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Interactive Science Toolkit: Effects On Students' Performance in Science 8

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ABSTRACT: The creativity, critical thinking, and informed decision-making that science education cultivates shape a nation's future. In the Philippines, students continue to struggle to comprehend scientific concepts and raise their grades in spite of the Department of Education's attempts. This study examined how students at La Libertad National High School, La Libertad, Zamboanga del Norte, performed in Science 8 during the 2024–2025 academic year in relation to the Interactive Science Toolkit. The quasi-experimental research design used in this study used pretest-posttest nonequivalent groups. The study's two groups were an experimental group instructed using the Interactive Science Toolkit and a control group given traditional lecture-based instruction. To statistically evaluate the results, the researcher created a test that gathered data, and mean calculations, standard deviations, z-tests, and t-tests were employed. The findings show that the two groups' pretest scores were comparable and that their knowledge levels did not differ significantly. But more significantly, the experimental group's scores improved from the pretest to the posttest, indicating that the toolkit enhanced their engagement with the science curriculum and their understanding of scientific concepts. They also performed noticeably better on the posttest than the control group. Research has demonstrated that the implementation of interactive scientific toolkits in the classroom significantly enhances students' academic performance. We recommend educators use these kinds of resources to enhance learning, boost student motivation, and facilitate comprehension. Studies on the all-encompassing effects of interactive tools on conceptual mastery and knowledge retention could be carried out.

KEYWORDS: Experimental, Interactive Science Toolkit, Post-Test, Pre-Test, Students' Performance

1.0 INTRODUCTION

Science education plays a pivotal role in shaping a nation's future by fostering critical thinking, innovation, and informed decision-making. Globally, there is a concerted effort to enhance science education to meet the demands of the 21st century. Traditional teaching methods, however, often fall short in engaging students and promoting deep understanding. This has led to the exploration of interactive learning tools designed to address these challenges. In science education, school children, college students, or the general public are taught and learn science. However, the challenges of science education in the Philippines include poor performance in science and mathematics (Aborot et al., 2022).

In the Philippines, the Department of Education has implemented the K-12 curriculum to improve the quality of education, with a particular focus on science subjects. Despite these efforts, studies indicate that students continue to face difficulties in grasping scientific concepts, resulting in suboptimal performance in science assessments. For instance, a survey by Ahakiri (2022) found that students exposed to web-based interactive learning environments exhibited higher academic performance compared to those who received traditional instruction. Similarly, research by Fajardo et al. (2020) demonstrated that the use of Interactive Science Notebooks significantly improved student teachers' physics achievement levels, highlighting the potential of interactive tools in enhancing science education.

The use of an interactive science toolkit is vital in the science classroom and can motivate students to study the sciences in greater depth. Through this, students learn technical literacy, critical thinking, and problem-solving abilities that will help them excel in school and beyond. The study claims that the use of an Interactive Science Toolkit is an instructional strategy for improving students' performance in science 8.

School is an essential place in which kids engage in a wide variety of computer activities. However, interactive educational tools have been shown to improve student performance and engagement in higher education (Quirido et al., 2020). These tools include interactive classroom tools and other interactive learning technologies (Asif et al., 2023), and by using these, it has been that there is an increase in students' interest in modules, improved skills, and enhanced relational activities (Kopylova, 2022). In

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addition, it will create a comfortable and interactive learning environment where they can feel successful and intellectually competent, leading to a more productive learning process (Baimakhanova et al., 2023) and by incorporating interactive teaching methods into an educational program, it can significantly enhance the ability of the students to process new information critically and improve their cognitive capabilities (Wei, 2022).

