover, the objective of the study of Querido et al. [26] was to evaluate the effectiveness of ClassPoint, as an Interactive Classroom Tool, in augmenting students' engagement and performance in mathematics inside traditional classroom settings. The study employed a quantitative quasi-experimental methodology, with a sample of 60 students. The research focused on assessing the Most Essential Learning Skills of Mathematics 10 during the second quarter. The study utilized Independent and Paired Samples t-tests to assess the presence of statistically significant differences in the mean responses of formative tests, posttests, and student involvement. The findings indicated that the students belonging to the Experimental group, who utilized the Interactive Classroom Tool, exhibited superior performance compared to the Comparison group, which did not employ the tool. The Experimental group had a statistically significant enhancement in their performance, achieving a mastery level of 78% MPS. Furthermore, the independent t-test analysis revealed a highly significant difference between the Experimental group and the Comparison group. In addition, the utilization of a paired t-test demonstrated a substantial enhancement in student involvement through the implementation of the interactive classroom tool. This was evidenced by the significant difference in engagement scores seen before and after the integration of the Interactive Classroom Tool. The study proposes that educators might utilize Interactive Classroom Tool or ClassPoint as pedagogical resources to enhance student engagement and academic achievement.

THEORETICAL FRAMEWORK

The theoretical framework of the research study on the impact of digital game-based learning on numeracy and mathematics education encompasses three main theories: Constructivism, Situated Learning Theory, and Game-based Learning. These theories provide the conceptual underpinnings that guide the design, implementation, and interpretation of the study. The

study was guided and supported by various theories for its completion.

The first theory for game-based learning was the constructivism of John Dewey. Constructivism is the idea of "learning by doing," and in the digital age, it may be used through game-based learning where individual students can practice problem-solving and decision-making skills. The interactive exercises can be altered as well. Engaged students can love learning with game-based learning technologies rather than seeing it as a disruptive burden. Constructivism posits that learners actively construct their knowledge and understanding through their experiences and interactions with the environment. Learning is viewed as a process of constructing meaning from experiences, and learners actively make sense of new information by relating it to their existing knowledge and mental models. In the context of the study, constructivism is particularly relevant as it emphasizes the importance of active student engagement and meaningful learning experiences.

The last theory for game-based learning is the situated learning theory of Jean Lave and Etienne Wenger. The goal of situated learning inside games is to employ information in context by creating a setting that is as close to reality as possible, so that students may easily transfer the material into the real world. Students will see instant "in-game consequences" that will help them understand the "game's learning goals" better. The approach highlights the importance of creating authentic experiences in games that will take place in a real-world setting.

Moreover, Situated Learning Theory emphasizes that learning is situated in authentic contexts and occurs as a result of participation in social and cultural activities. Learning is seen as a process of enculturation, where learners acquire knowledge and skills by engaging in activities that are meaningful and relevant to their daily lives. In the context of the study, situated learning theory highlights the importance of providing learners with authentic and contextually meaningful learning experiences in mathematics.

Constructivism is highly involved as learners will construct their numerical skills to be determined by their experience in gamified learning. They will tend to use their previous knowledge as a foundation and build their new things as they are immersed in the engaging game, tending them to learn. In situated learning, it claims that students are more inclined to learn by actively participating in the learning experience. Learners will be more interested if games are related within the real-life context. Hence, thinking critically will be at ease as they are within the game in which they are having fun and enjoying. For this reason, a combination of learners' previous knowledge and community experiences will likely make digital game-based learning on numeracy more engaging, interactive, and effective in the teaching and learning process.

Game-based learning can be seen as a vehicle for implementing situated learning principles in the mathematics classroom. Digital games often present mathematical problems and challenges that are situated in realistic and

relevant contexts. As students engage in gameplay, they are immersed in scenarios that mirror real-life situations, enabling them to apply mathematical concepts and problem-solving strategies to solve authentic problems. By situating learning in meaningful contexts, game-based learning facilitates the transfer of knowledge and skills to real-world situations. Game-based learning is not a single theoretical framework but rather an approach that draws from various learning theories and pedagogical principles. Game-based learning leverages the motivational and engaging elements of games to enhance learning outcomes. Games typically incorporate elements such as competition, rewards, immediate feedback, and progression, which can foster student motivation and persistence in learning.

