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ECOQUEST: A GAMIFIED ECOSYSTEM LEARNING SUPPLEMENT FOR GRADE 4 LEARNERS

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ABSTRACT

This capstone project introduced a gamified learning supplement to address challenges in traditional ecosystem learning for Grade 4 students. The primary goal was to develop an engaging educational game focused on food chains, life cycles, animal diets, and habitats, while ensuring alignment with curriculum standards. Data were collected from 15 respondents through questionnaires, interviews, and observations. Methodologies such as weighted means and Likert scales were utilized to evaluate acceptability and usability within the SCRUM framework. Findings indicated that traditional instructional methods lacked interactivity and engagement, often failing to meet the needs of diverse learners. EcoQuest, the proposed solution, received an average acceptance rating of 4.80 from educators and IT professionals. In conclusion, EcoQuest demonstrates the potential to enhance ecosystem education through gamification. Future recommendations include integrating a hint system and voice-over features to improve accessibility for diverse learners.

Keywords: Ecoquest , gamification, matatag curriculum, supplemental Learning

INTRODUCTION

Education is important to one's life as it serves as a foundation for acquiring skills and knowledge. Sustainable Development Goal 4 (SDG 4) emphasizes the importance of quality education for all, aiming to ensure inclusive and equitable education and opportunities. (UNICEF, 2023)

For children, to give quality education, the importance of having an engaging learning experience can help them better understand their environment. However, engagingly teaching grade school learners can be challenging, especially for topics that are complex for children, such as the ecosystem which has a lot of information to absorb and learn. Children's attention span is naturally far shorter than adults, as they are more easily distracted and need frequent breaks to rest their minds before they resume their concentration which can hinder their engagement and learning outcomes. (Brain Balance, n.d.).

Also, kids struggle to retain learning and remember their prior knowledge, which they just learned a while ago, and this is especially true when the topic involves a lot of new information, such as vocabulary, spelling words, science topics, etc. (Dogra, 2023).

Traditionally, in the classroom setting students are grouped with one teacher leading the class, resulting in limited individual attention. This lack of personalized interaction can lead to decreased motivation and disengagement among students. Consequently, learners may feel less involved in the learning process and become passive or bored. The effectiveness of learning is compromised, and educational objectives may not be adequately met. Commonly employed teaching methods include lectures, discussions, and recitation-based assignments. (Utopia, 2021)

Effective and interesting teaching strategies play an essential role in today's changing educational environment, especially when it comes to challenging topics like the ecosystem. According to Kumar (2023), interactive learning is crucial in a child's educational path. It encourages participation, creativity, and critical thinking, making the learning experience more effective and pleasant. Children not only learn through interaction, but they also gain a sense of satisfaction from mastering new knowledge and skills. As the world is driven by technological advances, with the use of technology, education may become more interactive and collaborative, this improves student engagement with the topics. They learn by "doing" rather than by memorization, which means that more knowledge is frequently retained. This might be as taking an interactive quiz or as easy as playing educational games. (Oaktree, 2020). Digital educational games have emerged as a novel and noteworthy tool for academic innovation, garnering increasing societal attention and exploration. These games, based on computer and Internet technologies, are highly favored by educators and students alike due to their unique learning methods and interactivity. In contrast to traditional education approaches, digital educational games offer learners a fresh and distinctive learning experience, presenting educational content in a gamified format that simulates real-life scenarios, thus creating a captivating and interactive learning environment (PMC, 2024).

To understand the current process of teaching and learning about the ecosystem, the researchers interviewed the science elementary school teachers at Magsaysay Elementary School. The teachers mentioned the MATATAG Curriculum as the guiding framework they adhere to in their instruction. The MATATAG curriculum is an educational framework that has been designed specifically to improve the teaching and learning mechanisms. The program emphasizes a holistic approach to student development, cultivating a deep appreciation for diverse cultures while instilling essential life skills that will benefit them in various aspects of their lives. The curriculum

implementation is underway and requires the support and coordination of schools, teachers, and school heads. In effect, it will help to transform the education system in the Philippines, ensuring a bright future for Filipinos (A Comprehensive Guide to the MATATAG Curriculum, 2024). The MATATAG Curriculum was launched on August 10, 2023. Before its phased implementation starting SY 2024-2025, the Department of Education (DepEd) shall conduct the pilot implementation of DM 54, s. 2023 or the Pilot Implementation of the MATATAG Curriculum (MATATAG Curriculum Phase 1 SY 2024-2025 | Department of Education, n.d.). According to the science teachers in Magsaysay Elementary School, the common instructional materials used in the classroom are videos from YouTube and textbooks. However, in the teaching process, the focus on topics such as the food chain and life cycle are often briefly discussed before moving on to the next lesson.

