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THE EFFECTIVENESS OF MENTIMETER APPLICATION IN INCREASING CLASSROOM ENGAGEMENT IN TEACHING SCIENCE

Noli P. Julosan

Lorenzo S. Sarmiento Sr. National High School, Población, Mawab, Davao De Oro, Division of Davao De Oro, Philippines

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ABSTRACT

Technological tools are believed to be successful learning agents and catalysts for the entire educational process. This study aims to evaluate how well the Mentimeter application engages students in science lessons. The study was carried out at Calinan National High School in the first semester of the 2021–2022 academic year. The goals of the study were met using a quasi-experimental research approach. The respondents, who were Calinan National High School Grade 11 students, were chosen by complete enumeration. The data were analyzed using percentages, the mean, and T-tests. Students in Grade 11 who received instruction either without or with Mentimeter Application Simulations often received a score of "did not meet expectations" on the pre-test. On the other hand, during the post-test, students who had received instruction without Mentimeter Application Simulations received a rating of "fairly satisfactory," whereas those who had received instruction with Mentimeter Application Simulations received a rating of "outstanding." The science pre-test results of the two Grade 11 classes also showed no discernible variation. The post-test results, however, showed a substantial difference between students who received instruction with or without Mentimeter application simulations. In comparison to the control group, the experimental group had a greater mean gain score.

KEYWORDS: Mentimeter Application, Experimental Study, Calinan National High School, Philippines.

INTRODUCTION

The lack of student involvement and participation in scientific classrooms has become a source of increasing concern. The Philippines scored an average of 357 out of 79 in the most recent Programme for International Student Assessment (PISA), which was held in 2018, which was substantially lower than the worldwide average of 489 (OECD, 2019). The Philippines was rated 78th out of the 79 participating nations in science. In a different international comparison study by TIMMS (Trends in International Mathematics and Science Study) conducted in 2019, the Philippines placed 53rd out of 58 participating countries in science at the Grade 4 level and 50th out of 56 participating countries in science at the Grade 8 level (IEA, 2020). These findings imply the necessity of enhancing Filipino kids' academic performance in science. Despite professors' best attempts to design dynamic and

interesting lessons, students frequently find it difficult to stay motivated and interested in the material. One answer to this problem could be to use technology to boost classroom participation, such as the Mentimeter app.

Moreover, Mentimeter is an interactive presentation tool that allows teachers to create quizzes, polls, and surveys that students can respond to in real-time using their mobile devices. By using Mentimeter in the classroom, teachers can make the learning process more interactive and engaging for students, as well as provide them with immediate feedback on their understanding of the material. In the study conducted by Liu, H., Wang, Q., Wu, Q., & Chen, H. (2020) entitled "Using Mentimeter to enhance students' classroom participation and Interaction in College English Teaching.", their results showed that the use of Mentimeter significantly increased student participation and interaction, as well as improved their motivation and satisfaction with the course. The researchers also found that Mentimeter was an effective tool for formative assessment and provided immediate feedback to both teachers and students. Another study was conducted by Kyndt, E., Gijbels, D. et.al. Their study explored the effects of using Mentimeter to facilitate student-generated questions in higher education courses. Their results showed that using Mentimeter significantly increased student engagement and teacher immediacy in the classroom and that students reported a high level of satisfaction with the use of Mentimeter in their courses. The study concluded that Mentimeter can be an effective tool for enhancing student engagement and teacher immediacy in higher education courses.

Hence, the goal of this study is to determine how well Mentimeter engages students in science lessons in the classroom. The findings of this research will offer insightful information about the possible advantages of utilizing technology in the classroom and how it may be used to enhance the teaching and learning process. Teachers may make educated judgments about incorporating technology into their teaching practice and produce more efficient and engaging learning experiences for their students by evaluating the influence of Mentimeter on classroom engagement.