RESEARCH PARTICIPANTS

The student-respondents are composed of 30 in Grade 7 Faith and 30 in Grade 7 Hope, age 12 – 14 years old, who enrolled in the school year 2022 – 2023 at one of the public secondary schools in the Province of Sorsogon and they will be purposively chosen as respondents of this study. The inclusion criteria include: (1) the respondents must be Grade 7 students of the school year 2022 – 2023 (2) must be studying at the referred school, (3) they must be present during the time of data gathering (4) and they must bring an android or smartphone. Likewise, the exclusion criteria are: (1) those who are not Grade 7 students of the school year 2022 – 2023, (2) those who are absent during the time that data is being collected, and (3) those who don't have an android or smartphone. Lastly, the subjects are oriented that they can withdraw anytime they want, and the researcher can look for another volunteer and willing respondent to participate in exchange for their withdrawal.

METHODOLOGY RESEARCH DESIGN

This study utilized both the quantitative and qualitative methods and quasi-experimental research as the basis for 'Digital Game-based Learning (GBL) on Numeracy of Grade 7 Students using ClassPoint. It is quantitative since the study specified the level of effectiveness of Game-based Learning using ClassPoint as an aid of instruction and the performance level of Grade 7 students in numeracy specifically on performing operations on integers which is one of the least mastered competencies during the school-based numeracy exam taken by the same students. This method determines the learning outcomes of the student by integrating technology using Game-based Learning, it highlights the use of Game-based Learning as an approach, strategy, or supplementary instruction for learning concepts and skills, encouragement that learning is fun, evaluation tool, or remedial instruction.

The respondents are Grade 7 students. This study is composed of two groups, the experimental and controlled. A pretest and posttest are both given to the two groups. In the lesson proper, the experimental group is taught using Digital Game-Based Learning using ClassPoint with the researcher as their teacher, while the control group will not, rather the teacher instructed them like the regular classes using the traditional

method. There was another teacher who facilitated the control group but with the same academic background and qualifications that fit closely with the researcher.

In addition, the study employed descriptive qualitative research intending to produce an extensive summary of unique events experienced by individuals or groups of individuals. With this, the researcher conducted a Focus Group Discussion interview with the selected participants from the experimental group. The said interview was about their gamified learning experience on numeracy using ClassPoint, as well as the other aspects of ClassPoint that need to be improved based on the views, opinions, suggestions, and recommendations of the students.

INSTRUMENTATION

The main instrument of the study was the pretest and the posttest. The digital game-based learning using ClassPoint was the intervention that the teacher used to support the Numeracy learning of the Grade 7 students.

The instrument is a multiple-choice type of test. This is a conceptual understanding test focusing on one of the least mastered competencies of Grade 7 students during the school-based numeracy assessment test, which is performing the four fundamental operations on integers. The mentioned competencies for the numeracy test were supported by Khalid et al. [27]. They argue that to be numerate, one of the skills that need work is the basics, such as operations on integers. People all over the world have written a lot about how hard it is to do basic math operations with whole numbers or integers, especially addition and subtraction. As part of identifying epistemic barriers to negative numbers, it was revealed by Fuadiah et al. [28] how students' comprehension of negative numbers and identified their difficulties related to the concept of integer and its counting operation. Even after teachers explained the integer counting operation technique, students still had a notion of confusion.

On performing the basic operation on integers, topics to be covered for the pretest and posttest are adding, subtracting, multiplying, and dividing both positive and negative integers, solving simple word problems involving operations on integers, and citing real-life situations wherein performing operations on one to two-digit integers are applied.

The pretest and posttest were composed of 30 items, distributed per topic based on the Table of Specification to be made by the researcher. The Table of Specifications (TOS) was prepared before making the test questionnaire to ensure the items would be distributed properly among learning competencies on integers. The pretest was conducted before the implementation of Game-based learning using ClassPoint as an instructional method and material and the posttest was given after discussing the covered lesson on performing operations on integers.

