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Using ClassPoint: Its Effects on the Students' Engagement and Academic Performance in Advanced Algebra

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Abstract. The growing emphasis on varied instructional approaches underscores the critical role of technology in fostering innovation and promoting lifelong learning. This focus aligns seamlessly with Sustainable Development Goal 4 (SDG 4), which advocates for inclusive and equitable quality education for all individuals, regardless of their background or circumstances. This study is grounded in multiple theoretical frameworks, including Engagement Theory by Kearsley and Shneiderman, Constructivism by Piaget and Vygotsky, and Direct Instruction by Engelmann, providing a robust theoretical framework for understanding the impact of technology on learning outcomes. A quasi-experimental design was employed, utilizing pretest-posttest assessments with control and experimental groups to evaluate the effects of ClassPoint on student engagement and academic performance. Feedback was gathered from Grade 9 Advanced Algebra students at a private school in Cebu using validated researcher-constructed questionnaires. Results revealed that both the control (SD=5.04) and experimental (SD=4.02) groups exhibited below-average performance in the pretest, indicating a consistent trend of underachievement before any interventions. However, the experimental group showed significant improvement in the posttest, achieving above-average results, with a statistically significant mean gain (U=101.5, $p<.01$) and mean ranks of 17.06 for the control and 33.27 for the experimental group. These findings indicate that integrating ClassPoint enhances student outcomes compared to conventional methods, contributing to the ongoing discourse on technology integration in education and supporting the objectives of SDG 4 by promoting effective learning opportunities for all students.

Keywords: ClassPoint; Interactive classroom tool; Student engagement; Academic performance; Advanced algebra; SDG 4

1.0 Introduction

The global shift towards various instructional methods, including in-person, online, and hybrid, has highlighted the importance of incorporating firsthand insights for long-term innovation in education (Hassan, 2020). Recognizing the need to strengthen the future of mathematics education, this study aims to continue integrating technology into classroom instruction. The increasing reliance on technology in education presents challenges for educators in maintaining student engagement and academic performance.

Digital technology has emerged as an integral component of education, offering the potential to enhance mathematics instruction and elevate students' involvement and academic achievements (Cahyono & Ludwig, 2018; Quispe-Prieto et al., 2021). In the Philippines, government schools are also incorporating Information and Communications Technology (ICT) to keep up with technological advancements, as it is believed that technology will be an essential life skill for instructors and students in Science, Technology, Engineering, and Mathematics (STEM) education by 2030 (Southern Oregon University, 2023). However, teachers face increasing challenges in keeping students engaged, which directly impacts academic performance. Furthermore, transitioning back to a traditional in-person format after the pandemic has proven challenging for numerous students who had grown accustomed to using technology during online classes (Verde & Valero, 2021).

Classroom-response systems (CRS), also known as Interactive Classroom Tools, can enhance classroom communication and interaction, enabling teachers to effectively monitor student progress and maintain a supportive learning environment (Abdelrady & Akram, 2022). The ClassPoint application, an emerging CRS tool integrated into PowerPoint, offers a user-friendly interface to transform teaching through interactive learning, content creation, real-time collaboration, and gamification.

While prior studies, such as Querido (2023a) and Yusi (2022), have highlighted the effectiveness of ClassPoint in mathematics education, there remains a significant gap in empirical evidence specifically examining its effects on student engagement and academic performance across diverse classroom settings. This study aims to address this gap by investigating the efficacy of ClassPoint in enhancing mathematics education, with a particular focus on its impact on student engagement and academic performance in Advanced Algebra, specifically regarding Quadratic Functions. By providing empirical evidence on the influence of ClassPoint on mathematics education, this research aims to contribute meaningfully to the ongoing discourse on technology integration in teaching practices, thereby enriching the understanding of how such tools can be effectively utilized in the classroom.

2.0 Methodology

2.1 Research Design

A mixed-methods study that employed a proper experimental approach; a pretest-posttest nonequivalent groups design was used to collect quantitative data, while survey questionnaires were used to collect qualitative data. Despite a small sample size of 49 participants, the researcher ensured comparability between the groups to enhance the validity of the cause-and-effect relationship. Although the groups were not randomly assigned, a matched-pairs design was used to analyze the pretest results and control for confounding variables.