METHODOLOGY

A quasi-experimental design was used in this study. This experimental design was considered because it can establish a cause-and-effect relationship and also due to its resistance to common threats to internal validity (Tomas, 2022). The study determined the significant difference between pre-test and post-test scores of the Grade 11 students in science taught with Mentimeter Application and without Mentimeter Application.

Research Locale

The study was conducted at Calinan National High School, a public high school offering both Junior High School and Senior High School Program in the Division of Davao City located at Peñano Street, Calinan, Davao City.

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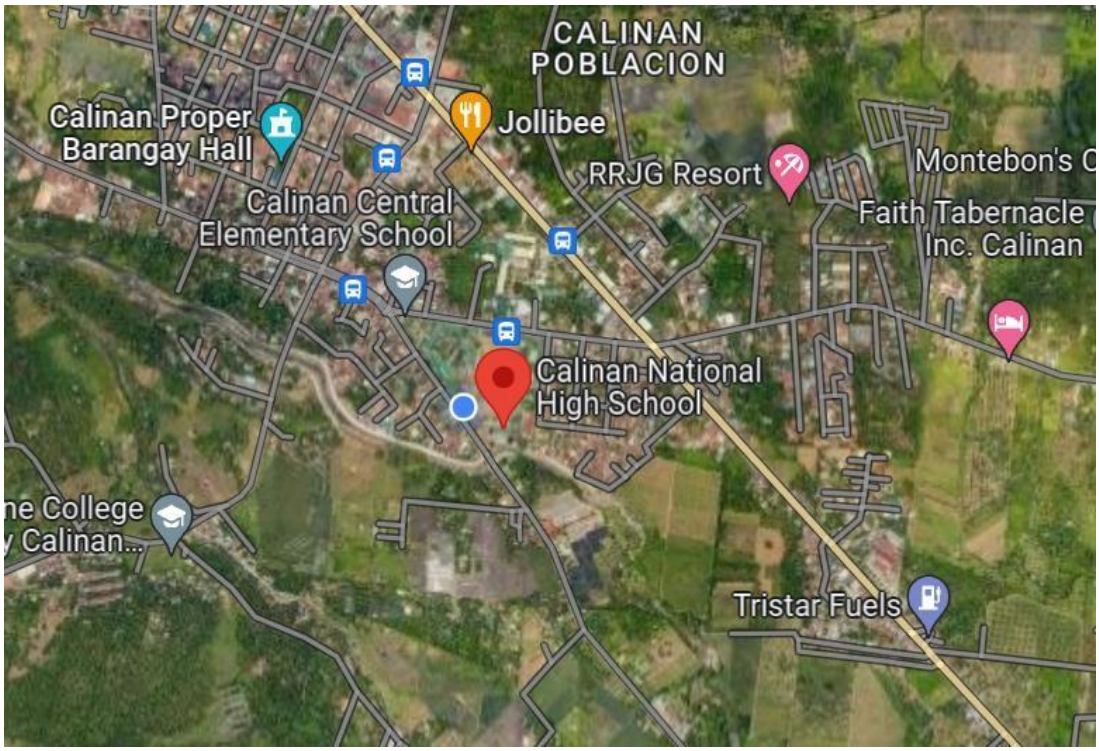

Vicinity Map of Calinan National High School, Calinan, Davao City

Sampling Design and Sample Size

The study utilized a convenience sampling technique. Respondents were obtained based on the teacher's preference and students' availability. The study comprised 120 Grade 11 students enrolled in Physical Science. The experimental group was composed of sixty respondents (N= 60) and the control group of sixty respondents (N= 60). The subjects of the study were not informed that they were undergoing an experimental study to avoid biases. There were two groups in the study: A- With Mentimeter integration group (60 students) and B- Without Mentimeter integration group (60 students). These two groups were both homogenous classes.

Distribution of Respondents

GROUP	STRATEGY OF TEACHING	SECTION	LEARNERS
A	With Mentimeter Integration	HUMSS 1	60
B	Without Mentimeter Integration	HUMSS 2	60

Respondents of the Study

The respondents in this study are the Grade 11 Students in Calinan National High School enrolled in the Humanities and Social Sciences strand for the School Year 2022-2023. The researchers made sure that both the control and experimental groups were on the same footage.

