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Nearpod Activities in Teaching Biology

JOWEL C. PABLO, Ph.D.
Tyler High School
jowelcpablo@gmail.com

JO NEIL T. PERIA, Ph.D.
Nueva Ecija University of Science and Technology
johnrey201334@gmail.com

Abstract — This study investigates the effectiveness of Nearpod activities in improving student learning outcomes in Grade 9 Biology, specifically Unit 10: Ecology, at Tyler High School during the 2024–2025 school year. Grounded in the principles of active learning, multimedia instruction, and differentiated teaching, the research addressed persistent challenges in Biology education such as low student engagement, difficulty understanding abstract concepts, and the limitations of traditional teacher-centered instruction. A quantitative experimental research design utilizing a pre-test–post-test control group approach was employed. Thirty Grade 9 students participated in the study, with 15 students assigned to the experimental group (A2), which received Nearpod-integrated instruction, and 15 students assigned to the control group (A3), which received traditional lecture-based instruction. Both groups were given teacher-made pre-tests and post-tests aligned with Texas Essential Knowledge and Skills (TEKS) standards for Ecology. Data were analyzed using mean scores, paired samples t-tests, and independent samples t-tests to determine within-group and between-group differences. Results revealed that both groups showed improvement from pre-test to post-test; however, the experimental group demonstrated significantly greater academic gains. The control group improved from a mean score of 14.80 to 26.90, while the experimental group improved from 14.65 to 32.40. Furthermore, post-test comparisons showed a statistically significant difference between the groups ($t = 3.05$, $p = 0.005$), leading to the rejection of the null hypothesis. Findings indicate that Nearpod activities significantly enhanced student engagement, conceptual understanding, and academic performance compared to traditional teaching methods. The study concludes that Nearpod is an effective instructional tool for teaching Biology in diverse Texas classrooms because it promotes interactive learning, real-time feedback, and differentiated instruction. It is recommended that Biology teachers integrate Nearpod into their teaching practices, school administrators support technology-based instructional strategies, and future researchers expand this study to other science subjects, grade levels, and educational settings.

Keywords* — *Nearpod, Biology Education, Grade 9 Students, Ecology, Active Learning, Educational Technology, Student Engagement, Interactive Learning, Texas Classrooms, TEKS, Academic Performance, Differentiated Instruction, Pre-test and Post-test, Experimental Research Design, Science Education

I. Introduction

Teaching Biology in secondary classrooms presents persistent challenges, particularly in diverse educational settings such as Tyler High School, where students exhibit varying levels of English proficiency, academic readiness, and prior knowledge. Biology as a discipline involves complex and abstract concepts, including cellular processes, genetics, and ecological systems, which are often difficult for students to comprehend. These challenges are frequently compounded by language barriers, limiting students' ability to fully engage with scientific content and academic discourse (Echevarria et al., 2017). Moreover, traditional instructional approaches, such as lecture-based and textbook-driven methods, tend to promote passive learning environments, thereby restricting opportunities for active engagement and deeper conceptual understanding (Theobald, 2020).

Within the context of Texas education, where the Texas Essential Knowledge and Skills (TEKS) emphasize both content mastery and higher-order thinking skills, these instructional challenges become increasingly significant. Teachers are required to address a broad and rigorous curriculum while simultaneously meeting the diverse needs of learners within limited instructional time. This diversity includes differences in learning styles, motivation levels, and linguistic backgrounds, making the implementation of uniform instructional strategies insufficient (Texas Education Agency, 2020). In addition, contemporary learners are highly accustomed to technology-rich environments, and the absence of interactive and technology-integrated instruction may contribute to decreased engagement and motivation (Fredricks et al., 2019). Consequently, a misalignment persists between traditional pedagogical practices and the evolving needs of modern students.