According to Imelda Pamara, a science teacher in grade 4, one of the challenges she encountered in teaching is that slow-learning students struggle to grasp their lessons. Additionally, the lack of engaging and interactive materials specifically designed for these topics is a challenge for the teachers. Children might become more engaged in learning if technology is used in the classroom. Because youngsters nowadays are pretty accustomed to the usage of electronic gadgets, incorporating them into schooling would undoubtedly assist in piquing their interest and enhancing their involvement levels. Integrating technology into education provides students with an engaging learning experience, allowing them to remain more interested in the subject without being distracted. Student learning can become more dynamic and engaging by establishing tasks in class that incorporate technology resources, oral presentations, and group participation. Participation can extend beyond verbal communication as well. (Haleem et al., 2022) .

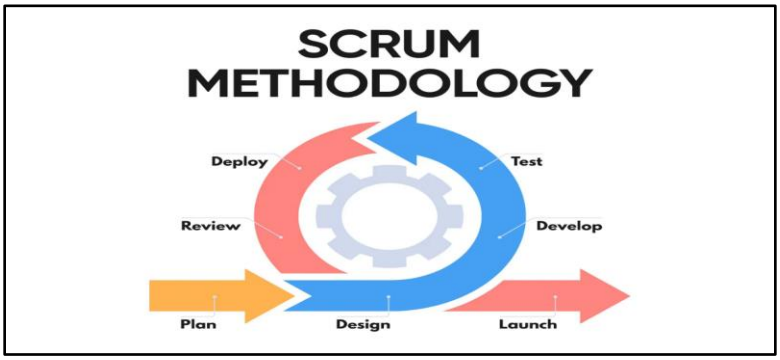
This project aims to develop an immersive gamified learning experience titled “Ecoquest” specifically designed for fourth graders. The Ecoquest game includes four interactive activities: Food Chain, Life Cycle, Animal's Diet, and Animal’s Habitat. Each activity is crafted to deepen students' understanding of ecosystems while engaging them through game-like elements. By merging educational content with playful mechanics, the project seeks to create a fun and enriching learning environment that captures students' interests and fosters a love for science. This game enhances the learning experience by transforming educational content into an interactive and enjoyable adventure through gamification. It encourages children to immerse themselves in the fascinating world of ecosystems and biodiversity, fostering curiosity and engagement. Experience by young participating learners can develop a deeper understanding of these vital concepts while having fun, paving the way for a lifelong appreciation of nature and environmental stewardship.

METHODS

The researchers used both descriptive and developmental research designs. These research designs helped the researchers address the different aspects of the game “Ecoquest”. The descriptive design can be used to understand the preferences and acceptability of the target audience. The developmental design guided the researchers in designing, testing, and developing the game. According to Voxco (2021), the goal of a descriptive research design is to gather data in a systematic way to describe a group of people, situations, or events. More precisely, it assists in providing answers to the research problem of what, when, where, and how questions instead of their why. Additionally, the researchers used a developmental research design. As defined by

Richey (n.d.), it is studying systematically to design, develop, and evaluate instructional programs, processes, and products that need to meet criteria for effectiveness.
Researchers used various methods including thorough research, interviews, and surveys using questionnaires to gather and analyze data effectively. This approach allowed the researchers to gain a deeper understanding of user needs and inform game design. Finally, interviews and surveys were conducted to get user feedback on the Ecoquest. All this information played a crucial role to improve the game and ensure it meets the needs of its target audience.