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Research Instrument

A test questionnaire was made by the researchers to measure the respondents' academic performance in Physical Science. The test questionnaire consisted of 30 items of multiple-choice type of test with 30 minutes time allotment for answering. Students' answers were classified as correct (1 point), incorrect (0 point), and no answer (0 point). The questions were based on the standard learning competencies. A Table of Specifications was also created to guide the researchers in crafting the questions. The questionnaire was validated by three Master Teachers at Calinan National High School.

Grading Scale, Descriptor, and Verbal Description of Test Scores

GRADING SCALE	DESCRIPTOR	VERBAL DESCRIPTION
90-100	Outstanding	The academic performance is exemplary.
85-89	Very Satisfactory	The academic performance is very satisfactory.
80-84	Satisfactory	The academic performance is satisfactory.
75-79	Fairly Satisfactory	The academic performance is fairly satisfactory.
Below 75	Did Not Meet	The academic performance did not meet the expectation

Data Gathering Procedures

The data was gathered through the following procedures:

1. The researchers requested permission from the school principal to conduct the study.
2. Validators examined and checked the questionnaire to ensure that the purpose of the study will be attained.
3. The researcher employed the pre-test for the two groups (Group A and B).
4. Group A was taught science integrating the Mentimeter application into the teaching and learning process.
5. Group B was taught the same lesson but without integrating the Mentimeter application into the teaching and learning process.
6. Afterwards, a post-test was administered to the control and experimental group. The same questions were used in the pre-test and post-test but the items were arranged differently.
7. Results of the pre-test and post-test were tallied for statistical analysis.

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Statistical Tool

The following are the statistical tools used for data analysis and interpretation with the level of significance using two-tailed tests at a 0.05 will be;

Percentage

The percentage was used to determine the mean percentage score of the experimental and controlled groups in the pre-test and post-test.

Mean

The mean was used to determine the mean gain score between the pre-test and post-test scores of the control and experimental group.

T-Test

An independent-samples t-test was used to compare the post-test scores between the experimental and control groups.

Statistical Analysis

Since the number of participants in the study was below 50, whether the data were normally distributed was examined by the Shapiro–Wilk normality test and Q-Q graph (Buyukozturk, 2012). According to the results of the Shapiro–Wilk normality test ($p > 0.5$), the Q–Q graph also showed that the data were normally distributed. According to the Skewness–Kurtosis test results, Skewness is between −0.599 / 0.761 and Kurtosis = −0.547 / −0.209. According to Tabachnick and Fidell (2013), it can be assumed that the data are normally distributed when Kurtosis & Skewness values are between −1.5 and +1.5.

RESULT AND DISCUSSION

This chapter presents the results, analysis, and interpretation of the findings of the study. The data presented both tabular and textual forms. All inferential results were analyzed and interpreted at a 0.05 level of significance.

Table 1. Pre-Test Scores of Grades 11 Students in Science

Pre-Test	N	Mean	Percentage	Descriptive Rating
With Mentimeter Integration	60	14.12	31%	Did not meet the Expectation
Without Mentimeter Integration	60	13.97	30%	Did not meet the Expectation

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As shown in the table above, the pre-test mean score of Grade 11 students in science for the experimental group (with Mentimeter Integration) and control group (without Mentimeter Integration) were 14.12 and 13.97, respectively. Further, the mean percentage score of the experimental group is 31.00 while the control group garnered 30.00. Both groups obtained a descriptive rating of "did not meet expectations, " indicating that both groups obtained poor performance in the pre-test. Basically, when students have no idea about the topic being delivered by the teacher in the class and pre-examination is being administered the usual score performance of the students obtained a low score or poor score performance. This empirical idea showed that the students were not yet ready or motivated for the topic and do not have a strong foundation in interactive and collaborative action and knowledge on the topic to be discussed by the teacher. Indeed, the result of the pre-test examination of both groups was enclosed.

