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Edpuzzle as Learning Intervention Material in Addressing the Least Learned Competencies in Earth and Life Science

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Abstract. Addressing learners' least learned competencies requires strategic intervention that combines effective pedagogy and authentic assessments. Despite the growing availability of digital tools, video-based learning platforms such as Edpuzzle remain underutilized as an intervention strategy in science education. This quasi-experimental research explores the use of Edpuzzle as an innovative learning intervention material to address the least learned Earth and Life Science competencies, specifically in the topic of metamorphism, among Grade 11 students at Aplaya National High School. The study identified the learning gaps using item analysis of pre-test mean percentage scores (MPS). The intervention was conducted among 30 Grade 11 students divided randomly into two groups: one using the Edpuzzle video-based lesson and the traditional remediation. Pen-and-paper test and perception surveys were employed to measure both learning outcomes and student engagement. Results showed that the Edpuzzle group significantly performed better than the traditional group, with an MPS of 73.33 compared to 42.67. Students who utilized the Edpuzzle found the online platform to be engaging, effective, and suited to their needs, with a mean perception of 3.41 (Strongly Agree). Statistical tests showed a significant difference between the groups, which suggests that the higher average scores of the Edpuzzle group indicate its potential to boost engagement and mastery. The findings suggest that Edpuzzle can support differentiated instruction, which allows teachers to deliver self-paced, engaging lessons, particularly during intervention periods. Meanwhile, schools may consider integrating interactive video tools such as Edpuzzle into their institutional intervention frameworks.

Introduction

The Department of Education (DepEd) in 2016 made it a priority through its learning development agenda that no learners shall be left behind. This guiding principle has become one of the thrusts of the K to 12 curriculum towards inclusive education. This requires diverse teaching strategies and the integration of technology to address learners' diverse needs. Educational institutions must ensure that teachers are well-equipped with necessary content mastery, pedagogical and technological skills, and can design instructional materials and tools aimed at delivering quality education to their learners. Despite these efforts, science education continues to face significant challenges. The curriculum's spiral progression demands that teachers facilitate increasingly complex content across disciplines while fostering scientific literacy, skills, and attitudes (Bug-os et al., 2021). Furthermore, national and international assessments reveal persistent deficiencies. The Philippines ranked 76th in science among 81 countries in the 2022 Programme for International Student Assessment (PISA), highlighting critical gaps in students' problem-solving and critical thinking skills. Similarly, the 2024 National Achievement Test (NAT) results at Aplaya National High School show Grade 10 and 12 students scoring within the Low Proficiency range, underscoring an urgent need for effective data-driven remediation to improve conceptual understanding and academic performance in science.

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In response to these learning deficiencies, DepEd introduced Strategic Intervention Materials (SIMs) to support low-performing learners (DepEd Memo No. 117, s. 2005). The growing use of technology-enhanced SIMs aims to increase engagement and accessibility. With this, teachers are encouraged to use such tools to supplement instruction, embed assessments, and foster a more engaging and inclusive classroom environment. Edpuzzle, an interactive online video platform, transforms passive viewing into active learning through embedded quizzes and feedback. Research suggests that Edpuzzle enhances student motivation (Alvarez et al., 2021; Del Puerto, 2023), achievement (Ramasany et al., 2022), cognitive skills (Giyanto et al., 2020; Rahayu and Bhaskoro, 2022), and independent learning (Romorosa et al., 2023). International peer-reviewed studies support these benefits: Navarrete et al. (2025) conducted a comprehensive review of 257 articles on video-based learning and identified key characteristics that enhance learning effectiveness, while Pacala (2024), upon a systematic review on the impacts of technology-enhanced teaching and learning methods in science education, found that students had generally positive perceptions and experiences with the use of technology in the science classroom. Mayang et al. (2021) also explored the use of Edpuzzle in problem-based learning environments, finding that students exposed to Edpuzzle-assisted instruction demonstrated improved critical thinking skills compared to those in traditional learning settings, though some caution that Edpuzzle's effectiveness depends on proper scaffolding of the science concept towards mastery (Montagud-Romero et al., 2022). These results complement the current study's findings, reinforcing the effectiveness of Edpuzzle as an interactive learning intervention material. Both studies highlight the promise of integrating technology with intentional pedagogical strategies to address least learned competencies and enhance student learning outcomes in science education.