In many important ways, interactive educational tools (Interactive Science Toolkit) are superior to traditional classroom environments and provide an interactive approach to learning. Students' levels of engagement and motivation are increased by these resources, which are frequently enhanced with gamified aspects and multimedia material (Zainuddin & Halili, 2016). By leveraging personalized learning technologies, educators can create dynamic learning environments that adjust to the specific needs and preferences of each student, thereby fostering greater engagement and improving overall learning outcomes (Johnson et al., 2019). Furthermore, interactive tools enhance accessibility and offer flexible learning opportunities by overcoming traditional barriers, enabling students to engage with content at their own pace and convenience (Siemens, 2018). These technologies cater to diverse learning styles and provide a holistic educational approach by facilitating multimodal learning experiences, integrating real-world applications, and fostering collaborative learning environments (Anderson & Dron, 2017; Zhang et al., 2019; Tran & Nguyen, 2021).

Despite the adoption of various instructional strategies, science education still grapples with challenges in improving student performance and engagement, mainly due to the insufficient use of interactive and student-centered learning tools (Marzano, 2017). In conventional classroom environments, science instruction tends to rely on lectures, which restrict students' chances for interactive exploration and active engagement, both of which are critical for understanding complex scientific principles (Liu et al., 2017). A pressing problem in Science 8 education is the declining academic performance of students, particularly in mastering complex topics such as physics, chemistry, and biology, as revealed by national assessment results and teacher feedback (DepEd, 2019). This issue is compounded by the disparity between conventional teaching methods and students' increasing preference for technology-driven, interactive learning experiences that align with their digital-native tendencies (Bebell& O'Dwyer, 2016).

To address these issues, this study aims to assess the effects of an Interactive Science Toolkit on students' performance in Science 8. The toolkit incorporates technology-based learning materials, simulations, and hands-on activities designed to foster engagement and deepen understanding. This study is necessary to determine if such an innovative approach can bridge the gap between current teaching practices and the learning needs of today's students, ultimately improving their academic performance and fostering a love for science.

2.0 METHODOLOGY

This study presents the method used, research environment, Respondents of the Study, Research Instrument, Data Gathering Procedure, Statistical Treatment, and Ethical Considerations.

2.1 Method Used

This study utilized the quasi-experimental research design employing the pretest-posttest nonequivalent groups design. In quasi-experimental research designs, causal hypotheses were tested the same way as in experimental designs, and the number of participants in each group was not necessarily equal.

2.2 Research Environment

This research was conducted at La Libertad National High School, which is located in Poblacion, La Libertad, Zamboanga del Norte. The institution caters to learners from Grade 7 to Grade 12.

2.3 Respondents of the Study

The study subjects were the Grade 8 section Galileo and Archimedes students in science subjects. Since there were 2 sections in Grade 8, each section constituted the experimental and control groups. Table 1 shows the two different groups and the number of students in each group. The Grade 8 students were exposed to the experimental and control groups based on their section. The toss coin method was employed to determine the groups to be exposed to traditional teaching and the interactive science toolkit.

Table 1. The Subjects of the Study

Respondents	Subject of the study			
Experimental Group (Grade 8 – Galileo)	R	O1	X	O2
Control Group (Grade 8 – Archimedes)	R	O3	C	O

Where:

R is the randomized assignments
O1 is the observation in the pretest scores of the experimental group
O2 is the observation in the posttest scores of the experimental group

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O3 is the observation in the pretest scores of the control group
O4 is the observation n the posttest scores of the control group
X is the variable use in the experimental group
C is the variable use in the control group

2.4 Research Instrument

To measure students' performance in science, a 30-item self-made pretest and posttest questionnaire was administered. The test items were based on Bloom's Taxonomy of learning, specifically focusing on the cognitive domain: remembering (R), understanding (U), applying (A), analyzing (An), evaluating (E), and creating (C). The test construction followed a table of specifications to ensure an equitable distribution of items across all competencies and that all significant aspects of the topics were appropriately covered in the test items and correct proportions.

2.5 Data Gathering

With the recommendation of the panel members to conduct the study, a letter was sent to the office of the Dean of the Graduate School, Jose Rizal Memorial State University-Main Campus, Dapitan City, seeking endorsement from the Assistant Principal of La Libertad National High School for the conduct of the pilot testing of the instrument to a set of students not part of the study, a pretest of the respondents of the study in both control and experimental groups before the experiment, the conduct of the experiment, and the administration of the posttest after the experiment.

