SAJAAS

Southeast Asian Journal of Agriculture and Allied Sciences

Volume 4 Issue 1

Utilizing Nearpod Application to Enhance Grade 8 Learners' Integrated Science Process Skills

Custodio, Jhanine B.[1]
Gonzales, Pieven Jester A.[2]
Santos, Bless Carmi Ann D.[3]
Manguil, Carlo Jaime M.[4]

Corresponding Author: *manguilcarlo@gmail.com*

[1-4]Institute of Education, Bulacan Agricultural State College, Pinaod, San Ildefonso, Bulacan, Philippines

pp. 26-43

SAJAAS | Southeast Asian Journal of Agriculture and Allied Sciences
www.sajaas.basc.edu.ph
sajaasjournal@basc.edu.ph

Utilizing Nearpod Application to Enhance Grade 8 Learners' Integrated Science Process Skills

Article History:
Received: *Aug. 08, 2024*
Accepted: *Oct. 31, 2024*
Published: *Feb. 04, 2025*

Custodio, Jhanine B.[1]
Gonzales, Pieven Jester A.[2]
Santos, Bless Carmi Ann D.[3]
Manguil, Carlo Jaime M.[4]

Corresponding Author: *manguilcarlo@gmail.com*

[1-4]Institute of Education, Bulacan Agricultural State College, Pinaod, San Ildefonso, Bulacan, Philippines

Abstract

In recent years, the pressing issue of the low performance of learners in science has addressed the need for innovative teaching strategies to motivate and help them intrinsically embrace essential scientific concepts. The demands of 21st-century education continuously challenge science teachers to explore more technology-driven solutions. This action research explored the effectiveness of the implementation of the Nearpod application in improving the Integrated Science Process Skills (ISPS) of grade 8 learners during the school year 2023-2024. The research employed a quantitative approach in processing all the data gathered. Nearpod was systematically integrated into Science 8 classes, with features like Collaborative Board and Immersive Reader being used regularly in weekly lessons. Learners participated in interactive activities, such as using the Collaborative Board for group discussions and engaging with immersive virtual reality experiences to elicit prior knowledge. Formative assessments were conducted through Nearpod's Poll and Draw It features, providing immediate feedback to learners and the Time to Climb feature was used to gamify review sessions. Findings indicate a significant improvement in learners' performance after exposure to the application. The mean score in the post-test of the experimental group is higher (M=16.5, SD=1.48) than the post-test of the control group (M=11.78, SD=1.34) t=8.97 (p=0.000). This finding was further supported by the quantitative data from questionnaires using a Likert scale elaborating on positive experiences and perceptions of learners regarding the integration of Nearpod. Learners appreciate well the structured approach of the Nearpod including focused instruction, guided practice, collaborative learning, and independent application. Using interactive tools in the classrooms improves the learners' overall performance. As digital natives, the learners can relate well to the lessons through the regulated use of gadgets as supplementary materials that enrich their learning environment. As suggested, it would be beneficial to look into how this technology integration strategy can also be applied in different schools that value the inevitable advancement of technology that, in turn, influences the teaching and learning process with an extended study timeframe to gauge its lasting impacts.

Keywords: *Action Research, Grade 8 Learners, Integrated Science Process Skills, Nearpod Application*

Introduction

In the Philippines, a nation embracing innovation, it is crucial to incorporate modernity with teaching, especially in science. The use of various technologies as tools brought modernity to learning and helped teachers and students cope with the ever-changing curriculum. The rapid and constant pace of change in technology increases the opportunity for students to understand scientific concepts to the extent that it can be carried on to their future years with consistency.

Educational technology (EdTech) plays a significant role in attaining the United Nations Sustainable Development Goal 4 (SDG4) for quality education. A framework for EdTech's contribution to quality education was proposed elaborating its potential to democratize access and improve academic performance (Costa et al., 2023). Although there is limited academic literature linking EdTech and SDG4 so far, increasing research opportunities in these fields are being reported (Jordan, 2020). In fact, Suaco et al. (2024) found that SDG-related competencies are integrated into the secondary science curriculum in the Philippines, with teachers showing a good understanding and positive attitudes toward SDGs. In addition, a pedagogical model for integrating digital technology and SDGs in K-12 education is provided which gained high support from students and teachers (Silva et al., 2023).

Although several interventions, such as Strategic intervention materials (SIM), lesson studies, and teacher mentoring, have been implemented to improve science performance in the Philippines, these approaches are limited by factors like time, budget, and the number of participants that can be accommodated (Villar et al., 2022; Payot and Deloy, 2022; Perdio, 2022). Research has emphasized the need for more ICT-based professional development to support teachers' instructional practices (Bibon, 2022). Thus, a more student-centered approach and technologically-driven classroom is needed to align the instruction to the current needs of the learners and their prior knowledge based on the Constructivist learning theory (Alam, 2016). This theory promotes authentic learning principles in the classroom that ultimately provide a positive and more conducive learning environment for the learners' academic success.

Traditional science teaching often involves teacher-centered approaches, characterized by standard lectures that lead to passive learning and low student achievement. Classroom observations revealed that didactic methods are still being widely used, leading to a decline in students' interest and participation in the subject (Oliveira and Lathrop, 2022). The learners have minimal opportunities to actively develop their scientific inquiry, problem-solving, and collaborative learning. To address this issue, there has been a shift towards incorporating ICT in science education that can increase student motivation. An inquiry-based approach utilizing ICT tools can enhance visual, intuitive, and collaborative work, leading to greater student involvement (Palomarez-Ruiz et al., 2020).

Nearpod, an interactive digital learning application, has been found to positively impact teaching and learning processes in terms of improving students' attitudes, learning outcomes, and teaching efficiency (Prasetyo, 2024; Putra et al., 2021). While it offers a free version, additional storage and premium features are available through a paid subscription (Kidder, 2021). This application promotes socio-emotional learning, critical thinking, and collaboration, and caters to learners' diverse learning styles (Caroy, 2023; Rios-Zaruma et al., 2019; Naik et al., 2022).

Nearpod allows for video-conferencing during the conduct of a flexible learning system and supports BYOD (Bring Your Own Device) environments promoting flexibility and accessibility (Hakami, 2020; Ryan, 2017). Lastly, it allows for diverse content creation, including 3D models, simulations, and virtual field trips (Naik et al., 2022). Studies in chemistry and language education have shown that Nearpod-based activities increased learners' motivation and engagement (Naumoska et al., 2022;

Salvador-Cisneros and Conza-Armijos, 2022). However, poor internet connectivity has been reported as a limitation to the effectiveness of this platform (Caroy, 2023). Nearpod can be used in schools even without a developed Learning Management System (LMS) as it is made available online with free trials.