Table 2. Post-Test Scores of Grades 11 Students in Science

Post-Test	N	Mean	Percentage	Descriptive Rating
With Mentimeter Integration	60	41.55	92%	Outstanding
Without Mentimeter Integration	60	35.70	77%	Fairly Satisfactory

After the instruction, the post-test was administered to identify both experimental and control group students' understanding of the topic. The independent sample t-test results indicated that the students who were taught With Mentimeter Application Integration had higher scores than those taught Without Mentimeter Application Integration. The mean scores on the post-test of Grade 11 students of Calinan National Senior High School curriculum for School Year 2022-2023 in science for the experimental group (With Mentimeter Integration) and control group (without Mentimeter Integration) were 41.55 and 35.70, respectively. Further, the experimental group obtained a 92% rating or "outstanding" and the control group obtained a 77% rating or "fairly satisfactory" which indicates that students taught with Mentimeter Integration had better academic performance than those taught without With Mentimeter Integration in the post-test (Based on DepEd Order No. 8, s. 2015).

Such outcomes of this current study simply showed that Mentimeter Application Integration incorporates research-based practices on effective teaching to enhance the learning of science concepts. The simulations are designed to be flexible so that they can be used as lecture demonstrations, labs, or homework activities. They use an intuitive, game-like environment where students can learn through scientist-like exploration within a simplified environment, where dynamic visual representations make the invisible visible, and where science ideas are connected to real-world phenomena (Ipfs, 2019). Furthermore, researcher Dr. Katherine Perkins, who has been with Mentimeter Integration since its pioneering period hopes that the integration's accessibility and

interactive nature will increase scientific literacy and promote student engagement in the classroom (DOST, 2019).

Table 3. Difference between the Pre-test and Post-test scores of Grades 11 Students in Science with Mentimeter Integration

	N	Mean	t	p
Pre -Test	60	14.12	36.94869598	9.62E-38
Post - Test	60	41.55		

The pre-test and post-test mean scores of Grades 11 senior high school students of Calinan National High School in Science for the experimental group (with Mentimeter Integration) were 14.12 and 41.55, respectively. The independent sample t-test results indicated that there was a significant difference between the pre-test and post-test scores ($t=36.94869598$, $p<0.05$). Further, it implies that along with testing every simulation, the Mentimeter Integration team performs education research on their simulations. They have shown in their research that when students explore simulations in addition to traditional labs, student concept understanding improves. Moreover, Mentimeter Integration was chosen as the 2011 Microsoft Education Tech Award laureate. The Tech Awards honor innovators from around the world for technology benefitting humanity (Lee, 2019).

Table 4. Difference between the Pre-test and Post-test scores of Grades 11 Students in Science without Mentimeter Integration

	N	Mean	t	p
Pre -Test	60	13.97	27.999	0.000
Post - Test	60	35.70		

The pre-test and post-test mean scores of Grades 11 students of Calinan National High School in Senior High School Science for the control group (without Mentimeter Integration) were 13.97 and 34.70, respectively. The independent sample t-test results indicated that there was a significant difference between the pre-test and post-test scores ($t=27.999$, $p<0.05$) but not as higher as the scores of students taught using Mentimeter.

According to DOST, 2019, the school science curriculum should promote a strong link between science and technology, like Mentimeter Interactive simulations. School science should recognize that science and technology reflect, influence, and shape our culture. The science curriculum should recognize the place of science and technology in everyday human affairs. It should integrate science and technology into the civic, personal, social, economic, and ethical aspects of life.

Table 5. Mean Gain Score of Grade 11 Students in Science

	Pre-test	Post-Test	Mean Gain Score
With Mentimeter Integration	14.12	41.55	27.84
Without Mentimeter Integration	13.97	35.70	24.34

In terms of the mean gain score, the control group gained only 24.34 while the experimental group obtained a mean gain score of 27.84. This indicates that the experimental group (With Mentimeter Integration) garnered a higher mean gain score compared to the control group (Without Mentimeter Integration). Congruently, the group exposed to or taught with Mentimeter Integration grasped the lesson covered much better than the group taught without Mentimeter Integration.