The researcher conducted a pilot test to determine the reliability, index of difficulty, index of discrimination, and multiple-choice distracter of the test questions. The results will be tallied, ranked, and analyzed using the Lumen Ex

Machina 4 100x100 Item Analysis Template through Microsoft Excel presenting the result of the Reliability Test, Item Analysis, and Distractor Analysis.

For a test item to be considered good and bankable, it must be either average or hard in difficulty, it must be discriminating, and since it is a multiple-choice question, all the distracters must be good. However, what needs to be revised and what needs to be discarded might vary according to the researcher's preferences and content experts' standards.

The instrument has been validated by three content experts and underwent a reliability test through pilot testing in a class of Grade 7 and Cronbach's Alpha of more than .70 which is 0.8772 which means it is reliable. This instrument was used in
administering the pretest and posttest to the two groups to measure the effectiveness of the experiment.

The researcher created a PowerPoint Presentation with integrated ClassPoint to make it gamified, and lesson plans for a week to be used as a guide for teaching. These were mainly centered on the topic of performing operations on integers. The lesson plan was shown to the same content validators for the evaluation of the content and scope of the lesson. The PowerPoint presentation gamified by ClassPoint was validated by three ClassPoint Certified Trainers who are content experts as well. To determine their performance level, the result of the test was the basis to evaluate how effective the digital game-based learning using ClassPoint.

Lastly, a Focus Group Discussion interview was constructed by the researcher to garner the learning experience and perception of students on the use of ClassPoint as well as its points for improvements on its other aspects. The said interview was recorded to secure the authenticity of the responses of the students.

DATA ANALYSIS

The data gathered was treated using descriptive and inferential
analyses through the Statistical Package for the Social Sciences (SPSS). The researcher used the following statistical tools:

Mean. This was used in determining the level of students' numeracy skills through the 30-item numeracy test, with the same mean range and level of proficiency from Table 2. It seeks to answer problem 1.

Kolmogorov-Smirnov Test and Shapiro-Wilk Test. This is to determine if the distribution of data is normal and whether the study will apply a parametric test or nonparametric test on the analysis of data, to be applied to problem 2.

Paired Samples t-test. This test was utilized to answer problem 2 after the normality test revealed that the test distribution was normal. This is to determine the significant difference in the scores of respondents between the pretest and post-test scores of the experimental and control groups.

MEAN NUMERACY LEVEL OF THE CONTROLLED AND EXPERIMENTAL GROUP IN THE PRETEST AND POSTTEST

Table 1 presents the mean numeracy level of 30 student-respondents on the test obtained in the pretest and posttest. The control group in this study utilized the traditional method of teaching. This means that they discussed Operations on Integers using chalk and board approach like regular classes.

Table 1: Mean Numeracy Level of the Control Group in the Pretest and Posttest

	Mean	Standard Deviation	Numeracy Level
Pretest	15.57	3.390	Approaching Proficiency
Posttest	18.53	3.580	Proficient

According to the mean performance in the pretest, 15.57 which is considered as approaching proficiency with a moderate numeracy level, increased to 18.53 being proficient with a high level of numeracy skills. This implied that the numeracy level of the respondents increased after using the traditional method of teaching. This means that after using the traditional method of teaching, there is an improvement in the students' outcomes.

The data in Table 2 revealed the mean performance level of 30 student-respondents on numeracy based on the pretest and posttest of the experimental group. This group had an intervention in digital game-based learning using ClassPoint to improve numeracy.

Table 2: Mean Numeracy Level of the Experimental Group in the Pretest and Posttest

	Mean	Standard Deviation	Numeracy Level
Pretest	13.90	4.196	Approaching Proficiency
Posttest	21.70	3.385	Proficient

The experimental group obtained a mean value of 21.70 in the posttest from the mean value of 13.90 in the pretest. This increases from approaching proficiency interpreted with a moderate level of numeracy into being proficient giving an interpretation of a high level of numeracy. The data implied that the performance of the students in the posttest was better than the pretest. This increase means that the intervention of digital game-based learning using ClassPoint improved the numeracy skills of the students.

As observed, the mean score of the controlled group in the pretest which is 15.57 is higher than the pretest mean score of the experimental group which is 13.90. Despite the difference, the two groups are heterogeneous sections making them comparable.