Figure 1
Scrum Agile Methodology



Note. As shown in Figure 1, the software development model selected for the gamified Ecoquest project, an educational game designed for teachers and students in grade 4 was the SCRUM methodology, known as a subset of Agile. The flexibility and iterative structure of SCRUM, which makes it suitable for the dynamic process of developing an instructional mobile game, served as the foundation for this decision. Given Ecoquest's innovative blend of gaming and teaching, SCRUM's emphasis on frequent review and change was essential.
The data collection process involved using surveys to collect structured feedback and interviews to gain more detailed insights. To test user acceptance and satisfaction with the game, the data were analyzed using simple methods such as the weighted mean and Likert scale. The project targets Grade 4 students at Magsaysay Elementary School, which consists of three sections. These students are the primary users of the gamified system, while the teachers act as facilitators, guiding the students through the system and providing feedback throughout the learning process. To ensure the system's effectiveness and usability, 10 teachers and 5 IT experts participated as survey respondents. Their insights and opinions significantly contributed to the evaluation and improvement of the gamified system. The sample consisted exclusively of Science teachers and IT professionals. Specifically, 10 respondents were Science teachers handling Grades 4, 5, and 6 at Magsaysay Elementary School. These educators use the MATATAG curriculum in their classes and shared their feedback based on their classroom experiences.
The remaining five respondents were IT experts. One is an instructor in the IT Department of Pangasinan State University – Lingayen Campus, while the other four are professionals working in government agencies and private companies. All four external IT professionals hold Bachelor of Science degrees in Information Technology.
This focused group was selected to gather feedback from individuals with relevant educational and technical expertise to assess the pedagogical and functional value of the EcoQuest application. Although the sample size is limited, the professional backgrounds of the respondents

ensured that the feedback was both informed and contextually aligned with the study's objectives.

RESULTS

Challenges encountered in the traditional way of teaching ecosystem

Teachers highlighted that teaching Ecosystems through only textbooks and lectures limits student engagement. Without hands-on or interactive experiences, students find it challenging to grasp real-world ecosystem concepts, which could otherwise improve their understanding. Both teachers and students expressed difficulties in accessing tools specifically designed to support ecosystem learning.

The teachers also noticed that many students struggle to stay focused during standard ecosystem lessons. The absence of multimedia resources makes it difficult to hold students' interest and fully engage them with complex material, often resulting in only a basic understanding of the subject.

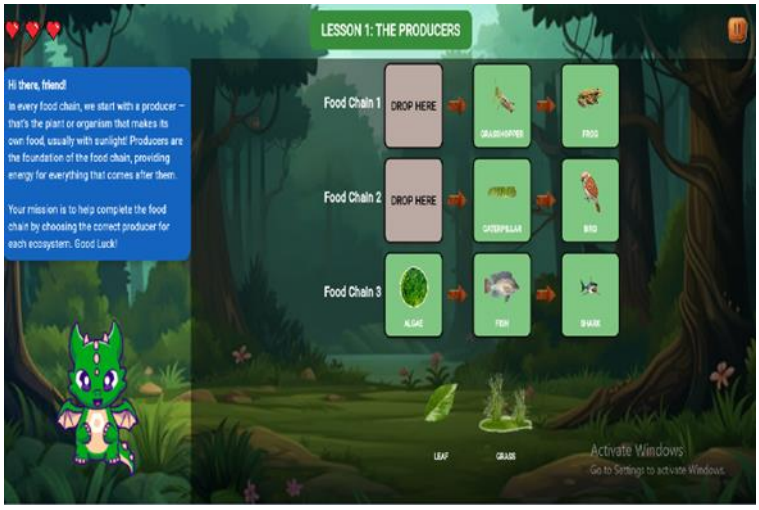
Teachers and students also face barriers with adequate visual aids or resources and a stable internet connection, limiting their ability to use online resources for learning ecosystems. This challenge restricts access to valuable educational content outside the classroom. These challenges highlighted the need for an efficient system to enhance the teaching and understanding of Ecosystem concepts.

Features of Ecoquest

Ecoquest offers a diverse range of engaging game-based learning activities tailored to explore essential concepts within ecosystems. Key topics include the Food Chain, Life Cycle, Animals' Habitat, and Animals' Diet. These thoughtfully designed activities aim to make learning not only enjoyable but also highly interactive for students, fostering a deeper understanding of ecological principles. Figures 2, 3 and 4 are some of the screen display of the Ecoquest.