Clearly, there is considerable evidence that Mentimeter Integration can be a powerful tool for achieving student learning of science. Recent research conducted on Mentimeter Integration has focused on the specific aspects of integration that help students build a conceptual understanding of the subject science; specifically, the value of showing the invisible, the use of analogy, and effective levels of guidance with simulations.

Educators have found that the use of heavily guided activities does not elicit deep thinking and learning from students; while other studies have found that with pure discovery learning, students are not able to "discover" the science for themselves. Recent studies reveal that appropriate scaffolding of the material is needed to help students build a mental framework for concepts. Then students can construct their own understanding within this framework (Adams, 2010).

SUMMARY

In light of the findings, the experimental group (taught with Mentimeter Integration) and the control group (taught without Mentimeter Integration) obtained a rating of 13.97 described as “did not meet expectations” and 14.12 “did not meet expectations” respectively. This indicates that both groups obtained poor performance in the pre-test. On their post-test, the experimental group obtained a 41.52 or “outstanding” rating while the control group obtained a 34.70 or “fairly satisfactory” rating.

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Based on the Pre-Test Post-Test Mean Gain Score with and Without Mentimeter Integration 14.12 13.97, 41.55, 35.70, 27.84, 24.34 results on determining the difference between the pre-test and post-test scores of Grades 11 students in science in the experimental group, it was found out that there is a significant difference between the pre-test and post-test of Grade 11 students of Calinan National High School in Science for the experimental group (with Mentimeter Integration).

Likewise, on determining the difference between the pre-test and post-test scores of Grades 11 students in science in the control group or the section taught without Mentimeter Integration, it was found that there is a significant difference between the pre-test and post-test accordingly. In terms of the mean gain score, the experimental group garnered a higher mean gain score compared to the control group. Wherein, the mean gain score for the experimental group stands at 27.84 meanwhile the mean gain score of the control group stands at 24.34.

CONCLUSION

Generally, the Grade 11 students in science who were taught with Mentimeter Integration or the experimental group of the study exuded improved academic performance than those who were not taught with Mentimeter Integration or the control group of the study as evidently revealed in the results of their post-test scores and with respect to their mean gain score attained. Certainly, the exposure of students to Mentimeter Integration positively affected the student's academic performance in Earth Science. Hence, it asserts that this technological aid is effective in gauging students to better understand the topic and more so in discovering the target concepts they need to master and comprehend. Aside from that, this could also have several implications for the performance of the students in the local and international assessment platforms. Hence, to assure better outcomes in terms of academic performance of the students especially in the field of science, technological learning agents like Mentimeter Integration can be integrated.

RECOMMENDATIONS

Based on the findings of the study and the conclusions generated, the researchers recommended the following:

1. The Department of Education has to consider the utilization of Interactive Integration and Simulations such as Mentimeter Integration in online learning modality platforms in view of the current global health crisis that hampered face-to-face learning in schools to take place.
2. Curriculum reviewers and planners may reconsider the wide integration of technological aids in the current curriculum that would suffice the curricular targets and in providing effective alternatives, particularly during the new normal learning atmosphere.
3. For students, utilization of learning aids such as interactive digital simulations should be motivated to increase their performance in various learning tasks, enrichment activities, learning sessions with peers and teachers, and other pivotal assessment avenues.

4. The teachers are greatly encouraged to use Mentimeter to help them effectively gauge learners in the learning processes, especially in science classes leading to a more pro-active and in-depth grasp of target or key concepts.
5. The school heads are implored to integrate the Mentimeter application in school curricular programs to further enhance the academic performance of students.
6. Educational Technologists need to develop advanced digital learning aids for students learning suited for any learning situation that is flexible and viable.
7. Education specialists and researchers may undertake similar studies in light of another locale to shed light on pressing educational issues and concerns.

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