Nonetheless, after implementing the different and separate interventions among the two groups, the traditional method for the controlled group and digital game-based learning using ClassPoint for the experimental group, the posttest

mean score of the experimental group was 21.70 which is now higher than the posttest mean score of the controlled group which was 18.53. Therefore, the difference in the pretest and posttest mean scores of the experimental group was higher than the difference in the pretest and post-test mean scores of the control group.

DIFFERENCE BETWEEN THE PRETEST AND POSTTEST OF THE CONTROLLED AND EXPERIMENTAL GROUP

Based on the result as seen from Table 3, the obtained p-values are greater than the alpha-value of 0.05 which leads to the rejection of the null hypothesis that the distribution of data is not normal. Therefore, the distribution is normal, and the researcher is bound to use a parametric test for measuring how significant the difference between the pretest and posttest scores of the controlled and experimental groups.

For this reason, a t-test for paired samples was utilized. It was also utilized in the study of Insorio [29] about using an offline mobile gaming application, having also a pretest-posttest design for two groups. Etcuban and Pantinople [30] studied the impact of teaching math using mobile applications and also used a pretest-posttest approach. T-test was also employed in their study. Querido et al. [26] assessed the effectiveness of the ClassPoint, as an Interactive Classroom Tool. Their study supports the use of paired samples t-tests as it was also utilized in their treatment of data. Tiria & Caballes [16] used t-tests as well and they show how gamification influenced the academic performance of senior high school physical science students.

Table 3: Test of Normality

Statistical	Kolmogorov-Smirnov Test				Shapiro-Wilk Test			
	Controlled Group		Experimental Group		Controlled Group		Experimental Group	
	Pre test	Post test	Pre test	Post test	Pre test	Post test	Pre test	Post test
Test Statistic	.133	.122	.097	.126	.981	.968	.982	.974
Sig-Value	.185	.200	.200	.200	.855	.496	.884	.659

Analysis of comparison is shown in Table 4 which was done using the t-test for paired samples to find out the difference in numeracy level of the group of students facilitated with digital game-based learning using ClassPoint and students taught using the traditional method. Results revealed that for the controlled group, the t-value of -12.768 with the corresponding p-value of .000 which is less than α= 0.05. Hence, the null hypothesis is rejected. Likewise, in the experimental group, the t-value is -15.625 with a p-value<0.05 which is .000. Thus, the null hypothesis of the experimental group is also rejected. As gleaned from the table, there is a significant difference between pretest and posttest scores for both the controlled group and experimental group. Both methods show positive outcomes, but this implies that the use traditional method is not as effective as utilizing the digital game-based learning on numeracy using ClassPoint.

Furthermore, since the pretest and posttest on the experimental group differ significantly, it means that the use of digital game-based learning using ClassPoint does improve and enhance the numeracy skills of Grade 7 students specifically on the operations of integers. Thus, the said intervention is effective.

This result is similar to the study of Yusi [25] that determines the effectiveness of ClassPoint in Teacher Business Math. It was revealed that there is a significant difference between the

pretest and posttest mean scores after utilizing Classpoint to teach Business Math.

In addition, the outcome of the present study was supported by Querido et al. [26] who also evaluated the effectiveness of ClassPoint in the most essential learning competencies in Grade 10 Mathematics. The results of the study showed that the students in the Experimental group, who made ClassPoint, performed better than the students in the Controlled group, who did not use the tool.

Table 4: Paired Samples t-test (Correlated Means) of the Controlled Group and the Experimental Group

Statistical	Statistical Analysis	
	Controlled Group	Experimental Group
Level of Significance	0.05	0.05
t-value	-12.768	-15.625
Sig-value	.000	.000
Interpretation	Significant	Significant
Decision to Ho	Reject	Reject

Lastly, the result of this study is also the same as the result of the study of Boldadora [31] who examined the effectiveness of digital game-based learning on student math proficiency. Both studies show a significant difference in the pretest and post-test scores of the students, outperformed the controlled group by the experimental group, and recommend the use of digital game-based learning in improving the numerical skills of students.