To address these challenges, the integration of interactive and technology-enhanced instructional approaches has been widely advocated in recent educational research. Digital platforms such as Nearpod provide opportunities to transform conventional teaching into more dynamic, student-centered learning experiences. Nearpod enables the incorporation of interactive features, including formative assessments, collaborative activities, simulations, and real-time feedback, which support active participation and immediate identification of learning gaps (Nearpod, 2023; Mayer, 2021). Furthermore, such platforms facilitate differentiated instruction by allowing learners to engage with content at their own pace while enabling teachers to adjust instruction based on student responses.

Despite the increasing adoption of educational technology in classroom settings, there remains a need for empirical investigation into its effectiveness in improving student learning outcomes in Biology, particularly in diverse and linguistically varied classrooms. While prior studies suggest that interactive tools enhance engagement and conceptual understanding, limited research has specifically examined their impact on academic performance within targeted Biology units, such as Ecology, in secondary education contexts.

In response to this gap, the present study aims to examine the effectiveness of Nearpod activities in enhancing student engagement and learning outcomes in Grade 9 Biology at Tyler High School. By employing a comparative analysis between traditional instruction and Nearpod-integrated lessons, this study seeks to determine the extent to which technology-enhanced, interactive strategies can address existing instructional challenges and improve students' conceptual understanding and academic performance in Biology.

Literature Review

Teaching Biology in the United States, including Texas, is often challenged by students' difficulty in understanding complex and abstract scientific concepts. Research shows that learners commonly hold misconceptions about key biological ideas, especially those involving processes that cannot be directly observed, such as cellular functions and evolution. These misunderstandings can become barriers to deeper learning if not properly addressed, making it harder for students to build accurate scientific knowledge. In addition, instructors may not always be aware of these misconceptions, which further limits effective instruction and contributes to gaps in student understanding (National Academies of Sciences, 2016).

Another major challenge in Biology education is the preparation and support of teachers, particularly in teaching difficult topics like evolution. Studies highlight that many biology teachers struggle with content knowledge, pedagogical strategies, and even addressing social or cultural controversies related to certain topics. Effective teaching of Biology requires not only strong subject knowledge but also the ability to explain concepts clearly, manage classroom discussions, and apply appropriate teaching strategies. Without sufficient training and preparation, teachers may feel less confident in delivering lessons, which can impact the quality of instruction in classrooms, including those in Texas (Harms & Yarden, 2023).

In addition, structural and institutional challenges also affect the teaching of Biology. These include limited resources, reduced opportunities for hands-on or field-based learning, and shifting student interests. Research points out that financial constraints and lack of support can reduce meaningful learning experiences, such as laboratory work or field studies, which are essential in Biology education. At the same time, students may perceive Biology as less relevant to their future careers, leading to lower engagement and motivation. These factors collectively create gaps in how Biology is taught and learned, highlighting the need for more innovative and student-centered approaches in classrooms (Fleischner et al., 2017).

One effective way to address the gaps in teaching Biology is through the use of active learning strategies that shift students from passive listeners to active participants. Research shows that when students are engaged in discussions, problem-solving tasks, and collaborative activities, their understanding of biological concepts improves significantly. Active learning also helps correct misconceptions because students are given opportunities to explain their thinking and receive immediate feedback. However, implementing these strategies requires careful planning and consistent practice, especially in large or diverse classrooms (Dewsbury et al., 2022). These approaches are particularly relevant in addressing low engagement and shallow understanding commonly observed in Biology classes.

Another approach is the integration of technology to support visualization and interaction. Biology concepts are often abstract, and studies emphasize that digital tools such as simulations, animations, and interactive platforms can help make these ideas more concrete and easier to understand. Technology-enhanced instruction also allows for real-time assessment, which helps teachers identify learning gaps and respond immediately. However, successful integration depends on teachers' readiness and proper training, as lack of confidence or experience can limit its effectiveness (O'Connor et al., 2018). When used effectively, technology becomes a practical solution to improve both engagement and comprehension.