2.2 Research Locale

The study took place at a private school in Cebu City that offers a complete basic education program, from early childhood education through grade school, junior high school, and senior high school. The Junior High School (JHS) department has a total population of 159 students in all four secondary levels. There are two sections per grade level, with 18-29 students in every classroom. Most of its clientele belongs to the elite and upper-middle classes. The principal head of the high school department comprises twenty-one (21) faculty members. The school has a strong focus on academic courses, including mathematics. Hence, the Grade 9 students have taken two mathematics courses, namely Advanced Algebra and Geometry. Additionally, the school has a computer laboratory with 26 working computer sets. There are also Liquid Crystal Display (LCD) screens with built-in speakers in every classroom, in between overlapping four (4) sliding whiteboards, one of which is a graphing board. The researcher implemented a PowerPoint presentation with ClassPoint integration Instruction in one of the two sections of the Grade 9 Advanced Algebra class. For instruction and assessment, smartphones, tablets, and LCDs were used to the maximum extent in every classroom as visual aids.

2.3 Research Subjects

The study was conducted in a Grade 9 Advanced Algebra class in one of the private schools in Cebu. The subjects were not randomly assigned. However, the researcher selected the two classes with the same Advanced Algebra course for Grade 9 students, as the researcher was one of the advisers for the batch. Using a matched pairs experimental design, the researcher also had the opportunity to regroup the students based on their academic performance, difficulties with learning and conduct, and their support system (group of friends) when they were still in Grade 8 (Voxco, 2021). There were 49 students: one section served as the control group (n = 25), while the other served as the experimental group (n = 24). These students come from elite and upper-middle-class families. These sections were covered in the researcher's official classes. The students were able to access the internet using their mobile phones or tablets. However, a busy schedule prevented the students from taking advantage of the opportunity to use the computers in the computer laboratory, which had a stable internet connection. The instruction for the control group followed a traditional approach, utilizing standard PowerPoint presentations. In contrast, the experimental group incorporated the interactive classroom tool

ClassPoint Pro into their PowerPoint presentation during the fourth quarter of the 2023-2024 school year.

2.4 Research Instrument

To assess the effectiveness of ClassPoint as an interactive classroom tool, the researcher administered a pretest and a posttest to both the control and experimental groups. The pretest and posttest questionnaires were based on the Grade 9 Mathematics dependent variable: students' academic performance in the fourth-quarter learning competencies of Grade 9 Advanced Algebra, as set by the teacher. A team of experienced educators carefully reviewed the 45-item pretest and posttest. A mathematics head teacher, two master teachers, and a language teacher assessed the content and readability of the tests using a questionnaire validator rating scale. The researcher incorporated the valuable feedback and suggestions to enhance the quality of the tests before administering the pretest. Before conducting the pretest, the instrument was pilot-tested with a set of Grade 10 students from another school with a similar demographic profile to further verify its validity and reliability. The initial pilot test revealed that the test items had varying difficulty, with a reliability score of 0.4168 using the Kuder-Richardson 20 (KR-20) method, which was deemed unreliable. The researcher then reviewed the items and revised them for a second round of pilot testing. The second round of pilot testing was administered to Grade 10 students at the same school. Using the Kuder-Richardson 20 (KR-20) method, the reliability was 0.7582, which is considered acceptable. The results of the pilot testing helped the researcher finalize a set of 40-item questionnaires for the pretest and posttest. The questionnaire was ensured to be valid after a thorough validation process with experts, and further validation was done by the students, who could learn about the topics covered in the study.

2.5 Data Gathering Procedure

The research was conducted during the fourth quarter of the 2023-2024 school year. The researcher has previously obtained permission from Inknoe, the software company behind ClassPoint, to use it as the Interactive Classroom Tool before conducting the study. The Philippine Customer Success Manager of ClassPoint granted permission via email, subject to the condition that they would receive a copy of the results, which the researcher agreed to. Ethical considerations were observed, including obtaining informed consent from parents, students, and the institution. Permission was also sought from the school administration, specifically from the school management committee. The study acquired permission from the school's Executive Director and Principal. Student assent and parental consent were also obtained via a letter, as the study involves student participation. Pretests, formative assessments, and posttests were conducted for both the Control and Experimental groups. A math pretest was given to both groups before using ClassPoint. A pretest questionnaire was given to participants at the beginning of the fourth quarter, in accordance with the school's calendar. The Experimental group was introduced to ClassPoint after the pretest. Measures have been taken to ensure the anonymity of student responses. Finally, a posttest and a student engagement survey were administered to the experimental group at the end of the fourth quarter.