2.6 Statistical Treatment

Mean. It was used to determine the pretest and the posttest science performance of the participants in both the control and experimental groups.

Standard Deviation. It was used to determine the homogeneity and heterogeneity of the students' scores where SD ≤ 3 is homogenous, and SD > 3 is heterogeneous (Aiken & Susane, 2001; Refugio, Galleto, & Torres, 2019).

t-test for Independent Samples. It was employed to test whether the control group participants' pretest performance differed significantly from the experimental group.

t-test for Correlated Samples. The test will be used to determine a significant difference between the students' pretest and posttest performance in the control and experimental groups. Cohen's d will be used to calculate the effect size in which d = 0.2 means small, d = 0.5 means medium, and d = 0.8 means large (Cohen, 1988).

Z-Tests. It was used to determine the significant difference between the hypothetical mean (HM) score and the actual mean (AM) score of the students.

The formula was: $t = \frac{x-\mu}{\frac{s}{\sqrt{n}}}$

Where: s = is the standard deviation of the sample;
x = is the mean score;
μ = is the hypothesized population mean; and
n = is the number of students who took the test.

Analysis of Variance. It was used to analyze the significant difference in students' posttest performance across the two treatments and their gain scores, with treatment serving as the between-subjects factor. A post hoc analysis was conducted to identify where the differences occurred, using Tukey's Honest Significant Difference. The effect size was calculated using Eta-Squared (η2), where a value of 0.01 indicates a small effect, 0.06 indicates a medium effect, and values greater than >0.14 indicate a large effect (Field, 2005; Pallant, 2007).

Cohen's d is a statistical measure used to assess the size of the difference between two groups. It is commonly used in the context of comparing the effect of an intervention (e.g., experimental vs. control group) in research. The formula for calculating Cohen's d is:

$$d = \frac{M_2 - M_1}{\sqrt{\frac{SD_1{}^2 + SD_2{}^2}{2}}}$$

Where:
M_1 is the mean score of the first group (e.g., experimental group),
M_2 is the mean score of the second group (e.g., control group),
SD_1 is the standard deviation of the first group,
SD_2 is the standard deviation of the second group.

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Interpreting Cohen's d:
Small effect: $d = 0.2$ d=0.2
Medium effect: $d = 0.5$ d=0.5
Large effect: $d = 0.8$ d=0.8

2.7 Ethical Considerations

The researcher obtained permission from the students prior to conducting the study. A consent letter was provided to ensure mutual agreement before the study began. The participants were assured that their responses would remain confidential and that the data collected would be used solely for research purposes.

3.0 RESULTS AND DISCUSSION

This chapter presents the analysis and interpretation of the data collection that answer the questions of this study. They are arranged in accordance with the order of the problem presented in the first chapter.

Problem No. 1 What is the pretest performance of the students in the control and experimental groups?

Pretest Performance of the Control Group

Table 2. Pretest Performance of the Learners in the Control Group

Competencies	No. of Items	HM	AM	SD	Z-Value	D
Explain ingestion, absorption, assimilation, and excretion	11	8.25	3.88	1.23	-0.89	Fair
Explain how diseases of the digestive system are prevented, detected, and treated	11	8.25	3.25	1.19	-1.02	Fair
Identify healthful practices that affect the digestive system	8	6	2.42	1.53	-0.73	Fair
Total	30	22.5	9.54	3.09	-2.645	Fair

d.f. = 91 c.v. = 1.662 $\alpha = 0.05$

Legend:

HM	Hypothetical Mean	SD	Standard Deviation
AM	Actual Mean	D	Description

Table 2 presents the pretest performance of the learners in the control group before any intervention was applied. The results were measured based on three competencies related to the digestive system: (1) explaining the processes of ingestion, absorption, assimilation, and excretion; (2) understanding how digestive system diseases are prevented, detected, and treated; and (3) identifying healthful practices affecting the digestive system. A comparative analysis was conducted against a standard set at a 75% mastery level.