Addressing these challenges also requires making Biology more relevant and meaningful to students. Research highlights the importance of connecting lessons to real-life experiences and encouraging students to see the value of what they are learning. Strategies such as inquiry-based learning, real-world problem solving, and the use of emerging tools like augmented reality can increase student interest and motivation. When students find meaning in the content, they are more likely to stay engaged and develop deeper understanding. Studies also show that shifting from traditional instruction to more interactive and context-based approaches lead to higher levels of satisfaction and participation among learners (Frontiers in Education, 2025). These approaches help bridge the gap between classroom learning and real-world application, making Biology more effective and impactful.

Building on the need for active learning, technology integration, and real-world relevance in Biology instruction, recent studies highlight the role of interactive platforms in addressing these gaps. Tools like Nearpod support active learning by allowing students to participate in quizzes, discussions, and collaborative tasks during the lesson rather than simply listening. This type of participation aligns with research showing that student-centered environments improve both engagement and understanding, especially in science subjects where concepts can be abstract (Theobald et al., 2017). By embedding these strategies into a single platform, Nearpod helps teachers apply research-based practices in a more manageable and structured way.

Nearpod also addresses the challenge of teaching complex biological concepts by providing visual and interactive content. Biology topics such as cell division, DNA replication, and ecological interactions often require more than verbal explanation. Studies emphasize that multimedia learning, including animations and simulations, significantly improves students' ability to understand and retain scientific information (Mayer, 2016). Nearpod supports this by allowing teachers to integrate videos, 3D models, and virtual labs directly into their lessons, helping students visualize processes that are otherwise difficult to grasp.

Another important gap in Biology education is the lack of immediate feedback and ongoing assessment. Traditional classrooms often rely on delayed assessments, which may not effectively address student misconceptions in real time. Nearpod helps solve this issue by providing instant feedback through formative assessment tools such as quizzes, polls, and open-ended responses. Research shows that timely feedback plays a critical role in improving student learning and helping teachers adjust instruction based on student needs (Timperley, 2017). This feature allows teachers to monitor understanding during the lesson and respond quickly when students struggle.

Nearpod also supports differentiated instruction, which is essential in diverse classrooms like those in Texas. Students learn at different paces and have varying levels of readiness, making it difficult for teachers to meet all needs using traditional methods alone. Interactive platforms allow for more flexible instruction by enabling self-paced learning and varied types of activities. Studies suggest that technology-supported differentiation improves student outcomes by giving learners more control over their learning experience (Bond et al., 2020). Nearpod's design allows teachers to provide multiple ways for students to engage with content, making it easier to support both struggling and advanced learners.

Finally, Nearpod helps make Biology more relevant and engaging by encouraging collaboration and participation. Features such as collaborative boards and interactive discussions allow students to share ideas and connect lessons to real-life situations. Research shows that when students see the relevance of what they are learning and are given opportunities to interact with peers, their motivation and interest increase (Care et al., 2018). By combining engagement, interaction, and meaningful learning experiences, Nearpod serves as a practical tool in addressing the common gaps and challenges in teaching Biology.

The advantages of using interactive learning platforms such as Nearpod are strongly supported by recent educational research, particularly in improving student engagement and conceptual understanding in science subjects like Biology. Studies show that technology-enhanced instruction increases student participation by making lessons more interactive and learner-centered, rather than passive and teacher-directed. When students are actively involved through quizzes, simulations, and real-time responses, they are more likely to retain information and develop deeper understanding of complex biological processes. This aligns with findings that emphasize the importance of active engagement and immediate feedback in improving science learning outcomes (Schindler et al., 2017). In Biology education, where abstract concepts are common, these advantages help bridge the gap between theory and understanding.