Nearpod-based interactive science learning media are found to be beneficial to the learners' creative thinking abilities and metacognitive skills (Siswati et al., 2023). Recent studies relatively found the effectiveness of other digital technologies in enhancing science process skills and related competencies. Simple computer simulations are found to improve various basic science process skills such as observing, summarizing, predicting, communicating, and classifying (Siahaan et al., 2017). Similarly, mobile-based interactive learning multimedia enhances the learners' science process skills better than the traditional approach (Nugroho and Surjono, 2019).

Science process skills refer to using logical reasoning to critically understand scientific knowledge, principles, concepts, and methods. Integrated science process skills, on the other hand, include skills in data interpreting, formulating hypotheses, making inferences skills, and controlling variables. Thus, Baharom et al. (2020) conducted a study to assess the impact of Inquiry-Based Science Education (IBSE) through an application to improving the learners' mastery and achievement in Science Process Skills (SPS). Relatively, Ekici and Erderm (2020) found mobile applications and technology-enhanced scientific inquiry to affect the development of both basic and integrated SPS positively. These approaches enhance students' ability to design experiments, state hypotheses, interpret data, and improve their critical thinking and problem-solving skills (Del Rosario and Chua, 2023).

Despite the prevalent use of technology worldwide, its integration into teaching methodologies remains limited, especially in science education. Most teachers understand the benefits and importance of ICT for learning, but its usage in the classroom is less common than for lesson preparation (Ferrari et al., 2011). This gap may be attributed to different factors, including teachers' lack of awareness of available resources, insufficient training, and challenges integrating new tools into existing curricula. There is still a gap between technological breakthroughs and their implementation in education addressing the need for more effective collaboration between technology developers and educators (Garyfallidou and Ioannidis, 2007).

On the other hand, the Philippines still finds it difficult to perform well in the Program for International Student Assessment (PISA), which assesses the learners' performance in math, reading, and science. The OECD conducts PISA and has been evaluating the literacy of 15-year-olds every three years since 2000 (OECD, 2023). Along with these challenges, grade 8 learners in one public secondary school in San Miguel, Bulacan, struggled to process their ISPS, which could be associated with developing their higher-order thinking skills (HOTs) in science.

With these surfacing challenges in science education, the study integrated an educational application in instruction to enhance the Integrate Science Process Skills and, in general, the science performance of the learners, which would greatly contribute to satisfying the learners' needs to acquire meaningful learning experiences. The researchers aimed to determine the impact of Nearpod application on enhancing the ISPS of grade 8 learners. Specifically, the study sought to examine the students' ISPS before and after using the Nearpod application, investigate the significant difference in the scores of learners in the control and experimental groups, as well as the pre-test and post-test of the experimental group, and explore the learners' feedback regarding the use of Nearpod.

Materials and Methods

Research Design

By employing a quasi-experimental design, the researchers evaluated the impact of the Nearpod application on Grade 8 learners' Integrated Science Process Skills (ISPS). Pre-test and post-test scores from the experimental and control groups were compared to assess learning outcomes. The experimental group used Nearpod, while the control group followed traditional instructions.

Diagnostic tests identified sections with ISPS difficulties, and a survey ensured learners had access to necessary devices and the internet. Statistical analysis, including paired and independent t-tests, was conducted to determine the significance of the results. A satisfaction survey gathered feedback from the experimental group on Nearpod's effectiveness.

Sampling Method

The required sample size was measured using purposive sampling. The researchers administered a diagnostic test to determine the learners' current level of knowledge and identified which sections needed help processing their integrated science process skills. In addition, the researchers surveyed how many students have access to gadgets and the Internet. The 50-item diagnostic test revealed that learners' scores ranged from 9, the lowest score, to 28, the highest. Subsequently, the survey showed that 100% of Grade 8 – cacao learners have access to gadgets and the Internet. Thus, they qualified from the set criteria and were chosen to be the experimental group.

Respondents

The respondents of this study were grade 8 students. These students enrolled in the grade 8 heterogeneous class have been identified as the group that was having difficulties in processing their integrated science process skills in science 8. The respondents of this study were selected based on the survey on how many students have and can access gadgets and the internet. The use of diagnostic test results checked the student's level of knowledge. One heterogeneous class section served as the control group and another heterogeneous class section was the experimental group. The table below shows the distribution of respondents.

Table 1

Distribution of the Respondents

SECTION	POPULATION
Grade 8 - Aratiles	30
Grade 8 - Cacao	30
Total	**60**

Instruments

The study utilized several instruments to gather data including a diagnostic test, a pre-test, a post-test, and a questionnaire. The 50-item diagnostic test, a teacher-made test, was used to identify the current level of knowledge of the learners and determine which sections needed help with their integrated science process skills (ISPS). Some modifications were made to align the items with the ISPS test. The researchers conducted a simple survey to determine learners' availability of gadgets and access to the internet. The survey consisted of different types of questions related to the various devices the learners use and their typical internet usage pattern. This was done to ensure that the technological requirements for using the Nearpod application were met.

A set of 20 multiple-choice questions was constructed for the pre-test and post-test to assess the learners' Integrated Science Process Skills. Science teachers reviewed and validated these tests to ensure content validity. However, due to time and resource constraints, the tests were not pilot-tested before implementation.

The content of the test includes some topics in Matter covered in the 3rd Quarter of Science 8 during the 3-week implementation of the Nearpod application. For the skill target, the researchers applied the ISPS levels instead of Bloom's taxonomy to match the test items from the ISPS, such as data interpretation, formulating hypotheses, making inferences, and controlling variables. The ISPS also starts from lower-order thinking skills to higher-order thinking skills. The table below shows the modified Table of Specifications.

Table 2

Modified Table of Specifications (TOS)

Topics	No. of Hours Taught	No. of Items	Integrated Science Process Skills (ISPS)				Percentage
			Interpreting Data	Formulating Hypothesis	Making Inferences	Controlling Variables	
Week 1 Atomic Structure Proton Neutron Electron	4 hours	7	9	8, 6	1, 4	17, 18	33.3
Week 2 Atomic Structure Isotopes Ions	4 hours	7	7, 10	3	11	19, 20	33.3
Week 3 The Periodic Table of Elements Proponents of the Periodic Table Arrangement of the Periodic Table Reactivity Series	4 hours	6	14, 15	5, 12	2, 13	6	33.3
Total	**12**	**20**	**5**	**5**	**5**	**5**	**100**

A 10–item questionnaire was adopted from Kovalskys (2015) to gather feedback from the experimental group on their perceptions and experiences of using the Nearpod application. It was used to capture constructs related to learners' collaboration, creativity, performance, and overall learning experiences.