Figure 2

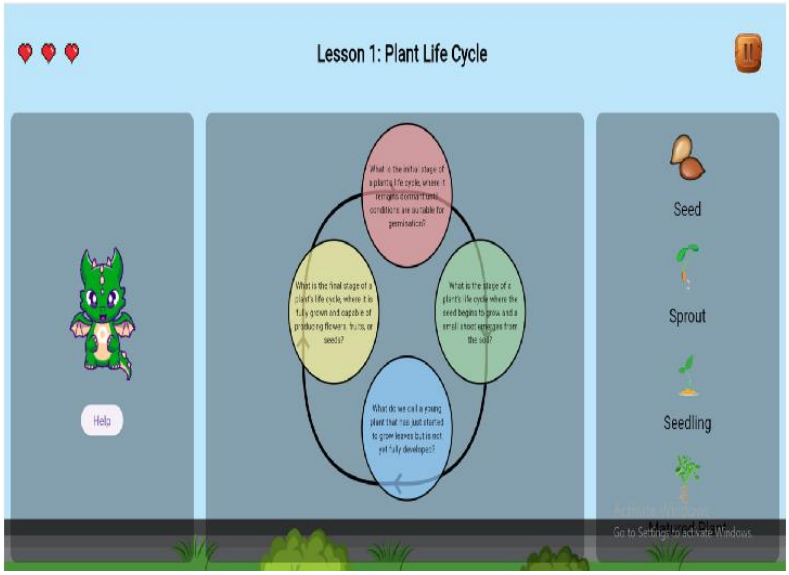
Food Chain Game Screen



Note. In the Food Chain game shown in Figure 2, the student needs to solve the puzzle by connecting producers with their consumers. Through this game, the student learns what producers are and which organisms rely on them for energy. As the game progresses, the student must complete and arrange different food chains in the ecosystem. If the player answered correctly, they can proceed to the next lesson of food chain. However, it they failed to complete each puzzle, they are not allowed to proceed to the next level. Through this interactive learning, students understand energy flow and how organisms depend on each other to survive.

Figure 3

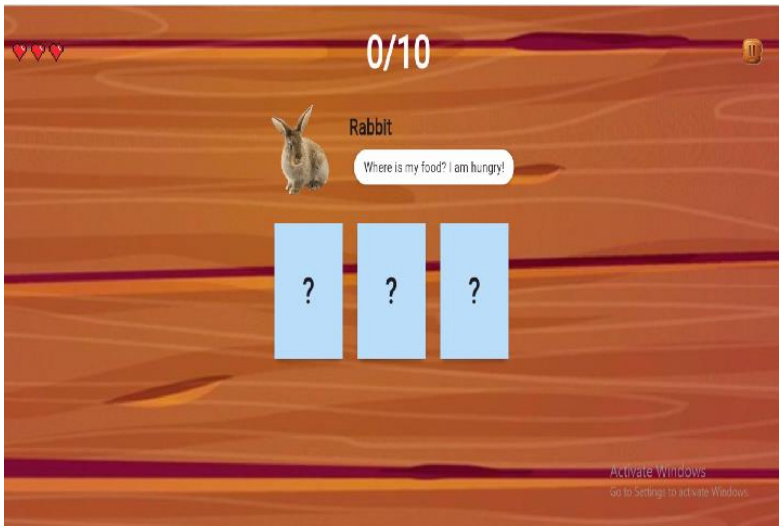
Life Cycle Game Screen



Note. In the Life Cycle game shown in Figure 3, students learn about various life cycles such as butterflies, frogs, and plants. The students arrange the different stages of an organism's life in the correct sequence. Each stage comes with a brief question to provide additional information, allowing students to learn about the specific stages in an engaging and informative way. A correct sequence allows advancement to the next level, while incorrect answers require the student to retry, reinforcing learning through repetition and feedback.

