QUANTIFYING THE INFLUENCE OF ICT INTEGRATION ON STUDENTS' PERFORMANCE: AN EXPERIMENTAL STUDY

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ABSTRACT

This research utilized a quasi-experimental design. In a pretest and posttest design, the participants are grouped as control and experimental which the latter received and treated with Information, Communication, and Technology (ICT). It significantly aimed to assess the effectiveness of ICT integration in the Science Assessment of Grade 8 students at Langgawisan National High School. ICT, as an intervention, emphasized the importance of catering to students' diverse needs, fostering engagement, comprehension, and academic growth in Grade 8 Science. The results of the study revealed that there was a significant difference between pretest and posttest results, thus the null hypotheses were rejected. Moreover, it has been discovered that incorporating ICT into teaching methods effectively enhances student performance. The study aligns with the idea of incorporating ICT in the classrooms, resulting in a substantial improvement in students' learning performance.

Keyword: *Science, Information, Communication, and Technology (ICT), quasi-experimental study*

1. INTRODUCTION

Education technology has been widely recognized for its ability to greatly improve teaching and learning. It has been seen effective tool to impact the teaching and learning process of the students as well the educators. Livingstone (2012) supports that Information, and Communications Technology (ICT) could improve the quality of teaching, learning, and management in schools, leading to higher standards. Additionally, Quidasol (2020), emphasizes that if ICT is being incorporated into educational institutions in an effort to help schools, then it consequently achieves their instructional objectives. Livingstone (2012) further stressed that ICT can improve the quality of teaching, learning and management in schools, thereby raising quality standards of education.

A study conducted by Higgins, et al. (2012) at Durham University in England reveals that the use of PowerPoint presentations in classroom instruction settings has been found to be effective in producing improvement. However, it was also emphasised that these results highlight the importance of supporting the teaching and learning process, regardless of whether technology is used or not. Furthermore, the convergence of technology and education is well-supported.

Studies investigating the link between technology accessibility and academic performance in schools generally discover positive associations. However, in certain instances, the effects varied based on the extent of technological integration. The recent investigation conducted by Timotheou, et al. (2022) highlights the concerning

issue of inadequate digital capability and lack of expertise in schools. This has resulted in growing disparities, inequality, and significant learning losses.

In the Philippines, the study of Simin and Sani (2015) as mentioned by the study of Quidasol (2022) of Department of Education, the results indicate that indicate that ICT integration was beneficial for teachers and students. Moreso, it also found out that ICT is vital in addition to timely to foster linkages and partnership among stakeholders in disseminating information for continuous development programs in achieving quality. With the DepEd Computerization Program (DCP), the Department of Education, is working hard to integrate technology into the classroom. Every partner in the education sector should support this. Apart from the formalized development programs, every individual should evaluate their own requirements and skills and continuously strive for improvement in order to upskill themselves in response to the correspondingly rising demands of their line of work.

In parallel, Langgawisan National High School grapples with a notable absence of ICT integration due to the scarcity of computers and internet connectivity. This deficiency hampers the potential for utilizing these technologies as invaluable tools for learning. Consequently, students in the said school don't have access to digital information presented in lessons since it lacks the necessary technology to support and help them grasping the competencies in Science and it ca be viewed from the previous results of the assessment that most of the students had low assessments results. To address this, education sectors and stakeholders must work hand in hand to provide what students need in the classroom. Thus, integrating ICT empowers learners, nurtures academic growth, improves educators, and also helps stakeholders, basically the parents, to become equipped partners in the school within their unique sociocultural setting.

1.1 Statement of the Problem

This study investigated the efficacy of the ICT Integration to Science assessment of the Grade 8 Students of Langgawisan National High School.

Specifically, it sought to answer the following questions:
1. What is the pretest mean score of control and experimental group?
2. What is the posttest mean score of control and experimental group?
3. Is there a significant difference between pretest and posttest scores of the control group?
4. Is there a significant difference between pretest and posttest scores of the experimental group?
5. Is there a significant difference between posttest of the control and experimental group?

1.2 Hypothesis

The following hypotheses were raised in the study and tested at 0.05 level of significance:

Ho1 There is no significant difference between the pretest and posttest results of the control group.

Ho2 There is no significant difference between the pretest and posttest results of the experimental group.

Ho3There is no significant difference between the pretest and posttest results of the control and experimental groups.