Integration of Nearpod

Nearpod is an educational technology platform designed for the learners' dynamic and diverse learning experiences. It provides various tools such as real-time polls, quizzes, collaborative boards, and multimedia presentations, allowing teachers to transform rote and isolated learning into progressive learning. In this study, Nearpod was systematically integrated into the K to 12 Science 8 Curriculum as a key tool for delivering interactive lessons to improve learners' Integrated Science Process Skills (ISPS).

Table 3

Integration of Nearpod Activities in Science 8 Lessons

WEEK	TOPIC	LEARNING COMPETENCY	NEARPOD ACTIVITY
1.1	Atomic Structure	Identify a substance based on its atomic structure;	Students identified the parts of an atom using information from the periodic table related to protons.
1.2	Protons	Find the number of protons, neutrons, and electrons in a given atom	The students answered activities on the collaborative board of the Nearpod application, where they shared their insights.
1.3	Neutrons	Determine the number of neutrons in a particular atom;	The students were given an activity called Draw It using the Nearpod. It served as an interactive whiteboard for the students.
1.4	Electrons	Determine the number of electrons in a particular atom;	The students were given an activity called Matching Pairs. The students clicked the cards they believed contained the correct match.
2.1	Isotopes	Explain what is an isotope	Atoms: Vocabulary The students strengthened their understanding of atoms by completing a vocabulary challenge matching key terms with their definitions.
2.2	Ions	Identify the no. of protons, neutrons, electrons, isotopes, and ion charge in an atom	Activity: Game to Climb The students reviewed ions and molecules using Nearpod's interactive quiz game, Time to Climb.
3.1	The Periodic Table	Use the periodic table to predict the chemical behavior of an element;	The Periodic Table: Draw-It The students interpreted the arrangement of elements on the periodic table with a Draw-It activity.
3.2	Proponent of the Periodic Table	Differentiate the contribution of each scientist to the development of the periodic table;	Atoms: Bohr Model In this practice activity, the students strengthened their understanding of atoms by completing a challenge matching element.
3.3	Arrangement of Periodic Table	Create a timeline for the development of the periodic table as per the similarities in properties of elements	Activity: Drag and Drop The students completed diagrams of the atoms of different elements by placing icons for protons, neutrons, and electrons in the correct locations.
3.4	Reactivity	Arrange the different elements based on their reactivity	Periodic Table: Matching Pairs In this activity, the students strengthened their understanding of chemical reactions by completing a challenge i.e. matching elements with the correct group

Nearpod was employed weekly in the experimental group (grade 8 – cacao) to transform traditional science lessons into interactive sessions that actively involved the learners. Specific features of the application such as Collaborative Board, Immersive Reader, and various assessment tools were combined to create an engaging and supportive learning environment. The Collaborate Board was frequently used as a bell-ringer exercise where the learners were asked to answer open-ended questions related to the lesson. This feature not only encouraged participation but also facilitated peer-to-peer learning to maximize interaction. The Immersive Reader feature allowed the learners to access the content more easily. This was used to enable the learners to interact with the materials independently because it has text-to-speech, translation, and picture dictionary functionalities. The learners were given enough time to practice this feature to ensure that they were comfortable and confident using it during sessions.

Nearpod was not merely an add-on but was fully integrated into the lesson structure. Each Science 8 module included activities that used Nearpod's interactive elements to reinforce key concepts. Virtual reality (VR) experiences were used as lesson hooks to stimulate learners' interest and activate prior knowledge by allowing them to explore environments related to the topic, such as underwater ecosystems and distant planets. Formative assessments were guided by Nearpod's Poll and Draw It features which served as exit tickets to test learners' understanding and provide immediate feedback. These assessments helped teachers to immediately identify and address misconceptions leading to a more responsive and adaptive learning environment. Furthermore, as Nearpod became a part of the daily classroom routine, the Time to Climb feature of Nearpod was used to gamify review sessions making the learning both entertaining and educational at the same time. This regular integration helped the learners to get more accustomed to the application ensuring also that they could fully grasp the content being taught. Table 3 shows how the Nearpod activities were integrated into different lessons in Matter during the 3-week implementation.

In Week 1, Nearpod activities focused on identifying the parts of an atom and determining the number of protons, neutrons, and electrons using the Collaborative Board and Interactive Whiteboard features as motivational activities where learners answered open-ended questions related to the lesson content. The Immersive Reader was used to logically present the details of the lesson in order to support learners' understanding of atomic structures and models. In week 2, the Nearpod activities centered around strengthening learners' conception of isotopes and ions, including a vocabulary challenge and an interactive quiz game, such as the "Game to Climb" activity. Moving to Week 3, the Nearpod activities were used to help learners interpret the periodic table, differentiate the contributions of scientists to its development, and complete diagrams of different atomic structures. The formative features of Nearpod, such as the Poll and Draw It tools, were used to assess learners' understanding, corresponding with the activities mentioned in Weeks 1.3 and 1.4.

Research Ethics Consideration

The researchers adhered to the guidelines outlined in DepEd Order (DO) No. 16, s. 2017, under the Research Management Guidelines. They sought and obtained the necessary permission from the school head as part of the process. The purpose of the study was explained to the student respondents and informed of their right to withdraw from the study. At the same, all confidential matters were secured. The parents or guardians of the student-respondents were informed about the conditions of the research and were provided a permission slip to allow their children to participate in the study. The student-respondents were informed about the study before the implementation of the research. Furthermore, the goal of the research was discussed both with the students and the parents/guardians with utmost clarity and transparency.

Data Collection

To measure the effectiveness of the intervention, data were collected using pre-test and post-test. The pre-test and post-test were both composed of a 20-item validated test used to measure integrated science process skills that assessed the level of ISPS of the grade 8 learners. After the pre-test, the intervention was introduced to the participants and applied to the third-quarter topics and discussion in the Science 8 module. The pre-test was conducted at the start of the lesson to measure the level of ISPS of the grade 8 students before the integration of the intervention. The experimental group received the intervention with the integration of the Nearpod application. For the logistics consideration, the researchers provided prepaid WiFi to ensure that all learners could consistently access the Nearpod platform. The learners' access to personal devices was confirmed through a preliminary survey to ensure that the technological requirements for Nearpod were met. No interventions were applied to the control group. Both groups took the post-test after the quarter. The post-test was administered toward the end of the study to determine how much the said intervention contributed to enhancing the level of ISPS of the students in Science 8. After the intervention, the researchers conducted a 10-item validated questionnaire to assess the students' attitude toward their feedback using the Nearpod application.