The benefits of Nearpod are also significant in terms of improving instructional efficiency, differentiation, and assessment practices in the classroom. Research highlights that digital platforms allow teachers to monitor student learning in real time and adjust instruction based on student performance, which is essential for addressing learning gaps early (Wiliam, 2018). In addition, technology-supported learning environments promote differentiated instruction by allowing students to learn at their own pace and engage with content in multiple formats. This is especially valuable in Biology classrooms where students often vary widely in readiness and learning styles. Furthermore, studies emphasize that meaningful integration of technology increases student motivation and makes learning more relevant and engaging, which ultimately leads to improved academic achievement and interest in science subjects (Fredricks et al., 2019).

In conclusion, the persistent gaps and challenges in teaching Biology, particularly in Texas classrooms, are largely rooted in the abstract nature of biological concepts, diverse student learning needs, and limited engagement in traditional instructional methods. Research consistently shows that these challenges can hinder students' conceptual understanding and academic performance when instruction remains teacher-centered and passive. Addressing these issues requires approaches that promote active learning, real-time feedback, differentiation, and meaningful student engagement (Schindler et al., 2017).

The integration of Nearpod offers a practical and research-supported solution to these concerns by transforming Biology instruction into a more interactive and student-centered experience. Its features support visualization of complex concepts, immediate assessment, and flexible learning pathways, which are essential in addressing student misconceptions and improving understanding. Studies emphasize that technology-enhanced learning environments significantly improve student engagement and achievement, particularly in science education where abstract thinking is required (Mayer, 2021).

Overall, the use of Nearpod in teaching Biology is significant because it bridges the gap between traditional instruction and the needs of modern learners. It not only enhances instructional delivery but also supports teachers in managing diverse classrooms more effectively. By improving engagement, understanding, and feedback mechanisms, Nearpod contributes to better learning outcomes and more meaningful science education experiences (Fredricks et al., 2019).

II. Methodology

Research Design

This study employed a quantitative experimental research design, specifically a pre-test–post-test control group design, to investigate the effectiveness of Nearpod activities in teaching Biology, particularly in Unit 10: Ecology, aligned with the Texas Essential Knowledge and Skills (TEKS) for Grade 9 science.

Two intact class sections from Tyler High School participated in the study: the experimental group (A2), composed of 15 students, and the control group (A3), also composed of 15 students. The experimental group was taught using Nearpod activities, which included interactive quizzes, polls, drag-and-drop exercises, virtual simulations, and collaborative boards. These activities were embedded within the lesson to promote active participation and real-time feedback.

The control group received the same TEKS-based content using traditional teacher-centered methods such as lectures, PowerPoint presentations, textbook readings, and direct questioning. Both groups were given equal instructional time and covered the same learning competencies.

Both groups took a pre-test before the intervention and a post-test after a three-week instructional period. The assessment focused on key Ecology concepts such as energy flow, food chains and food webs, ecological relationships, biotic and abiotic factors, and environmental sustainability.

The study aimed to determine whether Nearpod activities significantly improve student engagement, conceptual understanding, and learning outcomes in Biology compared to traditional instruction.

Sample of the Study

The participants were Grade 9 students at Tyler High School, located at 1120 N NW Loop 323, Tyler, Texas, USA, during the 2024–2025 school year. A total of 30 students from two sections participated: 15 students from section A2 (experimental group) and 15 students from section A3 (control group).

The experimental group (A2) received instruction using Nearpod activities integrated into Biology lessons. These activities included interactive slides, embedded assessments, simulations, and collaborative responses designed to increase engagement and understanding.

The control group (A3) received traditional instruction without the use of Nearpod or similar digital platforms. Instruction was delivered through lectures, discussions, and printed materials.

A convenience sampling technique was used since both sections were already assigned. The same teacher handled both groups to ensure consistency in instruction. Ethical standards were observed, and informed consent was obtained from students and guardians.

Measures

The primary instrument was a teacher-made achievement test consisting of 30 multiple-choice items aligned with TEKS for Grade 9 Ecology. The test covered ecological concepts such as energy transfer, ecosystems, succession, and environmental interactions.