2. METHODS

2.1 Research Design

This research utilized a two groups pretest posttest design. In a pre-test and post-test design, the participants were grouped as control and experimental which the latter received and treated an intervention. The outcome of interest is then measured once the following the intervention to ascertain impact (Choueiry (2022). The primary objective was to assess the effectiveness of ICT integration in the Science Assessment of Grade 8 students at Langgawisan National High School. As an experimental study, it sought to establish cause-and-effect relationships by comparing the pre-test and post-test results of the participants. The data were analyzed using statistical methods, such as paired t-test, to determine if the intervention significantly contributes to the participants' improved science understanding and if the competencies will be achieved. The experimental design enabled the controlled manipulation of variables, enhancing the study's internal validity and offering valuable insights into the impact of ICT Integration on the academic development of the students in Science.

2.2 Research Subject

The study utilized complete enumeration sampling, which involved incorporating the entire population into the study as the sample of respondents. Based on the study's parameters, a total of 40 participants will be chosen for the research. The participants were the Grade 8 students from Langgawisan National High School in Maragusan, Davao de Oro. There was an equal division of participants, with 20 students assigned to the Control Group and another 20 to the Experimental Group. The researcher too acquired the complete list of Grade 8 students who are currently enrolled at Langgawisan National High School in Maragusan, Davao de Oro. Thus, all Grade 8 students was included in the study as respondents, following the principles of total enumeration sampling, which entailed including the entire population. Following that, a total of 20 students were assigned at the Control Group, while an additional 20 students were assigned to the Experimental Group.

2.3 Research Instrument

The instrument in this study was the test questions, the researcher-made with 20 items that were based on the specific lessons to be taken in the fourth quarter. This questionnaire was used for the pretest and posttest which would be validated by experts identified by the Dean of the Graduate School. Table of specifications (TOS) was prepared to show the distribution of the test questions based on the cognitive level: understanding, comprehension, analyzing, applying, evaluating, and creating.

To identify whether the control and experimental groups were initially equivalent, a pretest was administered. Moreover, the researcher developed intervention program to test the effectiveness of ICT in the instructional discussion. The control group used the traditional method of teaching Science 8 while the experimental group would have the integration of ICT in Science 8. After the intervention, a posttest was administered to find out if there is an increase of the learning achievement of the students and to determine which group had learned more.

2.4 Validation of Instrument

The researcher-made questionnaire was checked and validated for the purpose of checking the validity of the instrument. Comments and suggestions about the questionnaire from the validators were followed and revised if there is any. To establish the questionnaire's reliability, the researcher conducted a pilot testing and administered to a group of students who are not included in the experimentation to achieve the reliability and validity of the test questionnaires.

2.5 Research Procedure

The following were the data gathering procedures that were employed in this study:

Seeking permission to conduct the study. The dean of graduate school endorsed the researcher to the superintendent of Davao de Oro division through letter. Once approved by the division superintendent, another letter was prepared for the school principal to allow him to conduct this study.

Administration and retrieval of the research instrument. The researcher administered the pre-test to both control and experimental groups, after administering, intervention followed using the ICT integration to the experimental group. After days of the intervention, the researcher administered the posttest. During the intervention, the researcher kept a record activity conducted in the classroom and analyzed the gathered data and discussion would follow.

Collection and tabulation of data. The researcher gathered and tallied all data and submitted it to the statistician for the statistical treatment. Subsequently, the data were subjected to analyses and interpretations.

2.6 Statistical Treatment of Data

The statistical treatment for the experimental study on the ICT Integration of Grade 8 students in Science that looks forward to enhance their academic performance which involves the computation of the mean, standard deviation, and T-test for relevant variables.

Mean (Average). The mean will be calculated to determine the average score or value for specific variables, such as participants' pre-test and post-test scores. The mean provides a central point of reference to understand the overall performance or changes observed in the study.

Standard Deviation. The standard deviation will be calculated to measure the dispersion or variability of data points around the mean. It provides insights into the spread of scores and helps assess the consistency or variability of participants' responses to the assessment.

Paired t-test. It is a statistical test used to compare the means of two samples when each observation in one sample can be paired with an observation in the other sample.

Independent t test. It is a statistical hypothesis test used to compare the means of two independent groups and determine if there is a statistically significant difference between them.