Data Analysis

The weighted mean of the pre-test and post-test was computed using paired and independent sample t-tests that determined the effectiveness of the Nearpod application in enhancing the integrated science process skills of grade 8 students in science. A questionnaire was used to know the student's feedback and satisfaction with using the application in their learning. The data that were gathered with this questionnaire was presented through descriptive statistics.

An independent sample t-test with assumed equal variances was used to analyze the significant difference between the scores in the pre-test and post-test of the students in the control and experimental groups. On the other hand, paired sample t-tests were used to measure the significant difference between the student's pre-test and post-test in the experimental group. The researchers used the STATA 12 software to analyze the data. In addition, the questionnaire was presented in descriptive statistics to see the students' perceptions and insights after using the application.

Results and Discussion

Learners' Integrated Science Process Skills with Conventional Teaching

Table 4 shows the pre-test result of the control group (8-Aratiles) with a mean value of 5.4 and a standard deviation of 2.25 which can be expressed verbally as "Fairly Satisfactory" for the respondents. The post-test result revealed a mean of 11.87 and a standard deviation of 1.81 which can be described as “Satisfactory” for the respondents. The mean score of the post-test is comparable to the mean score of the pre-test despite the lack of intervention with this group of learners. This suggests that the integrated science process skills of the learners may have naturally improved over time due to the implementation of the spiral progression approach in the curriculum. While the control group did not receive the Nearpod intervention, the traditional teaching methods employed by the teacher, such as questioning, discussion, and hands-on activities, may have still provided opportunities for the learners to practice and develop their ISPS to a certain extent. However, the lack of a more engaging, interactive, and technology-driven approach likely limited the extent of improvements in the control group's ISPS.

The spiral progression approach allows for the revisiting and reinforcement of concepts across grade levels, which may have contributed to the gradual development of the learners' ISPS (Derilo, 2019). Additionally, factors such as student motivation, prior knowledge, and cognitive development during the course of the study may have also played a role in the modest improvements observed in the control group's performance (Athuman, 2017).

Table 4

Results of the Pre-test and Post-test of Control Group (8-Aratiles)

Range	Pre-test		Post-test	
	Frequency	%	Frequency	%
17-20	0	0	0	0
13-16	0	0	1	3.33
9-12	3	10.00	21	70.00
5-8	17	56.67	8	26.67
0-4	10	33.33	0	0
Mean	**5.4**		**9.93**	
Standard Deviation	**2.25**		**1.78**	
Verbal Interpretation	**Fairly Satisfactory**		**Satisfactory**	

Outstanding (17-20); Very Satisfactory (13-16); Satisfactory (9-12); Fairly Satisfactory (5-8); Needs Improvement (0-4)

Learners' Integrated Science Process Skills before and after the Utilization of Nearpod

Before implementing the Nearpod among grade 8 learners, the researchers ensured that all participants in the experimental group had access to mobile phones or any gadgets, which is a crucial requirement for the effective use of Nearpod application. This access to technology allowed the learners to familiarize the interactive features and tools provided by Nearpod. Furthermore, the researchers provided the participants with sufficient time to explore and familiarize themselves with the key features of Nearpod, such as collaborative boards, immersive reader, and various assessment tools. This preparatory phase enabled the learners to become comfortable with the platform and its functionalities, allowing them to utilize the tools effectively during the science lessons.

Table 5

Results of the Pre-test and Post-test of the Experimental Group (8-Cacao)

Range	Pre-test		Post-test	
	Frequency	%	Frequency	%
17-20	0	0	13	43.33
13-16	0	0	17	56.67
9-12	2	6.67	0	0
5-8	16	53.33	0	0
0-4	12	40	0	0
Mean	**5.23**		**16.17**	
Standard Deviation	**2.01**		**1.29**	
Verbal Interpretation	**Fairly Satisfactory**		**Very Satisfactory**	

Outstanding (17-20); Very Satisfactory (13-16); Satisfactory (9-12); Fairly Satisfactory (5-8); Needs Improvement (0-4)

As shown in Table 5, the mean score of the pre-test was 5.23 with a standard deviation of 2.01 and can be described as "Fairly Satisfactory". More than half of the learners obtained a score ranging only from 5-8 in the pre-test. Meanwhile, the mean score of the post-test was 16.17 with a standard deviation of 1.29, and can be viewed as "Very Satisfactory". Almost half of the learners were able to obtain scores ranging from 17-20. This implies that the mean score of the post-test surpassed the mean score of the pre-test indicating an observed improvement in the ISPS of the learners after the utilization of the Nearpod application in science. During the intervention, the researchers systematically outlined Nearpod activities to the lesson structure, incorporating interactive elements such as collaborative boards to reinforce scientific concepts. This application has further enriched the learning environment, making learning more fruitful and productive. The formative assessments and gamification features in Nearpod helped to stimulate the learners' interest, promote active participation, and provide immediate feedback. This structured and interactive approach to teaching and learning facilitated a more engaging and responsive learning environment, ultimately contributing to the imaginable significant improvement in the learners' ISPS.

Several studies reported improvements in students' test scores after implementing Nearpod, with mean scores increasing from 64.7 to 84.8 in one particular study (Pupah and Sholihah, 2022) and from 74.13 to 83.05 in another (Khoirrohmah and Fadhilawati, 2024). Similarly, Nearpod's interactive features were favored by both teachers and students in science classes in high schools even if it did not significantly outperform traditional active learning methods in terms of grades (Lowry-Brock, 2016).

Significant Integrated Science Process Skills Progress

Table 6

Difference in Mean Scores between the Pre-test and Post-Test of the Experimental Group (Cacao)

	N	Mean Score (Mean±SD)	Standard Error	Significance (p<0.05)	T value
Pre-test	30	5.3±2.07	0.38	0.000	-27.14
Post-test	30	16.17±1.29	0.23	0.000	

Table 6 shows the result of the paired samples t-test conducted to statistically determine whether there is a significant difference between the experimental group's pre-test and post-test. A pre-test and post-test were administered to assess the impact of utilizing the Nearpod application. Learners gained an average score of 5.3 out of 20 on the pre-test, which increased to 16.17 on the post-test. This improvement was statistically significant, with post-test scores (*M*=16.17, *SD*= 1.29) being notably higher than pre-test scores (*M*=5.3, *SD*= 2.07); *t*(-27.14), *p=0.000.* Nearpod enabled the experimental group to actively learn the scientific concepts of atoms and the periodic table while practicing their ISPS more meaningfully than in the traditional classroom. As digital natives, the learners could relate well to the lessons through the regulated use of technology, which enriched their overall learning experience. This shift from a most-of-the-time passive, teacher-centered approach to a more interactive, student-centered learning environment facilitated by Nearpod may have contributed significantly to the experimental group's higher scores on the post-test. Utilizing technology-based instruction can be one of the ways teachers can apply the Constructivist approach in their classroom. The Constructivist approach is considered to be the trend nowadays in the 21st-century classroom, allowing learners to meaningfully generate new ideas by using their prior knowledge. It also emphasizes the role of teachers as facilitators of learning and the role of the students as active learners.