Using Mayer's (2020) cognitive theory of multimedia learning as the study's framework, the Edpuzzle intervention effectively combined visual and verbal elements to help students understand complex science concepts. The study highlighted the value of interactive, multimodal teaching but also noted that some tasks were challenging for students, indicating a need to balance difficulty. Overall, video-based tools like Edpuzzle can enhance active, self-paced learning and support diverse student needs.
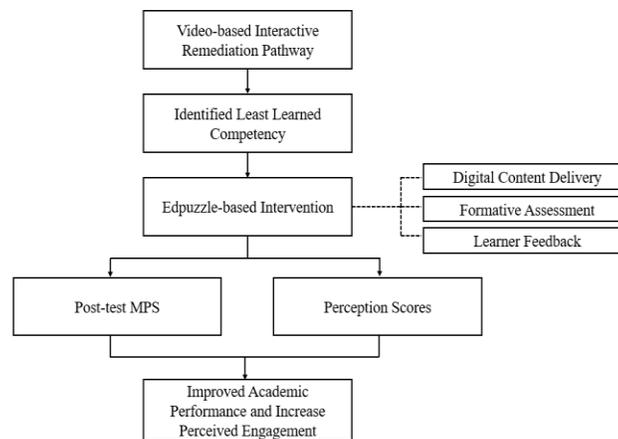

Figure 1. Conceptual Framework of the Study

While the use of Edpuzzle has expanded across subjects, few studies have examined its role as a formal remediation tool aligned with curriculum competencies, particularly in Philippine high schools. To address this gap, the study presents a conceptual framework (figure 1) through a video-based interactive remediation pathway that incorporates Edpuzzle targeted at the least learned science competencies which aims to improve student achievement and inform instructional practices. This model integrates digital content delivery, formative assessment, and learner feedback, which addresses the barriers to student achievement. The pathway is grounded in the theoretical assumption that interactive video-based learning materials enhance academic performance and foster greater learner engagement during intervention periods. Prior studies in video-based learning and educational technology (EdTech) integration support this assumption, aligning with recent findings from the 2024 National Achievement Test reports, which highlight persistent gaps in conceptual understanding among learners. Furthermore, recent EdTech meta-analyses reinforce the efficacy of interactive, feedback-driven tools in promoting meaningful learning outcomes, thereby supporting the relevance and timeliness of the proposed model.

Proposed Innovation, Intervention and Strategy

This research focused on addressing the least learned competencies of senior high school students taking Earth and Life Science as their science core subject for the first semester of SY 2024-2025. To address the least learned competency, the researcher used Edpuzzle video-based learning material that allowed the learners to have an active interface with various activities in a form of video lessons. The video lesson was edited, modified, and customized the parts by adding quiz questions directly to the video stream, and learners answered several questions posted on the video lesson. The video lesson tackled the topics related to the identified least learned competency in the Quarter 1 of Earth and Life Science. Meanwhile, another group of learners attended a regular intervention period where the same learning competency was addressed. At the end of the intervention period for both group of learners who used Edpuzzle and those who attended the regular period, a 15-item competency-based test was administered. Furthermore, survey questionnaires were administered to the group of learners who used Edpuzzle to determine their perceived effectiveness of the application.

Research Questions

This study was conducted to address the least learned competencies of senior high school students taking Earth and Life Science as their science core subject for the first semester of S.Y. 2024-2025 using Edpuzzle video-based material as a learning intervention. Moreover, this study focused on understanding how Edpuzzle video-based material will help improve the learners' acquisition of concepts and the perceived effectiveness of the intervention material to the learners. Specifically, this study seeks to answer the following questions:

1. What is the least learned competency of senior high school learners in Quarter 1 of Earth and Life Science based on the Mean Percentage Scores?
2. What is the mean score of the senior high school learners who use Edpuzzle video-based learning intervention material as compared to traditional intervention sessions when addressing the least learned competency in Quarter 1 of Earth and Life Science?
3. How significant is the difference in the test scores of senior high school learners who use Edpuzzle video-based learning intervention material as compared to traditional intervention when addressing the least learned competency in Quarter 1 of Earth and Life Science?
4. What is the perceived effectiveness of learners after using the Edpuzzle video-based learning intervention material when addressing the least learned competency in quarter 1 of Earth and Life Science?

