Unveiling the Impact of Explainer Videos on Grade 4 Science Learning: A Quasi-Experimental Analysis

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***Abstract*— This research looked into the use of explainer video as a science learning intervention for Grade 4 learners of Liwan West Elementary School. The study utilized the quantitative type of research employing a quasi-experimental research design through the use of experimental and control groups with pre-test and post-test approaches to determine the effectiveness of utilizing video explainers in improving pupils' academic performance in Science. Data was gathered from 32 Grade 4 pupils. It was analyzed using the Paired Sample T-Test and Independent Sample T-Test. Findings revealed that the use of explainer video in teaching Science is more effective than the pure lecture method.**

Keywords— explainer video, science teaching

I. INTRODUCTION

Teachers and school systems faced new difficulties due to the COVID-19 global pandemic. Before March 2020, a typical school day saw pupils congregating in face-to-face classrooms on scheduled days and teachers using the tried-and-true traditional lecture methods or engaging in hands-on activities (Engzell et al., 2020). Teachers, pupils, and parents found themselves in a completely different scenario as a result of the school lockdown. Only alternative forms of education could continue teaching and learning (Donohue & Miller, 2020). Teachers were compelled to switch to remote learning utilizing digital tools and resources as a result of this urgent health issue, which required them to think about introducing new techniques. Every industry is figuring out how to adapt to the new normal as the world fights the COVID-19 pandemic. For the benefit of the students, educators are adjusting to the new methods of lesson delivery and assessment (Viner et al., 2020). According to a report by Tria (2020), teachers in the Philippines are still adjusting to working with distance learning. The report said that student conduct, connectivity problems, and other technological malfunctions may obstruct effective delivery of learning. According to Alea et al. (2020), most teachers are leaning toward obtaining technology skills to meet the demands of the online modality, indicating that they have not yet overcome the challenges caused by the dramatic changes in the educational system. Teachers also struggle with the shift from traditional to digital instructional resources. The requirement to make these lessons engaging and practical for the students complicates things (Toquero, 2020; Chin et al., 2022; Robosa et al., 2021). Consequently, science is one of the most challenging disciplines to teach, particularly in the lower grades (Salleh et al., 2021; Kyado et al., 2021; Ocasio et al., 2021).

Science is both classroom and laboratory activity for both professors and students. Science is made engaging and intriguing using a variety of approaches (Larimore, 2020). The scientific theories, facts, discoveries, and most recent advancements in the various disciplines of Science astound students. They watch while new developments take place in the laboratories. Science is amazing but difficult, and it nevertheless piques students' interests. Science is taught and learned in classrooms, laboratories, homes, and occasionally outside during activities like field excursions (Chan et al., 2021; SIayah, 2020). Science teachers started to ask for resources to help them restructure their lesson plans so they could readily share them with their students as a result of the coronavirus they were dealing with. Numerous scientific education academic members, science instructors, and doctorate students in the field have developed online discussion boards where they share information and brainstorm ways to improve teaching methods with one another via Facebook and Twitter. In order to connect, they have also set up webinars and online meetings using Zoom and Google Hangouts (Jevons, 2022).

Vojir and Rusek (2019) stressed the significance of science as a topic at the upper primary level and the improvement of teachers' and students' content knowledge through understanding fundamental scientific ideas. But for a while, teachers had trouble comprehending certain scientific ideas. Additionally, there were issues with how some science subjects were taught. These concepts, which are challenging for teachers to grasp, will be improperly transferred to students, leading to the development of several alternative conceptions. Klippel et al. (2019) said that the instructional strategies teachers employ while delivering the concepts and abilities essential for developing students' comprehension of science play a role in accomplishing the aims of science education. The effectiveness, authenticity, and significance of students' learning are greatly impacted by the teachers' teaching strategies. It is common knowledge that how well pupils are taught significantly impacts the level of education they receive. Teachers undoubtedly need to improve how they offer instruction to ensure that pupils retain what they learn.