In the same way, several studies suggest that Nearpod, as an interactive LMS, has significantly enhanced the teaching and learning process in various educational settings. Different studies argued that Nearpod integration promotes active learning and improves learning outcomes or learners' achievement (Prasetyo, 2024; Hakami, 2020; Ryan, 2017). Regardless of class size or type, the application facilitates real-time interaction between teachers and students and encourages BYOD and flipped classroom strategies (Ryan, 2017). Furthermore, Nearpod has emerged as an effective tool for enhancing engagement, inclusivity, and interactivity in both K-12 and higher education contexts (Buttrey, 2021;

McClean and Crowe, 2017). On the cognitive aspect, Nearpod-assisted digital daily assessments have been claimed to significantly improve learners' creative thinking abilities and metacognitive skills (Siswati et al., 2023). Relatively, a study on critical thinking skills revealed that Nearpod-assisted learning substantially improved students' performance (Wulandari et al., 2023).

Table 7 presents the result of the independent samples t-test to statistically test the significant difference between the pre-test results of the control group and the experimental group. This means that there is no existing intervention yet in the experimental group and the pre-test was conducted before the utilization of Nearpod. The experimental group registered a 5.3 average score while the control group obtained a slightly higher average score of 5.6 from a 20-item assessment. The results elicited a p-value of 0.58 and 0.29 for the control group and experimental group, respectively, which is higher than the alpha value of .05. Therefore, it can be stated that there is no significant difference between the pre-test of the two groups indicating that both groups started at the same baseline level of knowledge or skill. In addition, it must also be noted that both groups came from heterogeneous classes. It further implies that any observed differences in the post-test scores can be easily attributed to the Nearpod application.

Table 7

Mean Score Difference in the Pre-test of the Control Group (Aratiles) and Experimental Group (Cacao)

	N	Mean Score (Mean±SD)	Standard Error	Significance (p<0.05)	T value
Aratiles	30	5.6±2.11	0.38	0.58	-0.56
Cacao	30	5.3±2.07	0.38	0.29	

Recent studies indicate that Nearpod can significantly improve academic performance in higher education settings (Jiménez Rico and Velázquez Sagahón, 2023). Likewise, Nearpod has demonstrated potential in the field of language acquisition for improving L2 learners' reading comprehension and English grammar proficiency (Salvador-Cisneros and Conza-Armijos, 2022; Mastura et al., 2023). On the contrary, a study by Lowry-Brock (2016) revealed although students and teachers like the active learning opportunities offered by Nearpod, the app does not significantly improve student grades when compared to learning with the teacher's use of PowerPoint.

Table 8 revealed the comparison of the post-test scores of the experimental and control groups after the implementation of Nearpod. The results specified that the mean score of the experimental group (M=16.57, SD=1.48) was higher than the mean score of the control group (M=11.78, SD=1.34). The increase was reported to be highly significant with a p=.000 that is less than the alpha value (0.05), t(8.97). These results imply that implementing Nearpod is useful in teaching and enhancing the integrated science process skills of grade 8 learners. Furthermore, the learners have found a more interactive learning opportunity using their mobile phones which is most commonly restricted by the teachers inside the classroom. One way to develop the new generation of learners into globally competent individuals is by allowing them to explore the full potential of technology, enabling them to maximize their learning. The strategic function of the Nearpod features likely played a crucial role in enhancing the experimental group's ISPS. For instance, the "Time to Climb" feature helped make the review sessions more engaging and enjoyable for the learners. This, in turn, may have positively influenced their motivation, attention, and overall learning experience as they were able to review and consolidate their knowledge in a fun and interactive manner. In contrast, the control group, which received conventional teaching methods without Nearpod application, showed slower improvements in their ISPS. Generally, systematic integration of Nearpod's interactive features, which is tailored to the specific ISPS and topics covered in Science 8, appears to have been a key factor in the experimental group's significantly higher performance on the post-test compared to the control group.

Table 8

Mean Score Difference in the Post-test of the Control Group (Aratiles) and Experimental Group (Cacao)

	N	Mean Score (Mean±SD)	Standard Error	Significance ($p<0.05$)	T value
Aratiles	30	11.78±1.34	0.36	0.000	8.97
Cacao	30	16.57±1.48	0.39	0.000	

More studies using well-known online programs could be a potentially creative way to get teachers and students involved in worthwhile teaching and learning activities. The introduction of Nearpod application provides a variety of options that can help teachers analyze and incorporate the application in daily lessons, activities, and assessments more easily. As discussed by Nisa et al. (2023), Nearpod-based interactive science learning resources can improve junior high school students learning activities and critical thinking skills. Specifically, many studies found that the application of Nearpod and mobile-based interactive learning multimedia is effective in enhancing the science process skills of learners (Ahmed and Elmubark, 2022; Xian, 2022; Nugroho and Surjono, 2019). In undergraduate financial accounting classes, Nearpod has been found to increase student interest and positively influence learning experiences when utilized for in-class multiple-choice exams (Shehata et al., 2019). Furthermore, Nearpod, which offers features such as concept mapping, collaborative boards, and web integration, has been applied to 11th-grade science classes to teach complex topics like global warming. These tools facilitate group discussions, peer feedback, and the development of practical solutions that improve classroom interactions (Qi et al., 2022).

Learners' Feedback on the Utilization of Nearpod in Integrated Science Process Skills Enhancement

Table 9 shows the learners' feedback regarding the utilization of Nearpod in enhancing their Integrated Science Process Skills (ISPS). The overall mean obtained was 4.70 with a standard deviation of 0.40 and could be verbally interpreted as "Strongly Agree" for the respondents. This implies that the learners have an overall positive experience and attitude with the Nearpod application as it allows them to participate actively during the discussion, collaborate with co-learners, and express creativity.