2.6 Ethical Considerations

Subjects have been provided with all the required information about the study, allowing them to make an informed decision regarding their participation. This information offers comprehensive details on the study's potential risks and benefits, the estimated time commitment, and the adviser's contact information, if necessary. Respondent information is always treated with the utmost care and respect to ensure complete privacy and confidentiality. All personal information has been redacted from the files, providing an additional layer of security through password encryption. The research subjects were free to participate voluntarily and could opt out of the study at any time, including after data collection. If any subject withdraws, their data will be removed from the study without explanation. This study cited all related studies and literature to avoid duplication and plagiarism. Data collected from the subjects were analyzed without falsification to prevent data manipulation. Raw answers will be stored only for verification purposes.

3.0 Results and Discussion

This study presents the performance level of Grade 9 students on the pretest. The results were obtained from a parametric test because the students were equitably divided into two sections based on their academic performance before the start of the school year. Tables 2 and 3 show the performance level of the Grade 9 students in the posttest. The results were obtained using a nonparametric test, specifically the one-sample Wilcoxon test, after the data were found not to be normally distributed. This test was used to compare students' actual scores with the test value, which was based on the institution's passing score.

Table 1. *Pretest Performance of the Control and Experimental Groups*

Group	*n*	*HM*	*AM*	*SD*	Standard Error Mean	Computed *t*-value	*p*-value	Qualitative Description
Control	25	30	13.04	5.04	1.01	−16.83	<.001*	Below Average
Experimental	24	30	12.25	4.02	0.82	−21.61	<.001*	Below Average

Note. HM = 75% of the total number of items; based on the school's passing standard, the total score is 40, and 75% is 30. Below Average (1-30), Average (30), Above Average (30-40).
*Significant at $\alpha < .05$ (Two-Tailed Test).

Table 1 shows that the actual mean of the control group was 13.04 (SD=5.04), and of the experimental group was 12.25 (SD=4.02). This indicates significant differences between the hypothetical and actual pretest means for the control and experimental groups, both of which performed below average.

The pretest performance of the control and experimental group was statistically significantly lower than the hypothetical mean (HM), with computed t-values of -16.83 and -21.61, respectively (p-value < .001). After analyzing the data, it is evident that the null hypothesis H_{01} is rejected in both cases. There is a notable distinction between the actual mean (AM) and the hypothetical mean (HM) in the pretest performance of both the control and experimental groups. The pretest results for both groups were below average, as neither group met the institution's passing standard (HM = 75%). The below-average pretest performance of both groups might be attributed to the assumption that the students did not yet have sufficient prerequisite knowledge of the topics. The institution's double math curriculum has been derived from the Most Essential Learning Competencies (MELCs) of the Department of Education (DepEd). However, the teacher has included additional topics in the Advanced Algebra curriculum. Therefore, the students' lack of familiarity with the concepts may have contributed to their subpar performance on the pretest.

Empirical evidence suggests that students often encounter difficulties in mathematical problem-solving due to a lack of familiarity with non-standard or unconventional questions, an inability to apply appropriate problem-solving strategies effectively, the presence of misconceptions, and a failure to generate novel ideas and strategies to address the problem at hand (Hidajat et al., 2019). Furthermore, research has shown that learners in junior high schools commonly struggle to grasp and apply basic mathematical concepts. These difficulties often persist as they progress through their educational journey into higher education institutions (Lima et al., 2019). As stated by Khanal (2022), to enhance mathematics learning for students with such difficulties, studies have highlighted the effectiveness of teaching approaches that emphasize praise and the development of problem-solving abilities. To leverage students' learning experiences, the researcher used ClassPoint, which promotes increased student engagement by enabling all students to respond to questions and earn points actively.

The results presented in Tables 2 and 3 reveal the performance of the Grade 9 students on the posttest for the two groups. Using a nonparametric one-sample Wilcoxon test on the posttest scores of the control group (n = 25) and the experimental group (n = 24) separately, the data show that the control group obtained a mean score of 24.20. In contrast, the experimental group obtained a mean score of 31.58 (see Tables 2 and 3, respectively). The median scores for the control and experimental groups were 27 and 33, respectively. These results suggest that while most of the control group only obtained below-average scores on the posttest, the experimental group mostly achieved average scores. This difference in performance might be attributed to the intervention, the ClassPoint Interactive Classroom Tool, which significantly improved the experimental group's students' engagement and performance in mathematics, reaching a 78% mastery level compared to the control group (Querido, 2023b).