Methodology

Sources of Data

This research was conducted at Aplaya National High School during the first semester of the school year 2024-2025. This study utilized a quasi-experimental research design involving two groups: an experimental group that received Edpuzzle video-based learning intervention material and a control group that received traditional teacher-led intervention. The participants of the study were selected from the pool of Grade 11 students who scored below 60% in their midterm examination in Earth and Life Science, specifically in topics under Quarter 1.

Sampling Procedure

Thirty (30) students were selected using simple random sampling through a fishbowl method and then randomly assigned into two equal groups (n=15). Group A used the Edpuzzle video-based learning intervention material, while Group B attended a regular teacher-led intervention class. Midterm scores were compared using an independent samples t-test, which confirmed no significant difference in academic performance between the two groups before the intervention, thereby establishing baseline equivalence. To address potential concerns regarding inclusivity and unintended comparisons, the division of the class was handled with sensitivity and transparency. Students were informed that both groups would receive equal instructional attention and that the grouping was for research purposes only. Efforts were made to ensure a positive and respectful classroom environment, minimizing any sense of competition or disparity among students.

Data Collection and Instruments

To identify the least learned competencies, item analysis and mean percentage scores (MPS) from the midterm examination were reviewed. This served as the basis for selecting the video lesson to be incorporated into the Edpuzzle application, as well as for identifying the topic for the regular intervention session. The learners assigned to use Edpuzzle attended an orientation, during which they created their free student accounts and explored the application with the assistance of the researcher.

The next phase involved the actual conduct of the remedial classes using Edpuzzle video-based learning intervention material at the Senior High School Information and Communication Technology (ICT) Laboratory. Each group received one remediation session of 50 minutes, conducted on the same day to minimize external factors. The experimental group attended the session in the Senior High School ICT Laboratory, where the students navigated the assigned Edpuzzle video-based learning intervention material, while the control group received a traditional teacher-led intervention in a separate classroom covering the same content. After the intervention session, both groups answered a 15-item competency-based multiple-choice test to measure their level of achievement. The assessment was content validated by the instructional leaders of the Science Department and tested for reliability using Cronbach's alpha, which yielded a coefficient of 0.83, indicating good reliability.

The final part of the study involved the administration of the Students' Perception Survey (SPS) developed by Espinosa et al. (2012) to determine the perceived effectiveness of using Edpuzzle as a learning intervention material. The SPS is a 10-item questionnaire designed to capture students' perceptions of Edpuzzle. Each statement is rated using a 4-point Likert scale, where 1 means strongly disagree, 2 means disagree, 3 means agree, and 4 means strongly agree. This survey was completed by a group of learners who used the Edpuzzle application.

Data Analysis

This research used a quantitative approach in analyzing the gathered data. The test scores of the learners were analyzed and described using mean and standard deviation to define the distribution and dispersion of scores. A t-test for independent samples using the significance level of 0.05 through the utilization of Jamovi was used to determine the significant difference in the level of achievement of senior high school learners who use Edpuzzle video-based learning intervention material as compared to traditional intervention sessions when addressing the least learned competency in Quarter 1 of Earth and Life Science. Before running the t-test, assumptions were checked to ensure statistical validity. The Shapiro-Wilk test for normality yielded a value of 0.964 ($p=0.393$) indicating that the data were normally distributed. Furthermore, Levene's Test for Homogeneity of Variance showed a value of 1.34 ($p=0.256$) confirming that the assumption of equal variances was met. The t-test results were supplemented with an effect size analysis. A Cohen's d value of -1.19 indicated a large effect size, demonstrating that the Edpuzzle-based remediation led to significantly higher achievement compared to the traditional intervention. The negative value reflects the direction of the difference in favor of the Edpuzzle group. Lastly, the responses of the students in the Students' Perception Survey were analyzed and described using mean and standard deviation.