Figure 4

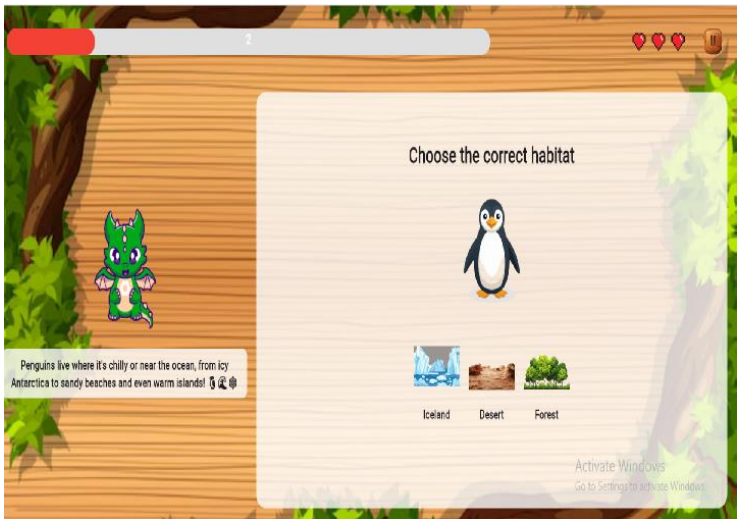
Animal's Diet Game Screen



Note. In the Animal's Diet game shown in Figure 4, students classify animals as herbivores, carnivores, or omnivores. They must match animals with their correct diets through a card-matching game. The cards are shuffled, and students must memorize the correct diet associated with each animal before selecting the right one. This interactive approach effectively deepens students' understanding of the essential roles different animals play in the ecosystem, particularly about their dietary needs, making the concept memorable and impactful.

Figure 5

Animal's Diet Game Screen



Note. The Animal's Habitat game shown in Figure 5, presents activity-engaging challenges for students to match animals with their correct habitats within a time limit. By selecting the appropriate habitat for each animal, students gain a deeper understanding of the rich diversity of animal species and the distinct environments they depend on for their survival. Through these hands-on activities, students gain a deeper understanding of ecosystems, while enjoying a fun and engaging learning experience.

Each game activity is developed to highlight different lessons within the ecosystem, encouraging curiosity and critical thinking among young learners. With Ecoquest, students can embark on an educational adventure that brings the complexities of nature to life. One of the key features of Ecoquest is its alignment with the Matatag Curriculum of the Department of Education for Grade 4. This ensures that every content of the game is designed to match the learning objective set by the curriculum.

In this way, Ecoquest is not only fun and interactive but also has an educational purpose. Based on the Matatag Curriculum, the lessons to be learned include animals and their habitats, where learners determine the places that meet animals' basic needs; the life cycle of animals, where learners learn different stages of development and reproduction; what animals eat, where learners group animals according to their diet; and, lastly, food chains, where learners study the series of living organisms that depend on each other for food. The researchers made the activities in the game aligned with these lessons and its learning objectives.

Another feature of the game system is the layout of the game adjusts to different screen sizes for ease of use on any device. Whether students are playing on a phone screen, a tablet and laptop, or a desktop, they can enjoy a smooth, responsive learning experience without any loss

of functionality. This makes it easy for students to switch between devices while maintaining the same level of engagement and convenience.

These features work together to address the shortcomings of traditional teaching, providing a more engaging and interactive encourages students to learn.

Acceptability Evaluation of the developed Ecoquest

The study's findings indicate that Ecoquest significantly enhances student engagement and comprehension compared to traditional teaching methods. The results showed that teachers found the application to be convenient and engaging, while students demonstrated an improved understanding of ecosystem concepts.

For general usability, Ecoquest received a weighted mean score of 4.3 (Very Acceptable). Teachers and IT experts complimented the easy-to-use interface, clear instructions, and visually appealing design. However, some respondents noted minor areas for improvement, such as refining the navigation system and making instructions even more interactive for grade 4 learners.

Regarding educational suitability, the tool earned a high rating of 4.6 (Highly Acceptable). Teachers reported that Ecoquest effectively helped students understand essential environmental concepts, such as the multiple activities such as the food chain, life cycle, animals' habitat, and animals' diet. The game's ability to balance education and entertainment was also well-received, making learning more interesting for students while ensuring curriculum alignment.

In terms of functionality, Ecoquest scored 4.4 (Very Acceptable). While the drag-and-drop mechanics and scoring system were largely effective, some users experienced minor technical issues such as occasional lagging and slow image loading. These challenges slightly affected the user experience but did not significantly hinder gameplay.

For overall feedback, Ecoquest achieved a high acceptability rating of 4.6 (Highly Acceptable). Teachers expressed their willingness to use the tool in their classrooms and recommended it as an effective supplement to traditional teaching methods.

The study evaluated the acceptability of the Ecoquest Gamified Mobile App using a 5-point Likert Scale.

Table 1

Acceptability Evaluation (Weighted Mean Scores)

Criteria	Weighted Mean	Descriptive Equivalent
General Usability	4.30	Very Acceptable
Educational Suitability	4.60	Highly Acceptable
Functionality	4.40	Very Acceptable
Overall Feedback	4.60	Highly Acceptable
Total Average Score	4.48	Highly Acceptable

While this study focused on assessing the acceptability and usability of EcoQuest, researchers did not conduct pre-test and post-test to measure student learning. As a result, the actual impact of the game on knowledge retention and conceptual understanding was not directly evaluated. Future research should incorporate pre- tests and post-tests to evaluate the actual educational impact of EcoQuest.