In addition, Table 2 shows that 18 students received negative ranks. This indicates that their scores were below the passing threshold of 30 for the 40-item test. Of the 25 respondents in the control group, five scored higher than the test value and were considered positive. However, two others tied exactly with the test value of 30. In contrast, the experimental group had only seven students with negative ranks, while 17 students received positive ranks. Additionally, there were no ties among the 24 respondents. The control group had a z-score of -3.44 and a test statistic W of 25, which is the sum of the positive ranks (i.e., smaller than the sum of the negative ranks). It was less than the critical value of 73, making the result statistically significant at p<.001. Therefore, we reject the null hypothesis H_{01}. In contrast, the experimental group had a z-score of -1.49 and a test statistic W of 98, indicating a negative sum of ranks (i.e., smaller than the sum of the positive ranks). It was greater than the critical value of 81, meaning the result was not statistically significant at p<.001. Therefore, we fail to reject the null hypothesis H_{01} for the experimental group.

Table 2. *Posttest Performance of the Control Group*

Descriptive Statistics				
Control	**n**	**Mean**	**Median**	**Standard Deviation**
Posttest	25	24.2	27	6.65
		n	**Mean Rank**	**Sum of Ranks**
Posttest – Test Value	Negative Ranks	18	13.94	251
	Positive Ranks	5	5	25
	Ties	2		
	Total	25		
		W	z	P
Posttest		25	-3.44	<.001*

Note. Negative Ranks: Control Posttest < Test Value
Positive Ranks: Control Posttest > Test Value
Ties: Control Posttest = Test Value
Performance is below average based on the school's passing standard; the total score is 40, and 75% is 30.
*Significant at α <.05 (Two-Tailed Test)

Table 3. *Posttest Performance of the Experimental Groups*

Descriptive Statistics				
Experimental	***n***	**Mean**	**Median**	**Standard Deviation**
Posttest	24	31.58	33	5.64
		n	**Mean Rank**	**Sum of Ranks**
Posttest – Test Value	Negative Ranks	7	14	98
	Positive Ranks	17	11.88	202
	Ties	0		
	Total	24		
		W	z	p
Experimental Posttest		98	-1.49	$.136^{ns}$

Note. Negative Ranks: Experimental Posttest < Test Value
Positive Ranks: Experimental Posttest > Test Value
Ties: Experimental Posttest = Test Value
Performance is average, based on the school's passing standard; the total score is 40, and 75% is 30.
^{ns}Not Significant at α <.05 (Two-Tailed Test)

The results indicate that the intervention with the ClassPoint interactive classroom tool was highly effective. Abidin et al. (2022) pointed out that students' negative mathematical disposition can impede their problem-solving skills in mathematical literacy. This emphasizes the importance of fostering a positive mathematical disposition. Children with mathematical learning difficulties (MLD) often struggle to disengage their spatial attention, which can hinder task focus and problem-solving abilities (Zhang et al., 2019). In addition, although the control group showed improvement in their posttest scores, the experimental group that used ClassPoint achieved significantly higher mean scores. As a result, the available evidence strongly indicates that the incorporation of this technology-driven intervention significantly improved students' academic performance (Querido, 2023c).

Table 4 presents the mean improvement in the performance of the Grade 9 students in Advanced Algebra from the pretest to the posttest for the control group. Table 5, however, reports the mean improvement from pretest to posttest for the experimental group alone.

Table 4. *Performance Gain from Pretest to Posttest of the Control Group*

		n	**Mean Rank**	**Sum of Ranks**
Control Posttest – Control Pretest	Negative Ranks	0	0	0
	Positive Ranks	25	13	325
	Ties	0		
	Total	25		
	W	z	p	r
Control Posttest	0	-4.37	$< .001^*$	0.87

Note. Negative Ranks: Control Posttest < Control Pretest
Positive Ranks: Control Posttest > Control Pretest
Ties: Control Posttest = Control Pretest
*Significant at α <.05 (Two-Tailed Test)

As shown in Table 4, all students in the control group achieved higher posttest scores than their pretest scores, as indicated by a positive rank sum of 325. Since the smaller sum of ranks, which are those belonging to the negative ranks, is 0, that is also the test statistic W, with a z-score of -4.37 and an effect size (r) of 0.87, which implies a significant effect on the performance gain of the control group from the pretest to the posttest. The p-value (p<.001) indicates statistical significance at the <.05 level, implying that the control group had a significant performance gain from pretest to posttest. Therefore, we reject the null hypothesis H_{02}.

The study by Querido (2023d) found that the control group, which did not use the ClassPoint tool, still showed improvements in their posttest scores compared to their pretest scores. This suggests that the conventional teaching method, which involves PowerPoint presentations, can still help students improve their academic performance (Gordani, 2019). This finding aligns with previous research indicating that PowerPoint-based instruction enhances student learning outcomes (Elmabaredy et al., 2020).