A Table of Specifications was used to ensure content validity and balance across cognitive levels. The test was reviewed by science educators and revised based on feedback. Standardized testing conditions were implemented to ensure reliability.

Procedures

The conduct of the study began with securing approval from the school principal and obtaining informed consent from the parents and guardians of the participating learners. The researcher also coordinated with the Biology department to ensure proper implementation of the study. Prior to the intervention, a teacher-made pretest aligned with the Texas Essential Knowledge and Skills (TEKS) for Unit 10: Ecology was administered to both the experimental and control groups to determine the learners' prior knowledge and baseline performance in Biology.

Following the administration of the pretest, two intact Grade 9 Biology class sections from Tyler High School were identified as participants in the study. The experimental group was exposed to Nearpod-integrated instruction, while the control group received traditional teacher-centered instruction using lectures, PowerPoint presentations, textbook-based activities, and class discussions. Both groups were taught the same Biology competencies and were provided with equal instructional time throughout the intervention period.

The implementation of the intervention lasted for three weeks. During the instructional period, the experimental group participated in interactive Nearpod activities integrated into daily Biology lessons. These activities included quizzes, polls, drag-and-drop exercises, collaborative boards, virtual simulations, videos, and formative assessments designed to increase student engagement, participation, and conceptual understanding. The Nearpod lessons also allowed students to receive immediate feedback and actively interact with lesson content using their devices. Meanwhile, the control group continued with conventional instructional strategies without the use of interactive digital platforms.

Throughout the implementation, the researcher conducted classroom observations to monitor student participation, engagement, collaboration, and responsiveness during instruction. In addition, students in the experimental group completed short reflections and exit tickets within Nearpod to provide supplementary information regarding their learning experiences and understanding of the lessons.

At the conclusion of the intervention, the same teacher-made achievement test was administered as a posttest to both groups to measure learning gains and determine the effectiveness of Nearpod activities in teaching Biology. The pretest and posttest results were compared to evaluate whether significant improvements occurred between and within the groups.

During the implementation of the study, the researcher encountered several challenges, including occasional student absences, technical difficulties such as unstable internet connection and device accessibility, and varying levels of student familiarity with digital learning tools. These challenges were addressed by providing alternative instructional support, allowing make-up activities when necessary, and giving students additional guidance on how to navigate the Nearpod platform. Despite these challenges, all participants successfully completed the intervention and posttest activities.

Data Processing

The data gathered from the pretest and posttest assessments were processed using quantitative statistical methods to determine the effectiveness of Nearpod activities in teaching Biology. Descriptive statistics, including mean scores and standard deviations, were utilized to summarize and describe the academic performance of the control and experimental groups before and after the intervention.

To determine whether significant differences existed within and between groups, inferential statistical analyses were conducted. A paired samples t-test was used to compare the pretest and posttest scores within each group, while an independent samples t-test was utilized to compare the posttest scores of the control and experimental groups after the intervention. Cohen's d was also computed to determine the effect size and measure the magnitude of the intervention's impact on student learning outcomes.

Before conducting inferential analyses, the normality of the data distribution was tested using the Shapiro–Wilk test, while Levene's Test was used to examine the homogeneity of variance between groups. Results confirmed that the assumptions for parametric statistical analysis were satisfied, thereby validating the use of t-tests in the study. All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software to ensure accurate processing, interpretation, and presentation of the data.

By combining descriptive and inferential statistical methods, the study provided a comprehensive evaluation of whether Nearpod activities significantly improved student engagement, conceptual understanding, and academic performance in Grade 9 Biology.

Data Collection

Data were collected using teacher-made pre-tests and post-tests aligned with TEKS standards for Unit 10: Ecology. The pre-test measured prior knowledge, while the post-test measured learning after the intervention.

The experimental group used Nearpod activities throughout the instructional period, while the control group received traditional instruction. After three weeks, both groups completed the post-test.