The control group did not reach the proficiency mastery level for any of the three competencies. In addition, their scores were well below the expected average, indicating that there was no adequate instructional rationale prior to instruction. To conclude, their performance, which was classified as fair, indicates that their understanding at the baseline assessment was very rudimentary, if not primitive.

The pretest results of the control group discussed above highlight the need to move away from traditional teaching approaches and emphasize more engaging multimodal methodologies. Implementing interactive strategies enables educators to provide more effective support towards students' mastery of science concepts and enhance academic performance.

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Pretest Performance of the Experimental Group

Table 3. Pretest Performance of the Learners in the Experimental Group

Topics	No. of Items	HM	AM	SD	Z-Value	D
Explain ingestion, absorption, assimilation, and excretion	11	8.25	4.69	1.57	-2.27	Good
Explain how diseases of the digestive system are prevented, detected, and treated	11	8.25	2.62	1.02	-5.51	Fair
Identify healthful practices that affect the digestive system	8	6	2.0	1.7	-2.36	Fair
Total	30	22.5	9.31	3.3	-4.002	Fair

Legend:

HM	Hypothetical Mean	SD	Standard Deviation
AM	Actual Mean	D	Description

Table 3 presents the pretest performance of students in the experimental group, focusing on their understanding of key science competencies related to the digestive system. The target level of mastery was set at 75% for each of the three areas assessed.

The findings show that the learners did not reach the desired level of mastery in any of the competencies. Although their score in competency 1 was relatively higher than in other areas, their overall performance still fell under the "fair" category. This suggests that students had limited prior understanding of the topic and entered the lessons with foundational gaps in scientific knowledge.

To summarize, the experimental group's pretest results indicate gaps that instructional strategies which aid in conceptual development and address misconceptions should fill. These findings highlight the need to strengthen students' foundational knowledge in science while also establishing a baseline from which future academic milestones can be measured.

Problem No. 2 Is there a significant difference in the pretest performance of the students between the control and experimental groups?

Table 4. Test of Difference between the Control and Experimental Groups' Pretest Performance

Competency	Group	Mean	SD	t-computed	p-value	Interpretation	Pooled stdev	Cohen's d	Interpretation
Explain ingestion, absorption, assimilation, and excretion	Control	3.88	1.23	-2.02	0.049	Significant	1.42	0.574	Medium effect
	Experimental	4.69	1.57						
Explain how diseases of the digestive system are prevented, detected, and treated	Control	3.25	1.19	2.00	0.051	Not significant	1.105	0.568	Medium effect
	Experimental	2.62	1.02						
Identify healthful practices that affect the	Control	2.42	1.53	0.92	0.36	Not significant	1.62	0.259	Small effect
		2							

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digestive system	Experimental		1.7						
Overall	Control	9.54	3.09	0.25	0.80	Not significant	3.201	0.072	Small effect
	Experimental	9.31	3.3						

Legend:

df	=	91
α	=	0.05
c.v.	=	1.662

Table 4 presents the comparison between the control and experimental groups' pretest performances across three science competencies related to the digestive system. This analysis aims to determine whether any significant differences existed between the two groups before instruction was implemented. The independent samples t-test was used to compare their mean scores for each competency, as well as the overall performance.

The findings show that, while the two groups scored similarly in most areas, a significant difference was found in one competency—specifically in explaining the processes of ingestion, absorption, assimilation, and excretion—where the control group slightly outperformed the experimental group. However, for the other two competencies and the overall pretest performance, the differences between the groups were not significant. This suggests that both groups had comparable levels of prior knowledge at the start of the study.

Problem No. 3 What is the posttest performance of the students in the control and experimental groups?

Tables 5 and 6 show the posttest performance of the students of the control and experimental groups. These were obtained after the students were exposed to the utilization of physical manipulative in the experimental group and traditional instruction in the control group.