Table 5 also shows a significant performance gain for the experimental group from pretest to posttest; all students in the experimental group achieved higher posttest scores than their pretest scores. This is evident from the table, which shows that all respondents in the experimental group are in the positive ranks, totaling 300. Since the smaller sum of ranks, which are those belonging to the negative ranks, is 0, that is also the test statistic W, with a z-score of -4.29 and an effect size (r) of 0.88, which implies a significant effect on the performance gain of the experimental group from pretest to the posttest. The p-value (p<.001) indicates that the experimental group showed a significant performance gain from pretest to posttest. Therefore, we also reject the null hypothesis H_{02} for the experimental group. In a recent study by Yusi (2022a), a noticeable increase in mean performance was observed on both the pretest and posttest. This indicates that implementing the ClassPoint system had a positive impact on students' mathematics performance. This observation is consistent with the findings of previous research conducted by Bong and Chatterjee (2022a). Their study found that students valued ClassPoint as an interactive quiz tool. It was found to enhance student-instructor interaction and promote greater engagement during class. In addition, the study found that a majority of students expressed that ClassPoint had increased their motivation to participate in class and allowed them to track their learning progress during the lesson.

Table 5. *Performance Gain from Pretest to the Posttest of the Experimental Group*

		n	Mean Rank	Sum of Ranks
Experimental Posttest -	Negative Ranks	0	0	0
Experimental Pretest	Positive Ranks	24	12.5	300
	Ties	0		
	Total	24		
	W	***z***	***p***	***r***
Control Posttest	0	-4.29	< .001*	0.88

Note. Negative Ranks: Experimental Posttest < Experimental Pretest
Positive Ranks: Experimental Posttest > Experimental Pretest
Ties: Experimental Posttest = Experimental Pretest
*Significant at α < .05 (Two-Tailed Test)

Table 6 outlines the differences in mean gain performance between the control and experimental groups. From this data, it can be concluded that the mean gain in the experimental group was statistically significantly higher than in the control group (U=101.5, p<.01), leading to the rejection of the null hypothesis H_{03}. The table exhibits the mean ranks of 17.06 and 33.27 for the control and experimental groups, respectively. The table also shows a z-score of -3.98 and an asymptotic p-value of <0.01, with an effect size (r) of 0.57, indicating a significant difference in performance between the two groups.

Table 6. *Difference Between the Performance Gain of the Control and Experimental Groups*

		n	Mean Rank	Sum of Ranks
Control Difference		25	17.06	426.5
Experimental Difference		24	33.27	798.5
U	***z***	**Asymptotic *p***	**Exact *p***	***r***
101.5	-3.98	<.01	<.01*	0.57

Note. *Significant at α <.05 (Two-Tailed Test)

The results indicate that the experimental group, which utilized the interactive classroom tool, achieved mastery on the posttest. In contrast, the comparison group, which used the conventional instruction method, only achieved an average level of performance (Querido, 2023e). This suggests that students exposed to interactive classroom tools, such as the ClassPoint platform, achieved better academic outcomes than those who relied on the conventional instructional approach.

Querido's (2023f) study further concluded that the group exposed to the interactive classroom tool had a significantly higher mean score than the control group, which had an average mean score. This finding is corroborated by Yusi's (2022b) research, which reported that participants' performance in Business Math before the ClassPoint intervention was below average (1.65), while their performance after the ClassPoint intervention increased to above average (4.90). These results provide strong empirical evidence that integrating interactive classroom tools, such as ClassPoint, can effectively enhance students' academic performance in mathematics and related subjects.

Respondents' Feedback on Using ClassPoint as an Interactive Classroom Tool in Advanced Algebra

Integrating ClassPoint into learning Advanced Algebra in the post-pandemic setting has provided students with different perspectives. Using the said interactive classroom tool, they could express their feedback on personal experiences, perspectives, and suggestions to improve their overall experience. The interface of ClassPoint as an add-in to the PowerPoint presentation not only makes it convenient for the teacher not to switch to different applications during the class activity, but the students also strongly agree that ClassPoint as an Interactive class tool is fun, interactive, and easy to use for them (Ritonga et al., 2023). The experimental group was also asked to complete a survey about using ClassPoint, which was integrated into the Advanced Algebra learning. Analyzing the insights shared by the students aims to provide a deeper understanding of their experience with ClassPoint, their perceptions of its efficacy in improving their academic performance and engagement, and their suggestions for better integration. The findings also shed light on the benefits, advantages, disadvantages, challenges, and