Results and Discussion

Least Learned Competency of Senior High School Learners in Quarter 1 of Earth and Life Science based on the Mean Percentage Scores

Item Number	MELC Code	Topic	Learning Competency	Difficulty Index (%)	Remarks
32	S11/12 ES-lc-16	Metamorphism	Describe the physical and chemical changes in rocks due to changes in pressure and temperature (metamorphism)	45%	Not Mastered

Note: <75% - Mastered; 51%-74.99% - Nearly Mastered; 0%-50.99 – Not Mastered (Source: Department of Education – Testing Unit Template for Mean Percentage Score and Item Analysis)

Table 1. Least Learned Competency in Earth and Life Science for the First Quarter S.Y. 2024-2025

Table 1 presents the least learned competencies of Grade 11 students based on their performance in the midterm examinations for Earth and Life Science. Item analysis revealed that item number 32 had the lowest difficulty index at 45%, which is interpreted as "Not Mastered." This indicates that the learning competency, "Describe the physical and chemical changes in rocks due to changes in pressure and temperature (metamorphism)," was the most challenging for students during the first quarter. This competency served as the basis for the intervention plan designed by the subject teachers to address conceptual gaps in the topic of metamorphism. Metamorphic rocks form through the transformation of pre-existing rocks under conditions of intense heat and pressure, a process known as metamorphism (Grotzinger & Jordan, 2014, as cited in The Geological Society of Glasgow, n.d.). The low mastery level suggests a disconnect between textbook definitions and students' conceptual understanding, possibly due to the abstract nature of the processes involved, which are difficult to visualize and relate to prior knowledge. According to Mayer's (2020) cognitive theory of multimedia learning, students benefit from instructional materials that integrate visual and verbal information, particularly for complex scientific concepts. Therefore, the intervention not only addressed a content gap but also demonstrated a need for more interactive and multimodal teaching approaches in science education.

Mean Scores of the Senior High School Learners who use Edpuzzle Video-based Learning Intervention Material as compared to Traditional Intervention Sessions when Addressing the Least Learned Competency in Quarter 1 of Earth and Life Science

Item No.	Traditional Intervention	Percentage	Remarks	Edpuzzle Intervention	Percentage	Remarks
1	13	86.67	Mastered	15	100.00	Mastered
2	7	46.67	Not Mastered	11	73.33	Nearing Mastery
3	9	60.00	Nearing Mastery	14	93.33	Mastered
4	6	40.00	Not Mastered	8	53.33	Nearing Mastery
5	2	13.33	Not Mastered	8	53.33	Nearing Mastery
6	2	13.33	Not Mastered	8	53.33	Nearing Mastery
7	12	80.00	Mastered	15	100.00	Mastered
8	11	73.33	Nearing Mastery	13	86.67	Mastered
9	13	86.67	Mastered	12	80.00	Mastered
10	1	6.67	Not Mastered	14	93.33	Mastered
11	0	0.00	Not Mastered	10	66.67	Nearing Mastery
12	4	26.67	Not Mastered	13	86.67	Mastered
13	4	26.67	Not Mastered	5	33.33	Not Mastered
14	5	33.33	Not Mastered	6	40.00	Not Mastered
15	7	46.67	Not Mastered	13	86.67	Mastered
	Mean	6.40		**Mean**	11.00	
	SD	4.39		**SD**	3.30	
	MPS	42.67		**MPS**	73.33	

Table 2. Item Analysis of Senior High School Learners' Test Result Using Edpuzzle Video-Based Learning Intervention Material compared to Traditional Intervention in Addressing the Least Learned Competency in Quarter 1 of Earth and Life Science

Table 2 presents the item analysis of senior high school learners who used Edpuzzle video-based learning intervention material with those who received traditional intervention to address the least learned competency in the first quarter of Earth and Life Science. Scores were analyzed using the mean percentage score and difficulty index. The results reveal that the learners who used Edpuzzle achieved a mean percentage score of 73.33 (M = 11.00, SD = 3.30), while those who received traditional instruction obtained a lower mean percentage score of 42.67 (M = 6.40, SD = 4.39). The Edpuzzle group engaged with interactive video content that included embedded questions directly targeting the least learned competency. For example, one question asked: *"How is contact metamorphism influenced by heat and reactive fluids?"* This was designed to assess students' understanding of mineralogical changes caused by thermal and chemical factors. Another question, *"Which of the following statements is NOT true about metamorphism?"*, challenged students to distinguish scientific misconceptions from accurate geological processes.