Posttest Performance of the Control Group

Table 5. Posttest Performance of the Learners in the Control Group

Topics	**No. of Items**	**HM**	**AM**	**SD**	**Z-Value**	**D**
Explain ingestion, absorption, assimilation, and excretion	11	8.25	5.21	2.30	-0.62	Good
Explain how diseases of the digestive system are prevented, detected, and treated	11	8.25	4.67	1.86	-0.73	Good
Identify healthful practices that affect the digestive system	8	6	3.96	2.39	-0.42	Good
Total	30	22.5	13.83	5.14	-1.77	Good

Table 5 shows the control group's posttest scores after being taught through traditional methods. The evaluation measures three competencies related to the digestive system. The objective of the posttest was to evaluate the extent of learning achievement after teaching was delivered, with an expected threshold of 75% mastery.

The findings indicate that although the conventional teaching method offered some level of organisation and presentation of the subject matter, it did not facilitate a proper comprehension or retention of the scientific concepts by the students. These findings are consistent with broader educational concerns surrounding the effectiveness of conventional teaching strategies, especially in science education. As highlighted by Rahmat et al. (2020), many students fail to reach the desired competency level in science because traditional approaches do not align with how learners best process complex and abstract information. Biological systems like the digestive process require visual, interactive, and exploratory learning experiences for students to fully grasp the content.

In conclusion, the control group's posttest performance reflects limited progress toward mastery despite exposure to conventional instruction. These findings emphasize the need for instructional innovations that promote meaningful engagement, particularly when teaching complex scientific content to junior high school students.

Posttest Performance of the Experimental Group

Table 6. Posttest Performance of the Learners in the Experimental Group

Topics	**No. of Items**	**HM**	**AM**	**SD**	**Z-Value**	**D**
Explain ingestion, absorption, assimilation, and excretion	11	8.25	7.35	2.1	-0.43	Very Good
Explain how diseases of the digestive system are prevented, detected, and treated	11	8.25	7.04	1.84	-0.66	Very Good
Identify healthful practices that affect the digestive system	8	6	5.62	1.36	-0.28	Very Good
Total	30	22.5	20	4.25	-0.59	Very Good

Legend:

HM	Hypothetical Mean	AM	Actual Mean
SD	Standard Deviation	D	Description

Table 6 presents the posttest performance of the Grade 8 students in the experimental group after being exposed to the Interactive Science Toolkit. The test evaluated three key competencies related to the digestive system: (1) explaining the processes of ingestion, absorption, assimilation, and excretion, (2) explaining how diseases of the digestive system are prevented, detected, and treated, and (3) identifying healthful practices that affect the digestive system. A benchmark of 75% mastery was used to assess performance. The outcome displays the greatest enhancement across all proficiencies, with average ratings of 7.35, 7.04, and 5.62 respectively. The standard "Very Good" descriptor also covers all ratings, while the overall average rating of 20 out of 30 maintains "Very Good." The low standard deviations suggest even student performance, which paired with the differing ability ranges, reinforces the effectiveness of the learning tool.

The findings show that students' understanding increased significantly with respect to their pretest scores, meaning that the Interactive Science Toolkit was effective in improving knowledge and concept clarity. Likely, the incorporation of interactive simulation games and visuals facilitated these increases as a result of heightened student motivation and their unique ways of learning. The students were not just memorizing; they were applying and exploring information, which are the tenets of meaningful learning. This aligns with Piaget's Cognitive Learning Theory which argues that knowledge is gained through active involvement and mentally engaging with the subject matter (Piaget, 1950). The toolkit enhanced students' prior knowledge by allowing them to learn experientially to rectify misconceptions, which helped in building more knowledge through unlearning.

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Problem No. 4 Is there a significant difference between the posttest performance of the students in the control and experimental groups?