EXPERIENCES AND PERCEPTION OF GRADE 7 STUDENTS AND THEIR RECOMMENDATIONS FOR IMPROVEMENT

The researcher designed a focus group discussion interview to gather students' perceptions of their learning experiences using ClassPoint, as well as suggestions for enhancements to its other features. To ensure the accuracy of the students' feedback, the said interview was recorded. Moreover, this was conducted to ensure that the increase in the score of the students in the experimental group was primarily due to the effectiveness of the intervention and not by other factors. Ten students were involved in the focus group discussion interview. It started with greetings and a discussion of the parameters of the interview. It was clear among the students that there would be no benefit in participating in the interview but would help the researcher evaluate the effectiveness of the digital game-based learning using ClassPoint in learning numeracy. Participants were also assured the confidentiality of gathered data, information, and details, and it will only be accessed by the researcher. They are oriented that they may withdraw their participation anytime they want, and their identities will remain anonymous.

As they experienced the gamified numeracy lessons, they described it as motivating, exciting, intense, satisfying, fun, and enjoyable. This reflects a positive response that it enriched their motivation to learn numeracy. Some expect it to be fun and some feel curious and excited. These are under the theme of Engagement and Participation, referring to their reactions towards the intervention leading them to interact within the class.

Conversely, a student states that the rules of operations on integers were presented through the game, making it fall under the theme of Effectiveness in Numeracy Learning as the content of numeracy or mathematics was mentioned. Moreover, a student revealed that he is interested in mathematics after the intervention. As the student mentioned the subject matter of mathematics, will fall under the same theme.

One of the reasons that they are very participative is that they are not afraid to commit mistakes as the researcher only reveals the names of those who answered correctly and not those with wrong answers, which greatly boosted their confidence. According to them, as they earn points, they feel satisfied, happy, competitive, and more eager to attend every session. This denotes that the use of digital game-based

learning using ClassPoint lifts the students' engagement and participation in class and learning.

The specific elements or features that they find motivating and enjoyable are the leaderboard, the stars reward system, and the ranking of scores. These are the competition elements that make the lesson gamified using ClassPoint. They earn stars for every right answer they get, and this will make them level up their badges. From this, we can see the leaderboard on who earns the most stars and the highest level of badge, and it was presented in order according to ranks.

Aside from the gamification elements, some loved the type of questions the ClassPoint had such as the Multiple-choice Questions and the Word Cloud. Moreover, some like the Color Wheel wherein the teacher may spin the wheel with the corresponding name of students, and it will randomly select from them on the spinning wheel. All their answers are the gamification features used in the numeracy lesson, making it fall under the theme of Effectiveness in Numeracy Learning.

ClassPoint features that mainly focus on scores, ranking, and competitions will be under the code of gamification, for these are the elements that make the numeracy lessons gamified. On the other hand, the features that center on the type of formative evaluation and activities will be under the Gamified numeracy code.

In terms of effectiveness on numeracy learning, they agreed that gamified lessons using ClassPoint have improved their understanding of numeracy concepts. Some claimed that they became more competitive and interested in the lesson because it was gamified. A student also said that it was more enjoyable because they were able to use their Android phones compared to the traditional approach of chalk and board method. Another student also mentioned that through the intervention, they were able to share all their ideas and answers. Generally, it supported the result that the increase in the posttest scores and its significant difference from the pretest scores was primarily because of the intervention.

It is also backed by the changes in the attitude of the students toward numeracy as a result of using gamified lessons. There is a student who says that he hated the subject matter before, but he likes it now as the lesson goes gamified. This was supported by his classmate who stated that the subject matter was no longer boring. Some got motivated and interested in the lesson, and some became more competitive. These responses will fall for the effectiveness of the gamified numeracy lesson.

Lastly, one says she became more confident, one says she was more eager to attend the math class, and some say they find learning more fun, interesting, motivating, and enjoyable with the digital game-based learning on numeracy using ClassPoint.

Generally, it supported the result of the increase in the posttest, and the significant difference in the pretest and posttest. It was not just proven in numbers, but also from the words and testimonials of the students. Digital game-based

learning using ClassPoint is therefore effective in terms of numeracy learning.