These findings are supported by recent studies which also indicate that learners have positive attitudes toward using Nearpod in both classroom and distance learning environments (Musa and Momani, 2022; Gangadharan and Thangavel, 2023). The interactive features as well as the visual aids and simulations of Nearpod improve student participation and comprehension (Paramita, 2023). The integration of Nearpod in teaching has shown positive impacts on learning outcomes and teaching efficiency (Prasetyo, 2024).

Item number 1 obtained the highest mean, which means that the learners strongly agreed with the statement, *"I learn more from the discussion when I use Nearpod."* This means that the Nearpod application reinforces the knowledge that the learners acquire in science. Since they are allowed to use their mobile phones or other gadgets, it probably increases their motivation for learning as long as the teacher ensures proper regulation. On the other hand. Item number 2 had the second-highest mean, which indicates that the respondents strongly agreed with the statement, *"I participate more in our discussion when I use Nearpod".* This implies that the application employed in learning has more likely facilitated understanding and improvement in the learners' class participation in the lesson. Compared to other app presentations, students claimed that Nearpod made their class tasks easier, and this outcome was in line with the findings of other researchers (Gallegos and Nakashima, 2018; Lowry-Brock, 2016; Siani, 2017).

This shift from traditional classroom discussion to blended learning not only enhances students' conceptual understanding of scientific concepts but also integrates their abilities in formulating concepts, solving problems, and thinking critically, which they can transfer to real-world contexts. Nearpod can help teachers engage learners in authentic learning by providing a variety of learning activities and resources, even in big classes (McClean and Crowe, 2017).

Table 9

Learners' Feedback on the Utilization of Nearpod in Integrated Science Process Skills Enhancement

STATEMENT	N	Frequency (f)					Mean	SD	Verbal Description
		SD (1)	D (2)	N (3)	A (4)	SA (5)			
I learn more from the discussion when I use Nearpod.	30	0	0	0	3	27	4.94	0.24	Strongly Agree
I participate more in our discussion when I use Nearpod.	30	0	0	0	5	25	4.88	0.33	Strongly Agree
I collaborate well with my classmates when I use Nearpod.	30	0	0	0	7	23	4.82	0.39	Strongly Agree
I am freer to create my work when I use Nearpod.	30	0	0	0	10	20	4.76	0.44	Strongly Agree
While using Nearpod, I work with my classmates in a way that can help me learn more.	30	0	0	0	7	23	4.76	0.44	Strongly Agree
While using Nearpod, I feel that I can express my creativity more.	30	0	0	0	9	21	4.71	0.47	Strongly Agree
I am aware that my classmates and teacher can view my work when I use Nearpod.	30	0	0	0	7	23	4.82	0.39	Strongly Agree
I like the challenge in every activity given using Nearpod.	30	0	0	0	9	21	4.82	0.39	Strongly Agree
I became more interested in science after using Nearpod.	30	0	0	0	6	24	4.82	0.39	Strongly Agree
. Generally, my work and participation through Nearpod improved my learning in science.	30	0	0	0	13	17	4.59	0.51	Strongly Agree
Grand Mean	**30**	**0**	**0**	**0**	**76**	**224**	**4.79**	**0.40**	**Strongly Agree**

Strongly Disagree (SD) (1.00-1.50); Disagree (D) (1.51-2.50); Neither agree nor disagree (N) (2.51-3.50); Agree (A) (3.51-4.50); and Strongly Agree (SA) (4.51-5.00)

Conclusion

Traditional teaching methods alone are less efficient in enhancing learners' ISPS than the technology-driven, interactive approach facilitated by the Nearpod application. This elaborates on the importance of incorporating engaging, technology-integrated instructional strategies, like Nearpod, to better support the development of essential science process skills among learners. The systematic integration of Nearpod's interactive activities into the lesson structure could be the key factor contributing to the learners' ISPS enhancement. The formative assessments and gamification features help to create a more engaging, responsive, and structured learning environment. The technology-based classroom is the new trend in the 21st century that teaches learners to become adaptive to change. The days of strictly adhering to the old curriculum and using the behaviorist method in the classroom to manage student behavior and run the class are long gone. Students can relate well if a teacher often uses digital media and different technologies since they are digital natives.

The learners who experienced Nearpod integration were able to thrive and adapt well to the Nearpod-enhanced learning setup. Teachers nowadays need to try new techniques to shift away from passive, lecture-based teaching methods towards more interactive, hands-on learning environments. The learners' ability to actively learn scientific content and practice their ISPs through Nearpod's activities indicates that such technology-integrated strategies can help bridge the gap between rote learning and the development of essential process skills. Nearpod application has the power to transform traditional science learning into technology-driven instruction where it cultivates the critical thinking, problem-solving, and scientific inquiry skills that are essential for learner's success in the 21st century. Furthermore, the positive learners' feedback on the Nearpod application further suggests that technology-based tools can foster greater student motivation, participation, and overall satisfaction with the learning process. This has important implications also for improving learners' performance and nurturing a love for science among students.

Recommendations

School administrators and teachers may consider integrating more interactive educational technologies, such as the Nearpod application, in science teaching as it offers a flexible learning modality. By adopting Nearpod and similar interactive platforms, educators can create a more engaging learning environment that promotes the development of essential science process competencies. Schools may prioritize investing in the use of interactive educational technologies, such as the Nearpod application, not only in science but also in other subject areas. The integration of technology-driven platforms can better align with students' learning preferences and facilitate adaptability to the changing landscape of the 21st century. The School Heads may encourage teachers to attend several training workshops that tackle the utilization of advanced technologies, generative AIs, and different educational applications that promote 21st-century skills as it can be part of their reskilling and upskilling initiatives and professional development of the teachers in the field. The integration of Nearpod into other learning areas and its inclusion for other grade levels are highly recommended. Exploring the transferability of this technology-driven approach to enhance competencies in subjects other than science can yield valuable insights for holistic educational development.

Prospective researchers may investigate the long-term retention of skills acquired through Nearpod utilization. Its effectiveness across different educational contexts, such as its impact on specific groups of learners or on other dimensions of learning like critical thinking and creativity, should be further explored. Future studies on this topic may consider incorporating a pilot testing phase to further validate the research instruments and enhance the quality of the data collected. Other methods like pre-experimental research design may also be employed to include all students in using Nearpod inside the classroom. Also, future studies may consider using a qualitative research method to strongly support the result of the quantitative data.