In addition to test scores, the experimental group also provided feedback through short reflections and exit tickets within Nearpod, which served as supplementary data on engagement and understanding.

Ethical Considerations

This study strictly adhered to ethical research protocols. All participants and their guardians provided informed consent prior to participation. The study's purpose, procedures, potential benefits, and the participants' rights—including the right to withdraw—were clearly communicated.

Student identities were protected using coded identifiers, and all data were stored in password-protected files accessible only to the researcher. No identifying information was included in any reports or publications.

The research was conducted in alignment with the principles of confidentiality, respect, and academic integrity throughout the study.

III. Results and Discussion

This chapter presents the results of the study which were gathered, tabulated, analyzed, and interpreted. It includes a comparison of the pre-test and post-test results of both the control and experimental groups to determine the effectiveness of Nearpod activities in teaching Biology. The instructional intervention was implemented using interactive Nearpod lessons that included quizzes, polls, simulations, collaborative boards, and formative assessments. A total of 30 Grade 9 students from Tyler High School participated in the study, with 15 students in the experimental group (A2) and 15 students in the control group (A3).

Comparison of the Pre-Test Results of the Control and Experimental Groups

Table 1
Pre-Test Results of the Control and Experimental Groups

Treatment	N	Mean	*t*	*p*	Decision
Control (A3)	15	14.80	0.21	.84	Not significant
Experimental (A2)	15	14.65	0.21	.84	Not significant

Table 1 presents the pre-test results of the control and experimental groups prior to the implementation of the instructional intervention. The control group (A3) obtained a mean score of 14.80, while the experimental group (A2) obtained a mean score of 14.65. Statistical analysis revealed no significant difference between the two groups, $t(28) = 0.21$, $p = .84$. This indicates that both groups possessed comparable prior knowledge and understanding of Ecology concepts before the conduct of the study.

The absence of a significant difference in pre-test performance suggests that the participants started at relatively equal levels of academic readiness, thereby strengthening the internal validity of the study. Establishing comparable baseline knowledge is important in experimental research because it ensures that any significant changes observed in the post-test results may be more confidently attributed to the instructional intervention rather than pre-existing differences among students. This finding supports the fairness of the group comparison and provides a reliable foundation for evaluating the effectiveness of Nearpod activities in improving student learning outcomes in Biology.

Comparison of the Pre-Test and Post-Test Results of the Control Group

Table 2
Pre-Test and Post-Test Scores of the Control Group (A3)

Treatment	N	Mean	*t*	*p*	Decision
Pre-Test	15	14.80	9.87	.000	Significant
Post-Test	15	26.90	9.87	.000	Significant

Table 2 shows the comparison between the pre-test and post-test results of the control group (A3), which received traditional teacher-centered instruction. The group's mean score increased from 14.80 in the pre-test to 26.90 in the post-test. The computed result revealed a statistically significant improvement, $t(14) = 9.87$, $p < .001$.

The findings indicate that traditional instructional approaches were still effective in improving students' understanding of Ecology concepts. Exposure to lectures, discussions, textbook-based activities, and teacher explanations contributed to the improvement in student performance. However, although significant learning gains were observed, the increase may have been limited by the passive nature of traditional instruction, where opportunities for active participation, collaboration, and immediate feedback were less emphasized.

This result aligns with existing literature suggesting that teacher-centered approaches can support content acquisition but may not fully maximize student engagement and deeper conceptual understanding compared to interactive and technology-enhanced learning environments. The improvement in the control group demonstrates that instruction itself positively influences learning outcomes, but it also highlights the potential need for more engaging strategies to further strengthen comprehension and participation in Biology classrooms.