Fun and Engaging

The participating students in this study had prior experience with ClassPoint in online and hybrid classes the previous school year. The students appreciated ClassPoint's interactive features, which kept them engaged. As noted in the study by Bong and Chatterjee (2022b), the students particularly valued the 'Pick-a-name' function, which they found very useful in preventing the instructor from repeatedly selecting the same students' responses to their questions. This function enabled greater student involvement in classroom discussions. The students were encouraged to share their feedback and observations, and the participants in the study provided the following responses, showcasing their perceptions towards the use of ClassPoint in the Advanced Algebra class:

Learner 2: "It was successful but, at the same time, kept us engaged."
Learner 7: "It is a better and easier way to learn lessons."
Learner 9: "Pretty fun and unique way of learning."

As a result, ClassPoint's interactive features made it easier for students to answer questions and made the learning process more enjoyable. Students could obtain immediate feedback on whether their answers were correct while remaining anonymous to everyone else. Research indicates that game-based learning (GBL) in a competitive context can improve students' engagement and interest in mathematics (Gil-Doménech & Berbegal-Mirabent, 2019a). This suggests that ClassPoint's competitive and interactive elements may have contributed to the students' increased engagement and performance in the subject.

Effects of Using ClassPoint

Another aspect the students highlighted in their experience was the effects of using ClassPoint in the learning environment. The students were asked whether using ClassPoint had been beneficial to them and whether it had enhanced their comprehension of the subject compared to previous quarters when the platform was not used. This provided a reference point for evaluating the effects of ClassPoint on students' learning experiences. Existing research by Yusi (2022c) indicates that using ClassPoint in teaching Business Mathematics has positively affected students' performance, contributing to their academic improvement. The current investigation asked the students to emphasize whether the use of ClassPoint had improved their class participation, and we elaborate on their responses below:

Learner 10: "I think it did, I could learn from my mistakes more."
Learner 15: "I guess it did because I had to pay more attention to the screen to see the questions."
Learner 20: "Since there was no need to worry about record keeping, I was less hesitant to participate."
Learner 22: "As opposed to just regular discussions, ClassPoint requires you to answer some polls, short questions, and word clouds. These help me stay engaged in the class rather than just sleeping. It also helps me by making me answer them and learning rather than just reading on the board and forgetting it later on."

Learner 24: "Yes, ClassPoint improved myself greatly; it made learning more fun."

Alongside the positive perspectives, the students also expressed some reservations about using ClassPoint, citing various challenges encountered during the classroom discussions. Despite the overall benefits, some students were able to provide feedback on whether the use of ClassPoint had helped them improve:

Learner 5: "Not really because people used it for social media."
Learner 15: "Not really, because it is hard to write."
Learner 18: "Not really. I did not see that big of an impact that ClassPoint caused."

The students' thoughts and concerns about their challenges with ClassPoint were acknowledged as valid. The researcher tried to help the students properly process and address these issues. The researcher acknowledges the possibility of inevitable difficulties when integrating new technology-based tools into the classroom environment. While the researcher aimed to mitigate these challenges as much as possible, the student feedback highlights the importance of anticipating and proactively addressing potential difficulties while implementing ClassPoint or similar interactive classroom platforms. By addressing these concerns, the researcher can work toward creating a more seamless and practical learning experience for students when using such interactive technologies in the classroom.

Features of ClassPoint

In line with the positive impacts students reported when using ClassPoint, they also noted various advantages and benefits associated with its implementation in the classroom, further solidifying its effectiveness. Students have cited the ability to actively respond to prompts, annotate content, and collaborate in real time as key drivers of enhanced student involvement and knowledge retention (Mazlan et al., 2023). Additionally, people have praised ClassPoint's visual and multimedia capabilities for their ability to illustrate complex concepts better, making learning more dynamic and immersive. Out of all the benefits the students have experienced with the use of ClassPoint, some have cited the following:

Learner 2: "It makes us (become) more participative."
Learner 7: "Makes me more encouraged to learn the lesson."

Furthermore, the students expressed appreciation for ClassPoint's various features. They found the multiple-choice feature the most helpful, while the word cloud was deemed the least useful. The students suggested that they primarily used the word cloud feature to gather their ideas and opinions on the topic, rather than for more substantive purposes. The students also mentioned other features, including polls, short-answer questions, draggable objects, and image uploads.