These results suggest that the integration of Edpuzzle significantly enhanced students' achievement compared to conventional methods. The effectiveness of Edpuzzle may be attributed to its interactive features, such as embedded questions and self-paced learning, that align with Mayer's (2020) cognitive theory of multimedia learning, which emphasizes dual-channel processing and learner control. Pulukuri and Adams (2020) found that EdPuzzle's interactive features encouraged students to engage in video content before classes, which promotes active learning and improved students' learning accountability. Alvarez et al. (2021) further highlighted Edpuzzle's positive impact on student motivation and performance. Similarly, Ramasamy et al. (2022) found that the application significantly improved student interest, engagement, and achievement, underscoring its potential to enhance science instruction. These findings not only support the use of Edpuzzle in addressing specific learning gaps but also point to its broader instructional value in increasing mastery of complex scientific concepts. This has practical implications for integrating video-based tools into regular classroom practice and professional development programs to improve science learning outcomes.

The Significant Difference in the Test Scores of Senior High School Learners who use Edpuzzle Video-based Learning Intervention Material as compared to Traditional Intervention when Addressing the Least Learned Competency in Quarter 1 of Earth and Life Science

	Statistic	df	p	Decision	Remarks
Test Score	5.12	28.0	<0.001	Reject Ho	There is a significant difference

Table 3. Independent Samples T-Test on the Test Scores of Senior High School Learners Using Edpuzzle Video-Based Learning Intervention Material Compared to Traditional Intervention in Addressing the Least Learned Competency in Quarter 1 of Earth and Life Science

Table 3 presents the difference in the test scores between senior high school learners who received the Edpuzzle video-based learning intervention material and those who underwent traditional intervention. The computed p-value (< .001) was lower than the alpha level of 0.05, leading to the rejection of the null hypothesis. This indicates a statistically significant difference in the achievement as defined by their test scores between the two groups. Furthermore, Cohen's d value of -1.19 reflects a large effect size, suggesting that the Edpuzzle intervention substantially improved student performance compared to the traditional approach. The negative sign simply denotes the direction of the difference in favor of the Edpuzzle group.

These findings reinforce the value of technology-enhanced instruction, particularly when it includes features like embedded questions and learner-paced control. Such features align with multimedia learning principles, which emphasize active cognitive engagement for better retention and understanding (Mayer, 2020). The results are consistent with Del Puerto's (2023) findings, which demonstrated the effectiveness of Edpuzzle video-based learning intervention material in enhancing students' engagement and problem-solving abilities in mathematics. The positive student outcomes in both studies suggest that Edpuzzle is not only content-flexible but also broadly applicable across subjects, including Earth and Life Science. These results have significant pedagogical implications, supporting the integration of EdTech tools into science remediation programs to address persistent learning gaps and improve mastery of complex concepts.

Perceived Effectiveness of Learners after using the Edpuzzle Video-based Learning Intervention Material when Addressing the Least Learned Competency in Quarter 1 of Earth and Life Science

Statements	Mean	Verbal Interpretation
1. The Edpuzzle helped me understand the lesson on Metamorphism.	3.53	Strongly Agree
2. The presentation of the concepts in the Edpuzzle is clear and is fitted to my needs.	3.60	Strongly Agree
3. I could easily understand the explanations provided by the Edpuzzle.	3.47	Strongly Agree
4. Activities and tasks given in the Edpuzzle were very easy.	3.20	Agree
5. The time allotment is adequate for each lesson.	3.40	Strongly Agree
6. Activities and tasks given in the Edpuzzle were very easy.	3.33	Strongly Agree
7. I enjoyed watching and doing all the activities provided in the Edpuzzle.	3.53	Strongly Agree
8. The Edpuzzle used words and terms suited to my reading comprehension.	3.40	Strongly Agree