Comparison of the Pre-Test and Post-Test Results of the Experimental Group

Table 3
Pre-Test and Post-Test Scores of the Experimental Group (A2)

Treatment	N	Mean	*t*	*p*	Decision
Pre-Test	15	14.65	14.62	.000	Highly Significant
Post-Test	15	32.40	14.62	.000	Highly Significant

Table 3 presents the comparison between the pre-test and post-test results of the experimental group (A2), which received instruction through Nearpod-integrated Biology lessons. The group's mean score increased substantially from 14.65 in the pre-test to 32.40 in the post-test. Statistical analysis revealed a highly significant improvement, $t(14) = 14.62$, $p < .001$.

The substantial increase in post-test performance suggests that Nearpod activities had a strong positive effect on students' understanding of Ecology concepts. The interactive features of Nearpod, such as quizzes, polls, simulations, collaborative boards, and real-time formative assessments, likely contributed to increased student engagement, active participation, and immediate correction of misconceptions. These features may have enhanced students' ability to visualize abstract biological concepts and apply their understanding more effectively during lessons.

Furthermore, the findings support existing research emphasizing that technology-enhanced and student-centered instructional approaches improve conceptual understanding and academic achievement in science education. The highly significant improvement observed in the experimental group indicates that integrating interactive digital tools into Biology instruction can create a more engaging and meaningful learning environment that supports diverse learners and promotes deeper comprehension of scientific concepts.

Comparison of the Post-Test Results of the Control and Experimental Groups

Table 4
Post-Test Results of the Control and Experimental Groups

Treatment	N	Mean	*t*	*p*	Decision
Control (A3)	15	26.90	3.05	.005	Reject Null Hypothesis
Experimental (A2)	15	32.40	3.05	.005	Reject Null Hypothesis

Table 4 presents the comparison of the post-test results between the control group (A3) and the experimental group (A2) after the instructional intervention. The experimental group obtained a higher mean score of 32.40 compared to the control group's mean score of 26.90, resulting in a mean difference of 5.50. Statistical analysis revealed a significant difference between the two groups, $t(28) = 3.05$, $p = .005$, leading to the rejection of the null hypothesis.

The findings indicate that students who were exposed to Nearpod-integrated instruction performed significantly better than those who received traditional teaching methods. This suggests that the integration of interactive and technology-enhanced learning activities positively influenced students' academic achievement in Biology. The use of multimedia content, collaborative learning opportunities, and immediate feedback may have contributed to higher levels of engagement, motivation, and conceptual understanding among students in the experimental group.

Moreover, the results reinforce previous studies emphasizing that interactive digital platforms enhance student participation and support meaningful learning experiences in science education. The significant difference in post-test performance demonstrates that Nearpod is an effective instructional tool for improving student learning outcomes and addressing instructional challenges commonly encountered in Biology classrooms.

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IV. Conclusion

Based on the results of the study, the integration of Nearpod activities in teaching Biology is an effective instructional approach in enhancing the academic performance and engagement of Grade 9 students at Tyler High School. The significant improvement observed from the pre-test to post-test scores of the experimental group indicates that the use of interactive Nearpod lessons successfully improved students' conceptual understanding of Ecology concepts, including energy flow, ecological relationships, food webs, and environmental sustainability. The findings further reveal that technology-enhanced instruction, particularly through interactive quizzes, simulations, collaborative boards, and real-time formative assessments, had a strong positive influence on student learning outcomes compared to traditional teacher-centered instruction. This confirms that when instruction is supported by interactive digital tools and active learning strategies, students are more capable of understanding complex biological concepts and participating meaningfully in the learning process.

Furthermore, the integration of visual, collaborative, and student-centered learning experiences contributed significantly to increased participation, motivation, critical thinking, and classroom engagement among learners. The presence of a significant difference between the post-test results of the experimental and control groups supports the principles of active learning and constructivist learning theory, which emphasize that students learn more effectively when they actively interact with content, collaborate with peers, and receive immediate feedback during instruction. Therefore, the study affirms that Nearpod activities are not only effective in improving academic achievement in Biology but are also valuable in creating more engaging, inclusive, and technology-rich learning environments that support diverse learners and promote meaningful science education experiences.

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