Unfortunately, prior to the pandemic, there was an issue with regard to the delivery of science education in the Philippines. The latest results of the Trends in International Mathematics and Science Study (2019) show that the Philippines scored 'significantly lower' than any other country that participated in grade 4 math and science assessments. The Philippines only scored 297 in mathematics and 249 in science, which are "significantly lower" than any other participating country. Specifically, 13% of Filipino students were on the Low benchmark, which means they had "limited understanding of scientific concepts and limited knowledge of foundational science facts," while 87% did not even reach this level. Furthermore, a report of the Program for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD, 2018) showed Filipino students ranked the lowest among 79 countries in mathematics, science, and reading.

Due to the variety of science-related concerns among pupils, teachers must be able to craft and implement creative plans that are receptive to the needs of students. As a result, teachers who employ successful teaching techniques enable students to integrate ideas gained in the classroom with actual circumstances meaningfully (Zourmpakis et al., 2022). They allow students to show off their expertise and, if necessary, make independent course corrections (Barrow et al., 2019). Hence, this study was conducted to assess the effectiveness of 21st-century strategies in teaching science learners, such as the use of video explainers in improving pupils' academic performance.

II. METHODS

This study utilized a quantitative type of research employing a quasi-experimental research design through the use of experimental and control groups with pre-test and post-test approaches to determine the effectiveness of utilizing video explainers in improving pupils' academic performance in Science. The participants of the study were the 32 Grade 4 pupils of Liwan West Elementary School, Liwan West, Rizal, Kalinga enrolled in the School Year 2021-2022. Participants were divided into two groups: 16 participants from the experimental group and 16 from the control group. The participants from the experimental group were given the intervention of integrating video explainers into learning science. Meanwhile, participants from the control group were given the traditional form of teaching science. The two groups were perfectly matched using the following: (1) results of the pre-test of the participants and (2) academic performance of pupils in the third grading period in their science subject.

Pre-test and post-test were used as the main instrument in the study. A 25-item test focusing on four (4) objectives like comparing and contrasting the characteristics of different types of soil, explaining the use of water from different sources in the context of daily activities, tracing and describing the importance of the water cycle, using weather instruments and describing the different weather conditions, and identifying safety precautions during different weather conditions was administered to the participants both in the control and experimental groups. However, items were jumbled during the post-test. The items were validated and checked by the master teacher and the school head.

Data Gathering Procedure

Pre-Implementation Phase

Prior to the conduct of the intervention, the researcher requested for approval of the study to the Schools Division Superintendent of the Division of Kalinga. In addition, a letter was also communicated to the school principal for the conduct of the intervention. A pre-test was given to the participants prior to implementing the suggested activity. After which, the researcher divided the class into two groups based on the results of the pre-test and their academic performance in Science for the third quarter.

Implementation Phase

The conduct of the intervention was done for a duration of four weeks. Participants from the experimental group were given the intervention of integrating video explainers into the science lesson. Meanwhile, participants from the control group were given the traditional mode of teaching science, which is the pure lecture method. Throughout the experiment, the content of the approach was identical to that of the pre-test and post-test. In addition, the same topics and content were given to both the participants in the experimental and control groups.

Post-Implementation Phase

A post-test was administered after the conduct of the experiment. The same test was given to both the participants from the experimental and control groups. In addition, the same test from the pre-test was used to assess the participants after the experimentation. However, the researcher jumbled the items, together with the choices, to minimize students' familiarity with the said test. After the conduct of the post-test, the data were tabulated, analyzed, and submitted to the data analyst for the treatment of the data.

Data Analysis

Frequency and percentage were used to describe the pre-test and post-test scores of the participants using the following score range and qualitative descriptions:

Score Range	Qualitative Description
21 – 25	Excellent
16 – 20	Very Satisfactory
11 – 15	Satisfactory
06 – 10	Fair
00 – 05	Poor

Paired Sample T-Test was used to compare the scores between the participants in the experimental and control groups before and after the conduct of experimentation, while

the Independent Sample T-Test was used to compare the pre-test and post-test performances of the two groups.