9. The Edpuzzle inspired and encouraged me to learn more topics in Earth and Life Science.	3.27	Strongly Agree
10. I want to use Edpuzzle in a regular classroom teaching next time.	3.33	Strongly Agree
PERCEIVED EFFECTIVENESS	**3.41**	**Strongly Agree**

Table 4. Perceived Effectiveness of Learners After Using the Edpuzzle Video-based Learning Intervention Material using the Students' Perception Survey (patterned from Espinosa et al., 2012)

The students' perception of the Edpuzzle video-based learning intervention material was measured using a Students' Perception Survey adapted from Espinosa et al. (2012). As shown in Table 4, the overall mean rating for perceived effectiveness was 3.41 (SD = 0.61), verbally interpreted as "Strongly Agree." The highest-rated statement, "The presentation of the concepts in the Edpuzzle is clear and is fitted to my needs," received a mean score of 3.60 (SD = 0.51), indicating strong agreement. In contrast, the statement, "Activities and tasks given in the Edpuzzle were very easy," had the lowest mean of 3.20 (SD = 0.68), interpreted as "Agree." These results suggest that students found Edpuzzle effective in enhancing their understanding and meeting their individual learning needs during remediation. Moreover, the relatively lower score on task ease implies that the platform offered a level of challenge conducive to meaningful learning, consistent with principles of productive struggle in educational design. The interactive and visual nature of Edpuzzle appears to promote deeper engagement, aligning with Mayer's (2020) cognitive theory of multimedia learning, which emphasizes learner control, interactivity, and dual-channel processing. These findings support the integration of Edpuzzle into classroom instruction, particularly for addressing least learned competencies.

Additionally, this aligns with the goals of DepEd Memorandum No. 117, s. 2005, which advocates for the use of Strategic Intervention Materials (SIM) to support learning recovery and differentiated instruction. As emphasized by Mayang et al. (2021), digital media play a critical role in the learning process by enabling both teachers and learners to engage in efficient, interactive instruction. Incorporating video-based tools like Edpuzzle into SIM programs represents a promising strategy to enhance the quality of remedial teaching, especially for low-performing learners who benefit from self-paced, visually supported interventions. This has broader implications for integrating EdTech into formal teacher development programs and scaling evidence-based digital interventions across classrooms.

Conclusion and Implications

The topic with the least learned competency in Earth and Life Science for the first quarter is metamorphism. Based on a difficulty index of 45%, students did not demonstrate mastery of the competency related to the concept of metamorphism. This baseline data informed the development of an intervention plan to address these learning gaps through the integration of Edpuzzle and traditional instruction. The study sought to answer whether Edpuzzle-enhanced instruction significantly improves students' achievement compared to traditional methods. Results showed that students who participated in the Edpuzzle video-based learning intervention material achieved a mean percentage score of 73.33, compared to 42.67 for those who received traditional instruction. An independent sample t-test confirmed a statistically significant difference between the two groups, indicating that Edpuzzle-supported learning produced better outcomes.

The results may be attributed to Edpuzzle's key features, embedded formative assessment for understanding, self-paced navigation, and real-time feedback, which align with multimedia learning theory. This theory posits that students learn more effectively when content is presented through both visual and auditory channels, especially when paired with interactive elements that reduce cognitive overload and increase engagement.

Tied back to DepEd's policy goals, particularly the emphasis on learner-centered, differentiated instruction and the integration of ICT in teaching and learning, this study supports the scalable use of Edpuzzle as a digital tool for bridging science learning gaps. It is recommended that schools integrate Edpuzzle into Strategic Intervention Material programs, supported by professional development training for teachers on video-based pedagogy and assessment design. At the division level, pilot implementations can be expanded and evaluated using larger, more diverse cohorts to inform evidence-based policy and practice in science instruction.

For future research and implementation, the study recommends exploring the long-term effects of Edpuzzle integration, assessing its effectiveness across multiple science competencies, and conducting quasi-experimental or longitudinal studies that control for confounding variables. These steps will provide a more comprehensive understanding of how digital tools can be sustainably and equitably adopted in Philippine science education.

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Competing Interests Statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Data Availability Statement

The data used in this research can be accessed through a formal request to the author of the study.

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Appendices

No appendices are included in this article.