Existing research has highlighted the prevalence of mobile phone usage in classrooms, which can often lead to distractions and negatively impact learning outcomes (Jalil, 2019). However, at the institution where the current study was conducted, specific measures were in place to address this issue. Each classroom initially collected and stored students' phones in dedicated phone boxes during the morning advisory period. The class adviser ensured that all students had surrendered their devices before the start of the day. The instructor permitted mobile phones or tablets for supervised use during technology integration, such as a classroom-response system (CRS) or the ClassPoint interactive classroom tool. However, the instructor established proper guidelines and agreements with the class before using these mobile devices during instructional activities. These measures and considerations were corroborated by the following insights regarding the advantages of integrating ClassPoint:

Learner 2: "Keeps us engaged."
Learner 6: "It helped me improve my learning about the lesson. It was also fun and exciting."

Another beneficial feature of ClassPoint is its ability to facilitate secure, anonymous student submissions. Students conceal their responses when they submit their answers to a specific question. However, they automatically receive the points they earn, frequently accompanied by visual feedback such as confetti. This anonymity appears to have contributed to the student's enjoyment and engagement in class, aligning with research by Gil Doménech and Berbegal-Mirabent (2019b). Their study found that game-based learning approaches that involve earning points and incorporate competitive elements can enhance students' engagement and interest in mathematics courses.

Limitations of ClassPoint

Despite the notable advantages of the ClassPoint interactive classroom tool, a more seamless integration requires addressing several limitations and technical challenges. Upon closer examination, the students identified various obstacles that can hinder effective use of ClassPoint in the learning environment. Primary among the reported challenges was inconsistent device connectivity, which disrupted the flow of interactive activities and caused classroom disruptions. Some students also reported experiencing internet access issues, such as lag, which ultimately hindered their ability to leverage ClassPoint's capabilities fully. However, it is essential to note that these connectivity-related problems are primarily external factors, as the ClassPoint system itself would not pose significant technical difficulties when reliable high-speed internet access is available. Overall, while the students generally had positive experiences with ClassPoint, integrating such interactive classroom technologies has limitations that must be carefully considered and addressed to optimize their effectiveness and seamless implementation. The following responses exhibit the challenges and limitations:

Learner 21: "Took quite a long time for it even to load. Very dependent on the internet. Moreover, since our school has internet problems, you can put 2 and 2 together."
Learner 24: "The only disadvantages I have noticed are that those who do not have cell service or a data plan are sometimes unable to participate."

While some challenges may be inevitable when integrating new technology-based tools into the classroom, the students expressed their willingness to explore potential coping strategies suggested by their instructor. The students were able to articulate their thoughts and ideas about how they might be able to address the difficulties they encountered when using ClassPoint, as detailed in the following responses:

Learner 2: "Not using the ClassPoint answering system but instead doing it in real life."
Learner 17: "I just waited and had patience with the connection.
Learner 24: "Stayed near the window or places with cell service in the classroom."

The technological limitations—such as inconsistent device connectivity and internet access issues—mentioned by the students could significantly impact the overall learning experience. Moreover, these constraints could effectively exclude individuals with limited access to stable internet connectivity from fully benefiting from the ClassPoint interactive classroom tool. Wegner's (2019) study corroborates these observations, revealing that while internet-based instruction does not significantly impact student achievement, earners generally display a more positive attitude towards their learning experience than those in traditional in-class models. This suggests that emphasis should be placed on improving access to reliable, high-speed internet, as it has become a crucial prerequisite for education in the digital age. Gultom (2020) noted that ubiquitous internet access allows students to engage in independent study and leverage a diverse array of educational resources, including e-learning platforms. Therefore, addressing challenges related to internet connectivity is paramount to enabling the seamless integration of interactive classroom technologies such as ClassPoint and enhancing the overall learning experience for all students.

Effective Integration of ClassPoint

Drawing on the students' detailed feedback, several recommendations and suggestions have emerged to enhance the effective integration of ClassPoint in the classroom. The students' feedback demonstrates a comprehensive understanding of the advantages and challenges of using this interactive classroom tool. Their perspectives illuminate the various factors that can contribute to the effective, significant adoption of ClassPoint to enhance student engagement and academic performance. The students have organized the following statements to provide a comprehensive understanding of how to integrate ClassPoint into the Advanced Algebra class more effectively:

Learner 2: "If it were less buggy and if everyone were more cooperative, then it would be more effective."
Learner 14: "Trying to load websites like ClassPoint in the school in general is difficult because the signal is bad. Had internet not been a problem, it would have been easier for us to proceed with the lessons swiftly since ClassPoint already makes the interaction easier."