III. RESULTS

Table 2. Pre-test scores of the participants in the experimental and control groups

Score Range	Control Group	%	Experimental Group	%
21- 25	0	0%	0	0%
16- 20	0	0%	0	0%
11 to 15	4	25%	2	13%
6 to 10	12	75%	14	88%
0 to 5	0	0%	0	0%
TOTAL	16	100%	16	100%
Mean Score	9.31	Fair	8.94	Fair

Table 2 presents the pre-test scores of the participants in the experimental and control groups. It can be shown from the results that both participants from the experimental and control groups obtained fair scores in their pre-test. Participants in the control group gave higher scores than in the experimental group. More specifically, 75% of the participants in the control group obtained a fair rating, while the remaining 25% obtained a satisfactory rating. On the other hand, 88% of the participants in the experimental group obtained a fair rating, while the remaining 13% obtained a satisfactory rating. The findings imply that during the pre-test, both the control and experimental groups performed on a fair level.

Table 3. Post-test scores of the participants in the experimental and control groups

Score Range	Control Group	%	Experimental Group	%
21- 25	0	0%	8	50%
16- 20	0	0%	8	50%
11 to 15	4	25%	0	0%
6 to 10	12	75%	0	0%
0 to 5	0	0%	0	0%
TOTAL	16	100%	16	100%
Mean Score	13.43	Satisfactory	20.56	Excellent

Table 3 shows the post-test scores of the participants in the experimental and control groups. It can be gleaned from the table that participants from the experimental group obtained higher scores than participants from the control group. More specifically, participants from the experimental group generally obtained an excellent rating, while participants from the control group obtained a satisfactory rating. After the post-test, 75% of the participants in the control group obtained a fair rating, while the remaining 25% obtained a satisfactory rating. On the other hand, 50% of the participants from the experimental group obtained an excellent rating, while the remaining 50% of the participants obtained a very satisfactory rating in their science test. The data implies that during the post-test, the control group performed satisfactorily, while the experimental group performed excellently.

Table 4. Significant difference in the Pre-test and post-test scores of the participants in the experimental and control groups

Test	Groups	Mean Score	t-value	p-value	Decision
Pre-test	Control Group	9.31	0.51	0.61	Not Significant
	Experimental Group	8.94			
Post-Test	Control Group	13.43	-9.80	0.00	Significant
	Experimental Group	20.56			

Table 4 presents the significant difference in the pre-test and post-test scores of the participants in the experimental and control groups. It can be shown from the results that there is no significant difference in the pre-test scores of the participants in the experimental and control groups. This is supported by the probability value of .61, which is higher than .05 level of significance. Hence, the null hypothesis is accepted. This means that there is a perfect matching of participants in the control and experimental groups prior to the conduct of the experimentation. On the other hand, there is a significant difference in the post-test scores of participants in the experimental and control groups with a probability value of .00. Hence, the null hypothesis is rejected. This means that the use of explainer video is effective in enhancing the performance of pupils in science since participants from the experimental group obtained higher scores than those in the control group.

Table 5. Significant difference in the pre-test and post-test scores of the participants in the experimental and control groups before and after the experimentation

Groups	Test	Mean Score	t-value	p-value	Decision
Control Group	Pre- test	9.31	-8.409	.000	Significant
	Post-Test	13.43			
Experimental Group	Pre- test	8.94	-19.448	.000	Significant
	Post-Test	20.56			

Table 5 shows the significant difference in the pre-test and post-test scores of the participants in the experimental and control groups before and after the experimentation. It can be shown from the results that there is a significant difference in the pre-test and post-test scores of the participants in the control group. This is supported by the probability value of .000, which is lower than .05 level of significance. Hence, the null hypothesis is rejected. However, the mean difference is only 4.12. Meanwhile, there is also a significant difference in the pre-test and post-test scores of the participants in the experimental group with a probability value of .000. Hence, the null hypothesis is rejected with a mean difference of 11.62. This means that the use of video explainers is an important factor in enhancing pupils' performance in Science.