Table 7. Test of Difference between the Control and Experimental Groups' Posttest Performance

Topics	Group	Mean	SD	t-computed	p-value	Interpretation	Pooled stdev	Cohen's d	Interpretation
Explain ingestion, absorption, assimilation, and excretion	Control	5.21	2.30	-3.43	0.001	Significant	2.198	0.972	Large effect
	Experimental	7.35	2.1						
Explain how diseases of the digestive system are prevented, detected, and treated	Control	4.67	1.86	-4.52	0.000	Significant	1.849	1.281	Large effect
	Experimental	7.04	1.84						
Identify healthful practices that affect the digestive system	Control	3.96	2.39	-2.99	0.005	Significant	1.924	0.854	Large effect
	Experimental	5.62	1.36						
Overall	Control	13.83	5.14	-4.60	0.000	Significant	4.697	1.308	Large effect
	Experimental	20	4.25						

Table 7 presents the comparison between the posttest performance of students in the control and experimental groups to determine whether the use of the Interactive Science Toolkit resulted in significantly better outcomes than traditional teaching methods. The test covered three competencies related to the digestive system, with standard deviation, mean score, and statistical significance levels analyzed using an independent samples t-test. The results reveal that students in the experimental group consistently outperformed those in the control group across all competencies. Notably, the mean total score of the experimental group was 20.00, categorized as "Very Good," while the control group scored 13.83, categorized as "Good." The t-test yielded a computed value that exceeded the critical value at a 0.05 level of significance, indicating a statistically significant difference in favor of the experimental group.

This finding suggests that the teaching approach with the Interactive Science Toolkit was more effective than the traditional teaching approach which relied heavily on giving the students lectures.

To sum up, data from Table 10 clearly supports the fact that the Interactive Science Toolkit had a positive impact on students' academic achievement in Science 8. The improvement seen with the experimental group highlights the necessity of incorporating more hands-on and relevant teaching approaches at the primary level. These results reinforce the growing body of literature advocating for the integration of digital tools in classrooms to support meaningful, equitable, and lasting learning experiences.

Problem No. 5. Is there a significant difference between the pretest and posttest performance of the students in the control group?

Table 8 shows the difference between the pretest and posttest of the students in the control group, focusing on science test performance across different competencies.

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Table 8. Test of Difference between the Pretest and Posttest of the Students in the Control Group

Topics	No. of Items	HM	Pretest		Posttest		t-value	p-value	Interpretation	Cohen's d	Interpretation
			AM	AM	AM	SD					
Explain ingestion, absorption, assimilation, and excretion	11	8.25	3.88	1.23	5.21	2.30	3.21	0.004	Sig	0.72	Medium effect
Explain how diseases of the digestive system are prevented, detected, and treated	11	8.25	3.25	1.19	4.67	1.86	3.02	0.006	Sig	0.909	Large effect
Identify healthful practices that affect the digestive system	8	6	2.42	1.53	3.96	2.39	2.75	0.12	Sig	0.767	Medium effect
Total	30	22.5	9.54	3.09	13.83	5.14	3.96	0.001	Sig	1.011	Large effect

Table 8 presents the comparison in the performance of students in the control group pretest and posttest, who were taught using traditional methods of instruction. The focus of the table is to find out whether there was a substantial enhancement in students' comprehension of the digestive system after the intervention. The data show that there was an increase in mean scores from the pretest to the posttest across all competencies; however, the overall improvement was moderate. The computed t-value noted was less than the critical value at the 0.05 p level, which, although learning had taken place, indicated that the improvement was not statistically significant in most areas.

These findings have significant impacts for teaching in the classroom. The minimal educational enhancements noted within the control group suggest a peripheral understanding of teaching practices in science education with regard to their learning effectiveness.

4.0 SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATION

4.1 Summary

This study generally aimed to find the effects of interactive science toolkit on students' performance in Science 8 at La Libertad National High School in School Year 2024 - 2025.