The student-generated recommendations encompass a range of considerations, addressing technical aspects, functionalities, pedagogical approaches, and the need for robust institutional support. This holistic perspective aligns with Amponsah's (2022) findings, which demonstrated that access to reliable internet connectivity among senior high school students in the Cape Coast Metropolis of Ghana led to greater improvements in academic performance than among peers without such access. By actively soliciting and incorporating learners' voices, the researcher has demonstrated a commitment to a collaborative, iterative process for refining the integration of ClassPoint. This approach aims to better align the technology with students' needs and preferences, ultimately enhancing its effectiveness and the positive impact on the learning experience.

The students' experiences and insights provide one way to strengthen the claims of Jean Piaget's Constructivist theory. Saxena et al. (2020) assert that Piaget's theory of knowledge construction through practical experiences suggests that children can enhance their cognitive abilities through participation in practical technological experiences and active engagement with technological knowledge. Furthermore, the constructivist educational philosophy enhances cognitive development by focusing on the process rather than the product, enabling children to grasp concepts better and apply them in real-life contexts (Sharma, 2020). Woolfolk (1993) emphasized the crucial role of active student participation in knowledge generation, aligning with Vygotsky's (1978) emphasis on the importance of a More Knowledgeable Other (MKO) in the learning process and supporting the integration of technology in education. IvyPanda (2022) underscores the integration of constructivism into educational curricula to enhance learning outcomes and foster active knowledge creation, including the use of technology.

In addition, the students' insights corroborated the Engagement Theory of Kearsley (1997) and Shneiderman (1994). The core concept of Engagement Theory is that students must engage in meaningful, interactive, and significant learning activities. Technology provides opportunities for involvement and participation that conventional methods alone may not easily achieve. In support, Querido (2023g) found that ClassPoint, as an interactive classroom tool, significantly improved students' engagement and performance in mathematics, achieving a 78% mastery compared to a control group. Despite the progress, institutions still face the challenge of enhancing the technology-based learning capabilities of their facilities and, ideally, integrating interactive technologies into every classroom to foster engaging learning activities.

4.0 Conclusion

The study yielded important insights into the effectiveness of technology-enhanced learning environments. Notably, both the control and experimental groups initially scored below average on pretests. However, while the control group continued to underperform on posttests, the experimental group showed a remarkable transition, achieving average performance. Both groups exhibited significant improvement from pretest to posttest, with the experimental group achieving statistically greater gains. This underscores the potential of technology-integrated pedagogy to foster enhanced learning outcomes. Student feedback on ClassPoint further illuminated its role in this success. Participants cited several factors that contributed to ClassPoint's effective integration into the classroom, notably its ability to boost engagement and improve academic performance. Overall, students expressed that ClassPoint made learning more enjoyable and interactive, highlighting its significant contribution to enriching the educational experience through technology.

Keeping up with trends in teaching methods and strategies has always been challenging. Integrating ClassPoint into a PowerPoint presentation improved students' academic performance, heightened their engagement in class activities, enhanced visualization of complex concepts, and deepened their comprehension of mathematical disciplines. The results emphasize the need to leverage technology integration to enrich cognitive and affective dimensions of learning in every classroom. In conclusion, integrating ClassPoint as an add-in to the usual PowerPoint presentation makes learning more fun and engaging than conventional instruction. ClassPoint promotes active participation, engagement, and more enjoyable learning. The study's findings align with Jean Piaget and Vygotsky's constructivist learning theory, which posits that children can enhance their cognitive abilities through practical technological experiences and active engagement with technological knowledge. The study also aligns with the Engagement Theory by Kearsley and Schneiderman, which supports the idea that students must engage in meaningful learning activities and highlights the significance of technology-based learning in fostering authentic, meaningful learning experiences.

Based on the study's findings, integrating technology significantly enhances student engagement and academic performance. School administrators need to allocate resources that support teachers and students in this integration, while also revisiting specific competencies to ensure effective technology use in the learning process. Teachers should consider using ClassPoint or other classroom-response systems (CRS) across subjects beyond Math to foster dynamic learning experiences. Furthermore, future research should investigate teachers' perspectives on using ClassPoint and similar interactive tools across a broader range of disciplines, providing valuable insights for optimizing technology integration in education.

5.0 Contributions of Authors

Mr. John Michael Potot solely completed this paper, including revisions, with prior assistance from his research adviser and panel members, as part of the requirements for his master's degree.

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7.0 Conflict of Interests

The author declares that there are no conflicts of interest regarding the publication of this research. The findings and conclusions presented in this study are solely those of the author and have not been influenced by any external affiliations or personal relationships.

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