IV. DISCUSSION

This study was conducted to assess the effectiveness of video explainers in enhancing pupils' performance in Science. Prior to the conduct of the experimentation, matching of participants was considered in the control and experimental groups to ensure equality between participants. Assigning participants to experimental and control groups through matching is another method used in quasi-experimental design. Researchers start by considering the variables that are crucial to their study, particularly those that could impact the dependent variable's demographics or other qualities (Coto, 2018). It was revealed in the study that participants in the experimental and control groups were properly matched.

Meanwhile, it was revealed in the results of the pre-test that participants in the experimental and control groups obtained a fair rating on their Science test. This means that participants from the two groups have a low level of understanding and knowledge on a certain Science topic, which teachers have been struggling to address. The result of the study is supported by findings of previous researches claiming the low and fair performance of elementary pupils in science (Haider et al., 2015; Harlen & Qualter, 2018; Kobilka, 2017). In addition, the results also revealed that there is an increase in the scores of the participants both in experimental and control groups. However, a high increase was seen in the experimental group, while there was a little increase in the scores of the participants in the control group. It can be stressed that participants in the control group were given the traditional lecture method of teaching. In contrast, those participants in the experimental group were given the intervention of using video explainers. Based on the results, lecture method is still effective as a strategy used by teachers in teaching Science. This is supported by the results of previous studies (Broadbent, 2017; Hawe & Dixon, 2017; Mills et al., 2020). Hawe and Dixon (2017) assert that the lecture form of instruction makes concepts easier to understand, which raises students' test scores. The lecture style allows the learner to proceed at his own pace and allows for one-on-one education. Sometimes, having class conversations as a whole is beneficial. However, the effectiveness of the use of the lecture method is too limited due to the diverse nature of learners (Gunawan et al., 2019). When it comes to conveying basic knowledge, lectures are comparable to other modalities but are not more effective. The role expectations of students and teachers may be addressed via the lecture approach. Furthermore, Bunce et al. (2017) stressed that the lecture method is not useful in learning Science among pupils. Lectures are not suited for teaching higher orders of thinking such as application, analysis, synthesis, or evaluation, for teaching motor skills, or for influencing attitudes or values. Lectures are not well-suited for teaching complex, abstract material. Thus, teachers need to utilize 21st-century learning strategies that are responsive to the needs of their learners such as the use of video explainers (Coto, 2018; Eisenberg, 2021; Harrison, 2018).

In this study, it was found that using video explainers is effective in enhancing the performance of pupils in Science. This is supported by the very high increase in the post-test scores of the pupils in the experimental group as compared to those in the control group. Furthermore, the effectiveness of the said strategy can be shown through the excellent rating that pupils in the experimental group obtained during the post-test. On online media platforms like YouTube, explainer videos—also referred to as explaining videos, instructional videos, or learning videos—are viral. For instance, students might view them for leisure or to prepare for exams (Espi, 2021). During the COVID-19 pandemic, the importance of online instructional videos for formal education has expanded (Pino et al., 2021). In addition to supporting distant learning, these online explainer movies may also enhance physics training through flipped classrooms (Kamer & Bohrs, 2018).

V. CONCLUSION AND RECOMMENDATIONS

The study concludes that using video explainers effectively enhances the performance of Grade 4 pupils of Liwan West Elementary School in their Science subject, as manifested in the increased scores of pupils in the experimental group compared to those in the control group.

Science teachers are encouraged to continue the utilization of video explainers in their lessons since it was found that it is effective in enhancing pupils' academic performance. Other subject teachers may also introduce video explainers in their lessons and conduct a comprehensive evaluation of the effectiveness of such a strategy in improving pupils' academic performance.

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