CONCLUSIONS AND RECOMMENDATIONS

This paper presents a gamified learning supplement, Ecoquest, designed for fourth-grade students, focusing on the concepts of ecosystems. The development of Ecoquest included features specifically designed to enhance learning and engagement. The application integrates multiple activities such as the food chain, life cycle, animals' habitat, and animals' diet to provide an engaging and immersive educational experience.

These features make learning about ecosystems more effective and enjoyable for students. The feedback from teachers and IT experts revealed that Ecoquest was highly acceptable as a supplemental learning tool. Educators found it easy to use and effective in supporting traditional teaching methods, with gamified features that motivated grade 4 learners. This positive reception highlights its potential to enhance teaching and learning.

The researchers suggest fixing performance issues, such as lag and slow image loading, to make the game run smoother. Improving the drag-and-drop feature would enhance ease of use. Adding more engaging visuals and simplifying the interface would make the game more enjoyable for students. Including support features that are easier to understand, especially for Grade 4 students, such as simple explanations or mini-guides, would also be helpful. Also, recommended adding a voice-over to enhance engagement and accessibility in the game. It helps students understand instruction quickly, supports those with reading challenges, and adds enjoyment with lively, themed voices. This feature makes lessons more memorable and creates a personal connection, boosting interest and participation.

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DECLARATION ON THE USE OF AI TOOLS

In conducting this research, the use of AI tools was used only for correcting grammar and language refinement. No AI assistance was utilized in data analysis, background of the study, or any other parts of the research process. Even though AI was used for English correction, the data analysis, ideas, and findings of the research were entirely the author's work.

REFERENCES

5 signs the traditional approach to education isn't working for your child. (n.d.). *Resilience Charter*. https://www.resiliencecharter.org/charter-school-blog/5-signs-the-traditional-approach-to-education-isnt-working-for-your-child/

Brain Balance Centers. (n.d.). *Normal attention span expectations by age*. Brain Balance Achievement Centers. https://www.brainbalancecenters.com/blog/normal-attention-span-expectations-by-age

Dogra, B. (2023). *How to help kids from forgetting topics | Retention techniques*. https://kidsmartapp.co.uk/content/learning-techniques/retention-techniques/

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in circular economy practices: A comprehensive review. *Circular Economy, 2*, Article 100013. https://doi.org/10.1016/j.cec.2022.100013

IDAP. (2023). SDLC design phase: Definition, activities, goals. *IDAP Blog*. https://idapgroup.com/blog/sdlc-design-phase/

Kumar, R. (2024). How educational mobile apps are transforming students' lives. *eLearning Industry*. https://elearningindustry.com/how-educational-mobile-apps-are-transforming-students-lives

Kumar, S. (2023). Why is interactive learning important for children? *Medium*. https://medium.com

Normal attention span expectations by age. (n.d.). *Brain Balance Centers*. https://www.brainbalancecenters.com/blog/normal-attention-span-expectations-by-age#:~:text=Children's%20attention%20span%20is%20naturally,they%20can%20resume%20their%20concentration

Oaktree. (2020). The relationship between technology and learning. *The Oak-Tree Group of Schools*. https://www.oaktreeschools.co.uk/2020/09/25/the-relationship-between-technology-and-learning/

PubMed Central. (2024). The impact of digital educational games on students' motivation for learning: The mediating effect of learning engagement and the moderating effect of the digital environment. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10783726/

Richey, R. C. (n.d.). Developmental research: The definition and scope. *ERIC*. https://eric.ed.gov/?id=ED373753

Saleem, A. N., Noori, N. M., & Ozdamli, F. (2021). Gamification applications in e-learning: A literature review. *ResearchGate*. https://www.researchgate.net/publication/348161943_Gamification_Applications_in_E-learning_A_Literature_Review

UNICEF. (2023). SDG Goal 4: Quality education. *UNICEF Data*. https://data.unicef.org/sdgs/goal-4-quality-education/

Voxco. (2021). What is descriptive research design? *Voxco*. https://www.voxco.com/blog/descriptive-research-design