References

Ahmed and Elmubark (2022). An Investigation into using Nearpod as an Interactive Tool to Aid Students' Achievement and Motivation for Learning Educational Technology. *Research on Humanities and Social Sciences*. https://doi.org/10.7176/rhss/12-4-01

Alam, M. (2016). Constructivism: Paradigm Shift from Teacher-Centered to Student-Centered Approach, *International Journal of Indian Psychology*. https://doi.org/10.25215/0401.086

Athuman, J.J. (2017). Comparing the effectiveness of an inquiry-based approach to that of conventional style of teaching in the development of students' science process skills. *International journal of environmental and science education*.

Baharom, M. M., Atan, N. A., Rosli, M. S., Yusof, S., and Abd Hamid, M. Z. (2020). Integration of Science Learning Apps based on Inquiry Based Science Education (IBSE) in Enhancing Students Science Process Skills (SPS). *International Journal of Interactive Mobile Technologies (iJIM)*, 14(09), pp. 95–109.https://doi.org/10.3991/ijim.v14i09.11706

Bibon, M.B. (2022). Teachers' Instructional Practices and Learners' Academic Achievement in Science. *Contemporary Mathematics and Science Education*. https://doi.org/10.30935/conmaths/11816

Buttrey, K. (2021). Inclusion, Engagement, and Nearpod: Providing a Digital Alternative to Traditional Instruction. *Kentucky Teacher Education Journal: The Journal of the Teacher Education Division of the Kentucky Council for Exceptional Children*. https://doi.org/10.61611/2995-5904.1031

Caroy, A. (2023). A Technology Report on Nearpod. *RELC Journal*. http://dx.doi.org/10.1177/00336882231153669

Costa, A.C., de Brito Silva, A.M., Espuny, M., Rocha, A.B., and de Oliveira, O.J. (2023). Toward quality education: Contributions of EdTech to the achievement of the fourth United Nations sustainable development goal. *Sustainable Development*. https://doi.org/10.1002/sd.2742

Del Rosario, K., and Chua, E.N. (2023). Case and Project-Based Learning Lessons in Enhancing Science Process Skills. *International Journal of Science, Technology, Engineering and Mathematics*. https://doi.org/10.53378/353006

Derilo, R. C. (2019). Basic and Integrated Science Process Skills Acquisition and Science Achievement of Seventh-Grade Learners. *European Journal of Education Studies*, 6 (1), 281-294. http://dx.doi.org/10.5281/zenodo.2652545

Ekici, M., and Erdem, M. (2020). Developing Science Process Skills through Mobile Scientific Inquiry. *Thinking Skills and Creativity*. https://doi.org/10.1016/j.tsc.2020.100658

Ferrari, A., Cachia, R., and Punie, Y. (2011). Educational Change through Technology: A Challenge for Obligatory Schooling in Europe. *European Conference on Technology Enhanced Learning*. https://doi.org/10.1007/978-3-642-23985-4_9

Gallegos, C., and Nakashima, H. (2018). Mobile Devices: A Distraction, or a Useful Tool to Engage Nursing Students? *Journal of Nursing Education*, *57*(3), 170–173. https://doi.org/10.3928/01484834-20180221-09

Gangadharan, A., and Thangavel, K. (2023). An Experimental Study of Students' Attitude towards ICT Teaching Process in Educational Psychology. *Thiagarajar College of Preceptors Edu Spectra*. https://doi.org/10.34293/eduspectra.v5i1.05

Garyfallidou, D.M., and Ioannidis, G.S. (2007). Bridging the gap between digital technology and science education. *2007 14th International Workshop on Systems, Signals and Image Processing and 6th EURASIP Conference focused on Speech and Image Processing, Multimedia Communications and Services*, 173-176. https://doi.org/10.1109/iwssip.2007.4381181

Jordan, K. (2020). Beyond Indicators: A Scoping Review of the Academic Literature Related to SDG4 and Educational Technology. *European Conference on Technology Enhanced Learning*. https://doi.org/10.1007/978-3-030-57717-9_26

Jiménez Rico, A., and Velázquez Sagahón, F. J. (2023). Aprendizaje significativo usando la herramienta Nearpod como recurso didáctico tecnológico. *Transdigital*, *4*(8), 1–20. https://doi.org/10.56162/transdigital213

Khoirrohmah, L., and Fadhilawati, D. (2024). Unveiling the Impact of "Nearpod" Application in Elevating Tenth-Grade Reading Narrative Text Comprehension Mastery. *Jurnal Riset dan Inovasi Pembelajaran*. https://doi.org/10.51574/jrip.v4i1.1348

Hakami, M.A. (2020). Using Nearpod as a Tool to Promote Active Learning in Higher Education in a BYOD Learning Environment. *Journal of Education and Learning*, 9, 119-126. https://doi.org/10.5539/jel.v9n1p119

Kidder, K.L. (2021). Nearpod. *The French Review*, 94, 261 – 261. https://doi.org/10.1353/tfr.2021.0163

Lowry-Brock, M. R. (2016). The effect of using Nearpod as a tool of active learning in the high school science classroom.

Mastura, A., Dewi, S. L., Misnar, M., Zuhra, I., and Misnawati, M. (2023). Boosting the L2 Learners' Reading Comprehension Capability by Employing Nearpod Media. *IJORER : International Journal of Recent Educational Research*, *4*(6), 877–888. https://doi.org/10.46245/ijorer.v4i6.431

Metaria, Muniroh, S., and Zubaidi, N. (2024). Enhancing Students' Engagement in FLSP Class: The Impact of Nearpod. *Celtic: A Journal of Culture, English Language Teaching, Literature and Linguistics*. https://doi.org/10.22219/celtic.v11i1.33329

McClean, S., and Crowe, W. (2017). Making room for interactivity: using the cloud-based audience response system Nearpod to enhance engagement in lectures. *FEMS microbiology letters*, 364(6), fnx052. https://doi.org/10.1093/femsle/fnx052

Musa, M.A., and Momani, J.A. (2022). University Students' Attitudes towards using the Nearpod Application in Distance Learning. *Journal of Education and e-Learning Research*. https://doi.org/10.20448/jeelr.v9i2.4030

Naumoska, A., Rusevska, K., Blazhevska, A., and Stojanovska, M. (2022). Nearpod as a tool for increasing students' motivation to learning chemistry. *International Journal of Education and Learning*. https://doi.org/10.31763/ijele.v4i1.616

Naik, A.S., Kathavate, P.N., and Metagar, S.M. (2022). Nearpod: An Effective Interactive ICT Tool for Teaching and Learning Through Google Meet. *IOT with Smart Systems*. http://dx.doi.org/10.1007/978-981-16-3945-6_26