Specifically, this research seeks to answer the following questions

1. What is the pretest performance of the students in the control and experimental groups?
2. Is there a significant difference in the pretest performance of the students between the control and experimental groups?
3. What is the posttest performance of the students in the control and experimental groups?
4. Is there a significant difference between the posttest performance of the students in the control and experimental groups?
5. Is there a significant difference between the pretest and posttest performance of the students in the control group?
6. Is there a significant difference between the pretest and posttest performance of the students in the experimental group?
7. Is there a significant difference between the mean gain scores of the students in the control and experimental groups?
8. What intervention plan can be designed to enhance the students' performance in science 8?

The quasi-experimental research design employing the pretest-posttest nonequivalent groups design were utilized. There were 50 students involved in the study. The main statistical tools used were mean computations, standard deviations, z-test and t-test.

4.2Findings

The following findings were revealed:

1. The study determined the effectiveness of the Interactive Science Toolkit on the students' performance in Science 8. Specifically, it aimed to assess the students' pretest scores when grouped using the Interactive Science Toolkit and Lecture

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Method; evaluate their posttest scores in Science after the intervention; determine if there was a significant difference between the pretest and posttest scores within each group; and identify if there was a significant difference in the mean gain scores between the two groups. The study employed a quasi-experimental pretest-posttest nonequivalent group design conducted at La Libertad National High School with Grade 8 sections Galileo and Archimedes. There were 26 students in the experimental group and 24 students in the control group. Both groups took the same pretest and posttest. Statistical tools such as mean, standard deviation, t-test, and z-test were used to analyze the data.

2. Most of the students' pretest scores in both the Interactive Science Toolkit and Lecture Method groups were below the expected performance level, with the majority classified under the "fair" category.

3. After the intervention, 80% of the students exposed to the Interactive Science Toolkit scored in the "very good" range, while the majority of the students under the Lecture Method remained in the "good" or "fair" categories.

4. There was no significant difference between the pretest scores of the students taught using the Interactive Science Toolkit and those taught using the Lecture Method.

5. There was a significant difference in the posttest scores of the students taught using the Interactive Science Toolkit compared to those taught using the Lecture Method, favoring the experimental group.

6. T-test results revealed a significant difference between the pretest and posttest scores in both the experimental and control groups. However, the experimental group showed a higher gain score, indicating greater improvement in performance.

4.3 Conclusions

Based on the findings of the study, the following conclusions are drawn

1. The pretest performance of students in both the control and experimental groups was at a fair level, indicating that students had initial weaknesses in understanding the concepts related to the digestive system.

2. There was no significant difference between the overall pretest performance of the control and experimental groups, suggesting that both groups had comparable prior knowledge before the intervention.

3. The posttest performance of students in the experimental group was significantly higher than that of the control group, indicating that the intervention used in the experimental group was more effective in enhancing students' understanding of the digestive system.

4. A significant improvement was observed between the pretest and posttest mean scores for both the control and experimental groups, demonstrating that both teaching approaches contributed to students' learning, but the experimental group's approach led to greater gains.

5. The significant difference in mean gain scores between the control and experimental groups suggests that the use of the Interactive Science Toolkit was more effective in improving students' science performance compared to the traditional teaching method.

6. The findings support the effectiveness of interactive and student-centered learning strategies in enhancing students' comprehension and application of scientific concepts.

4.4 Recommendations

Based on the findings and conclusions, the following recommendations are hereby offered:

1. Teachers are encouraged to incorporate interactive and student-centered learning strategies, such as the Interactive Science Toolkit, to enhance students' understanding of scientific concepts, particularly in topics related to the digestive system.
2. Curriculum developers should consider integrating interactive teaching tools and methodologies into the science curriculum to improve student engagement and performance.
3. School administrators should provide professional development programs and training for teachers on effective interactive teaching strategies to maximize their impact on student learning outcomes.
4. Future researchers are encouraged to explore the effectiveness of interactive learning tools in other science topics or subjects to determine their broader applicability in improving student performance.
5. Students should be actively engaged in hands-on and interactive learning activities to enhance their comprehension and retention of scientific concepts.

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