The positive experiences the students had with gamified numeracy lessons have been tackled. However, they encountered some challenges and difficulties such as the problem with the internet connectivity that caused some lagging in the system. There are instances also that the reward of stars is doubled and as the researcher presents the leaderboard in the slide presentation, it is long before it is gone to their device's screen when the researcher proceeds with the next slide. According to them, there are times that the current slide presentation from the researcher's end does not or is delayed showing up on the students' end. They also mentioned that sometimes, there are delays in the submission of their answers and the teacher-researcher does not receive their answers yet. It means that the primary challenge is the internet connectivity considering that the location of the school is far from the municipality proper.

Additionally, they also stated another difficulty that some of their classmates do not have personal Android phones to bring to class. That is why the researcher just makes some of them pair with their seatmates or friends who are willing to partner with them in using a device. Fortunately, all the students were able to participate actively in class. In terms of other aspects of ClassPoint that could be enhanced to support numeracy learning, there are features and game elements that were specifically stated by the students that they believe make the intervention even more effective. The first one that was suggested by the group is to make it available through offline mode that no longer requires internet connectivity to use. This is also one of the major issues encountered by the students in using ClassPoint. One student further suggested a 'Group' feature within the application as some of their classmates don't have an Android phone to use. To solve this, the researcher pairs those who do not have a device with their seatmate or friend with a device and they will enter the platform with their names. However, it can be suggested to still have a 'Group' feature so that the platform has a unique way of making students participate in a collaborative approach.

A student also recommended that there should be a longer time limit in answering the questions, but this is always possible since it is always the teacher that decides on how long the time limit is or there will be no time limit at all. Lastly, another learner suggested that they should be able to edit their responses when they already submitted their answers if ever, they changed their minds.

To their suggestions to make the intervention more user-friendly, the first one is for ClassPoint to have its own installable and downloadable application directed to their Android phones. Since they need first to open their respective browser and type in the search bar 'classpoint.app' for them to use it. Two students proposed again for ClassPoint to have a 'grouping' element, and to make it no longer need internet connectivity to make it offline so that they no longer have to spend for mobile data and load.

PROPOSED PROFESSIONAL DEVELOPMENT PROGRAM FOR MATHEMATICS TEACHERS ON THE USE OF CLASS POINT IN TEACHING NUMERACY

A professional development program was developed after determining the effectiveness of digital game-based learning on numeracy using ClassPoint. Since it was found out that the use of ClassPoint is effective in enhancing the numeracy skills of Grade 7 students, it is safe to say that teachers should be aware of this result and employ it in their respective classes. It aims to aid teachers in not only making their classes interactive and engaging but also in helping students master foundational numerical skills. It also has a goal to change the negative perception of students in the subject matter.

The said program will be conducted via Zoom and will be sponsored the ClassPoint Philippines. This will be a three-session professional development program wherein the first session will be centered on the quantitative and qualitative results of this study about the effectiveness of digital game-based learning on numeracy using ClassPoint, resulting in the development of the mentioned training program for mathematics teachers. This will be followed by another session regarding the basics and interface of using ClassPoint, and the last session will be focused on the use of ClassPoint in teaching numeracy. The resource speaker for this training program will be the researcher who is a ClassPoint Certified Trainer and a mathematics teacher.

CONCLUSION

This quasi-experimental study aimed to determine the effectiveness of digital game-based learning on numeracy of Grade 7 students using Classpoint and make an input of professional development program out of the result. Results revealed that both the control group and the experimental group moved up from having a moderate level of numeracy skills to a high level. However, the intervention used in the experimental group obtained a higher difference and increase between the pretest and posttest scores than the difference and increase in the pretest and posttest scores of the controlled group. Therefore, digital game-based learning using ClassPoint improved the numeracy skills of the students more than the traditional method of teaching.

The figures earned indicate the significance of the difference between the pretest and posttest scores of the controlled and experimental groups. The use of digital game-based learning on numeracy using ClassPoint is therefore effective.

ClassPoint proved beneficial for numeracy learning, incorporating these recommendations of offline usability, a group sharing feature, and a dedicated application, could significantly enhance its effectiveness and accessibility for Grade 7 students. These improvements align with the

identified challenges and would likely further optimize the learning experience with ClassPoint for numeracy education. Lastly, the training program for mathematics teachers will equip them to utilize and implement the effectiveness of ClassPoint on their respective numeracy lessons.

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