3. RESULTS

3.1 Pretest Scores among Control Group and Experimental Group

Group	Mean Score	Class Proficiency	Competency Level
Control Group	5.35	26.75%	Low Mastery
Experimental Group	4.10	20.50%	Low Mastery

Table 1: Pretest Scores among Control Group and Experimental Group

Table 1 reveals the mean scores and class proficiency as results of the pretest scores among control and experimental groups. The control group with no intervention has 5.35 mean score and 26.75% class proficiency. Meanwhile, the experimental group has 4.10 mean score and 20.50 class proficiency. This implies that the pretest score of the experimental has a decrease of 1.25 mean score and 6.25 decrease of proficiency. This demonstrates further that both pretest scores from control and experimental groups have a consistently low proficiency which indicates that the learning of Grade 8 students on selected topics in Science before the utilization of ICT is low and intervention should be implemented.

3.2 Posttest Scores among Control Group and Experimental Group

Group	Mean Score	Class Proficiency	Competency Level
Control Group	6.70	33.50%	Near Mastery
Experimental Group	16.95	84.75%	Near Full Mastery

Table 2: Posttest Scores among Control Group and Experimental Group

A significant difference in posttest performance between the control and experimental groups is revealed in Table 2. Specifically, the control group attained a mean score of 6.70 and 33.50% of class proficiency that means a low mastery level of skills testes is manifested. On the other hand, the experimental group achieved a mean score of 16.95 and a class proficiency of 84.75% that indicates a near full mastery level of competency is manifested. The stark differences of the mean scores and the class proficiency substantiated a relevance and significance of the intervention of ICT in Science 8. Thereby, this connotes that the integration of ICT is highly effective in enhancing the understanding and mastery level of the students in Science 8 compared to students in control group using the traditional method of teaching and learning process.

3.3 Pretest and Posttest of Control Group

Control Group	Mean	t-value	p-value	Remarks
Pretest	5.35	-2.358	0.029	Significant
Posttest	6.70			

Table 3: Pretest and Posttest of Control Group

Shown in the table 3 are the pretest and posttest results of mean, t-value, and p-value of the control group. This denotes the pretest mean score of 5.35, along with its corresponding t-value and p-value of -2.358 and 0.029 respectively which also indicates a statistical significance. For the posttest, it furthermore, demonstrates a mean score of 6.70 which means a significant improvement from the pretest results. Thus, the negative t-value basically means

that after the teaching session, the student's subject-matter competency has improved since the posttest mean is considerably greater than the pretest mean. Therefore, the null hypothesis is rejected.

3.4 Pretest and Posttest Scores among Experimental Group

Experimental Group	Mean	t-value	p-value	Remarks
Pretest	4.1	-28.263	0.000	Significant
Posttest	16.95			

Table 4: Pretest and Posttest Scores among Experimental Group

Presented in the Table 4 are the pretest and posttest results of the experimental group's mean, t-value, and p-value. The pretest has achieved a mean score of 4.1, t-vale of -28.263, and a 0.000 p-value. On the other hand, the experimental group's posttest attained 16.95 mean score which indicates a substantial increase form the pretest mean score results of 4.1. The t-value and p-value also associate a statistical significance, riveting a significant difference of the mean score before and after the intervention of ICT in Science 8 classes. Therefore, the null hypothesis is rejected. This highly underscores the effectiveness of the intervention that has implemented to Science 8 classes as it helps the improvement of students' understanding and mastery of lessons having been implemented in Science 8 classes with the intervention.

3.5 Posttest Scores among Control Group and Experimental Group

Posttest	Mean	t-value	p-value	Remarks
Control	6.7	-16.818	0.000	Significant
Experimental	16.95			

Table 5: Posttest Scores among Control Group and Experimental Group

The posttest results of both the control and experimental groups are displayed in table 5. Firstly, the control group achieved a mean score of 6.7, however the experimental group attained a greater mean score of 16.95. On the other hand, the t-value of -16.818 and p-value of 0.000 reveal a statistical significance in Science 8 performance between the two different groups post intervention. Therefore, the null hypothesis is rejected. This means that there is a significant difference of the effectiveness of the intervention as it is applied and implemented to the experimental group in enhancing their Science 8 mastery of skills compared to the other group, the control group.

4. CONCLUSIONS

The competency level of both the controlled and experimental groups at the beginning of the experiment were similar, with a low level of mastery, as indicated by their pretest scores.

Based on the results of the mean scores, negative t-values, and p-values provided above, it is evident that there is a significant difference in the students' scores on their learning achievement when testing the effectiveness of ICT integration on their academic achievement in learning Science 8 before and after the intervention. It has been discovered that incorporating Information, Communication, and Technology (ICT) into teaching methods effectively enhances student performance. The study aligns with the idea of incorporating Information, Communication, and Technology (ICT) in the classrooms, resulting in a substantial improvement in students' learning performance.

5. ACKNOWLEDGEMENT

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