Nisa, I.K., Wahyuni, S., and Budiarso, A.S. (2023). Development of Nearpod Based Interactive Science Learning Media to Improve Students Learning Activities and Critical Thinking Ability of Junior High School. *IJIS Edu: Indonesian Journal of Integrated Science Education*. https://doi.org/10.29300/ijisedu.v5i2.11026

Nugroho, T.H., and Surjono, H.D. (2019). The effectiveness of mobile-based interactive learning multimedia in science process skills. *Journal of Physics: Conference Series*, 1157. https://doi.org/10.1088/1742-6596/1157/2/022024

Oliveira, A.W., and Lathrop, R.L. (2022). Toward a Curiosity Mindset: Reframing the Problem of Student Disengagement from Classroom Instruction. *The European Educational Researcher*.

https://doi.org/10.31757/euer.535

OECD (2023), *OECD Economic Outlook, Volume 2023 Issue 1: A long unwinding road*, OECD Publishing, Paris, https://doi.org/10.1787/ce188438-en.

Palomares-Ruiz, A., Cebrián, A., López-Parra, E., and García-Toledano, E. (2020). ICT Integration into Science Education and Its Relationship to the Digital Gender Gap. *Sustainability, 12*, 5286. https://doi.org/10.3390/su12135286

Paramita, P.E. (2023). Exploring Student Perceptions and Experiences of Nearpod: A Qualitative Study. *Journal on Education*. https://doi.org/10.31004/joe.v5i4.4249

Payot, A., and Deloy, D. (2022). Exploring the Issues and Challenges on the Implementation of Science Strategic Intervention Material (SIM): A Qualitative Inquiry. *International Journal of Research Publications*. https://doi.org/10.47119/IJRP10011011020223965

Perdio, A.C. (2022). Review of PCK Enhancement Programs for Science and Technology Teachers: Prospects for Local Interventions in the Philippines. *EPRA International Journal of Multidisciplinary Research (IJMR)*. http://dx.doi.org/10.36713/epra9900

Prasetyo, A. (2024). Nearpod Integration: What and How Is the Potential for Teaching and Learning? *Journal of Electrical Systems*. https://doi.org/10.52783/jes.2297

Pupah, E.M., and Sholihah, U.A. (2022). Enhancing EFL students' reading learning process in COVID-19 pandemic through Nearpod. *Englisia: Journal of Language, Education, and Humanities*. https://doi.org/10.22373/ej.v9i2.10400

Putra, A.P., Arafik, M., and Pratiwi, I. (2021). Use of Nearpod to Enhance Student Engagement in Online Learning. *2021 7th International Conference on Education and Technology (ICET)*, 298-303. https://doi.org/10.1109/icet53279.2021.9575062

Qi, Y., Shen, E., and Xue, S. (2022). Applying Nearpod to 11th Grade to Improve Classroom Interactions. *Advances in Social Science, Education and Humanities Research*. https://doi.org/10.2991/assehr.k.211220.303

Rios-Zaruma, J., Chamba-Rueda, L.M., Zumba-Zúñiga, M., and Pardo-Cueva, M. (2019). Application of ICT and M-Learning to Improve Collaborative Learning and Interaction Using the Nearpod Platform. *2019 14th Iberian Conference on Information Systems and Technologies (CISTI)*, 1-6. https://doi.org/10.23919/CISTI.2019.8760728

Ryan, B.J. (2017). Near Peers: Harnessing the power of the populous to enhance the learning environment. https://doi.org/10.22554/ijtel.v2i1.16

Salvador-Cisneros, K.A., and Conza-Armijos, H.I. (2022). Implementation of Nearpod for Formative Assessment in Ecuadorian Student Teacher Education. *Proceedings of the 2022 5th International Conference on Education Technology Management*. https://doi.org/10.1145/3582580.3582613

Shehata, N., Mitry, C., Shawki, M., and El-Helaly, M. (2019). Incorporating Nearpod in undergraduate financial accounting classes in Egypt. *Accounting Education, 29*, 137 - 152. https://doi.org/10.1080/09639284.2019.1704806

Siahaan, P., Suryani, A., Kaniawati, I., Suhendi, E., and Samsudin, A. (2017). Improving Students' Science Process Skills through Simple Computer Simulations on Linear Motion Conceptions. *Journal of Physics: Conference Series*, 812. https://doi.org/10.1088/1742-6596/812/1/012017

Siani, A. (2017). BYOD strategies in higher education: Current knowledge, students' perspectives, and challenges. *New Directions in the Teaching of Physical Sciences*, *12*. https://doi.org/10.29311/ndtps.v0i12.824

Silva, J.B., Frasseto, L.D., Machado, L.R., Bilessimo, S.M., and Silva, I.N. (2023). A Pedagogical Model for Integrating Digital Technologies in Education: Workshops on Sustainable Development Goals (SDGS). *J. Inf. Technol. Educ. Res., 22*, 461-479. https://doi.org/10.28945/5219

Siswati, B.H., Suratno, S., Hariyadi, S., Prihatin, J., Wahono, B., and Rosyadah, A. (2023). The effectiveness of Nearpod assisted digital daily assessment to improve the creative thinking abilities and metacognitive skills of science students. *BIO-INOVED: Jurnal Biologi-Inovasi Pendidikan. https://doi.org/10.20527/bino.v5i3.16921*

Snyder, T. (2015). Data Bases and Statistical Systems: Education, Statistical Systems. In International Encyclopedia of the Social and Behavioral Sciences (pp. 769–774). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.92103-2

Suaco, T.P. (2024). The Integration of Sustainable Development Goals in the Secondary Science Curriculum of Cordillera Administrative Region. *Diversitas Journal*. http://dx.doi.org/10.48017/dj.v9iSpecial1.2835

Villar, A.S., Gabriel, E.R., and Farin, E.N. (2022). Academic Performance of Grade V Pupils Using Science Strategic Intervention Material in Zambales, Philippines. *Asian Journal of Education and Social Studies.* https://doi.org/10.9734/ajess/2022/v33i130783

Wulandari, I.A., Maspupah, M., and Sholikha, M. (2023). Analysis of Critical Thinking Skills of Students Assisted with Nearpod Media on Ecosystem Materials. *Pedagonal: Jurnal Ilmiah Pendidikan*. https://doi.org/10.55215/pedagonal.v7i1.6008

Xian, J. (2022). A Critical Evaluation of Nearpod's Usefulness in Teaching K-12 Biology Science Online Classroom. *Advances in Social Science, Education and Humanities Research*. http://dx.doi.org/10.2991/assehr.k.211220.156