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Exploring the Potential of Educational Digital Storytelling (EDS) as a Pedagogical Tool in Geometry

GRECEDES B. NARDO
University of the Philippines Cebu
gbnardo@up.edu.ph

Abstract

Educational Digital Storytelling (EDS) is defined as the creation of succinct narrative videos for pedagogical purposes. It is gaining recognition in academic research due to its multimodal characteristics and significance to the modern world. Numerous studies have demonstrated that digital storytelling enhances student motivation, engagement in learning activities, and educational outcomes. However, only a limited number of studies have employed digital storytelling as an evaluative tool for learning. Additionally, the study domains are predominantly in linguistics rather than in the discipline of Mathematics, specifically Geometry. Therefore, it is imperative to investigate the potential of EDS as an innovative instrument for learning Geometry. The data were gathered through an online survey using Google Forms. Following that, qualitative data analysis was conducted using Braun and Clarke's (2012) Thematic Analysis technique. Subsequently, the themes arising from the data were identified for analysis, conclusion, and recommendation. The research demonstrates that the integration of EDS with digital technologies and Cebuano material culture significantly enhances the comprehension of geometric concepts. EDS serves as a vital tool for the acquisition, comprehension, and enhancement of knowledge. This study advocates for the interdisciplinary integration of Mathematics, Computer Science, and Social Studies courses to consolidate knowledge into a unified educational framework.

Key words: Euclidean Geometry, Material Culture, Qualitative Research, Interdisciplinary, ICT

INTRODUCTION

Educational Digital Storytelling (EDS) represents an innovative pedagogical approach that integrates narrative techniques with multimedia production to effectively convey knowledge and experiences. EDS entails the creation of concise digital narratives—typically in video format—that amalgamate personal voice, visuals, and music to articulate meaning and enhance learning (Robin, 2008). Initially emerging within higher education, EDS has been adopted in K–12 classrooms, where it facilitates the development of 21st-century skills, including creativity, critical thinking, collaboration, and communication (Figa, 2007; Robin, 2016).

In the domain of mathematics education, particularly within the study of geometry, Educational Digital Storytelling (EDS) offers a distinctive opportunity to transition from rote procedural learning to a deeper conceptual understanding. Geometry, characterized by its visual and spatial attributes, is well-suited to the multimodal capabilities of digital storytelling. Walters et al. (2018) elucidate how students can conceptualize geometric problems within narrative contexts—identifying real-world scenarios, integrating mathematical elements, and employing reasoning to derive solutions. Through this methodology, learners are not merely engaged in

problem-solving; they are actively constructing and communicating mathematical meanings, thereby reinforcing their understanding through articulation and visualization.

Theories concerning experiential and self-directed learning, which support the EDS as a potential tool for learning geometry, focus on facilitating students' reflection on personal experiences while engaging in substantive academic tasks (Liu, Huang, & Xu, 2018; Jian & Chen, 2020). This reflective component is particularly relevant in the study of geometry, where learners often encounter difficulties with abstract concepts and specialized terminology (Steele, 1999). Storytelling serves to clarify these abstractions by embedding them in familiar contexts, thereby enhancing engagement and retention.

Moreover, EDS serves as an alternative assessment tool that effectively captures learners' conceptual development and metacognitive awareness. In comparison to traditional paper-and-pencil tests, digital storytelling offers a more comprehensive and nuanced perspective on student learning. It facilitates the integration of affective, cognitive, and psychomotor domains, in accordance with the principles of authentic assessment and formative feedback (Barrett, 2006; Lambert, 2013). Through the creation of a digital story, students not only exhibit their knowledge but also demonstrate their cognitive processes and the application of that knowledge across diverse contexts.

While digital storytelling has been investigated in various disciplines, including history and language arts (Ohler, 2013), its application within the field of mathematics, particularly geometry, remains relatively underexplored, especially in local contexts. Although some studies have addressed the use of EDS in mathematical problem-solving (Dogan & Robin, 2008; Sadik, 2008), there is a paucity of research examining its integration with cultural experiences and identity. The incorporation of personal and cultural storytelling into geometry learning has the potential to promote inclusivity, affirm the diverse backgrounds of learners, and render mathematics more relatable and meaningful.

While the advantages of educational digital storytelling (EDS) are increasingly highlighted, several scholars have identified limitations and concerns that merit attention. A prevalent critique pertains to the time-intensive nature of digital storytelling projects, which may detract from instructional time allocated to other essential curriculum components (Yuksel, Robin, & McNeil, 2011). Educators may encounter difficulties in balancing content delivery with the time and effort required to plan, guide, and assess multimedia-rich student output. Additionally, technological barriers present significant challenges. Not all students possess equal access to devices, software, or reliable internet connections, leading to disparities in participation and performance (Kajder, 2004). Furthermore, teachers may lack the technical expertise or confidence necessary to effectively implement EDS in their classrooms, particularly in under-resourced environments (Kearney, 2011).

From a pedagogical standpoint, critics contend that EDS may emphasize creativity at the expense of mathematical rigor, potentially overshadowing essential content objectives (Reed, 2011). In the context of geometry instruction, where precision, symbolic reasoning, and deductive logic are crucial, the narrative framework of storytelling could result in a superficial treatment of mathematical concepts if not properly guided.

Furthermore, there is a notable concern regarding the reliability of assessments. Although EDS provides valuable qualitative insights into student cognition, standardizing evaluation criteria across diverse projects presents challenges. Educators may encounter difficulties in objectively assessing the equilibrium between content comprehension and artistic expression (Yang & Wu, 2012).

Despite these concerns, numerous scholars have contended that the potential benefits of EDS surpass its limitations, particularly when it is implemented with careful consideration and appropriate support mechanisms. Nevertheless, these critical perspectives highlight the necessity of offering teachers professional development, ensuring equitable access to technology, and aligning storytelling tasks closely with curricular standards.

In this study, educational digital storytelling is conceptualized as a reflective artifact through which students articulate their comprehension of geometric concepts based on their lived experiences. The potential of educational digital storytelling as a learning tool in Geometry is examined, particularly its capacity to capture the depth and authenticity of learners' knowledge.

METHODOLOGY

Research Design and Participants

This study employed a qualitative descriptive research design to explore the potential of Educational Digital Storytelling (EDS) as a tool for enhancing students' conceptual understanding of geometry. This research was conducted in the high school program of a state university in Cebu City, Philippines. The institution comprises approximately 21 full-time faculty members and five part-time lecturers, and serves around 220 students from grades 7 to 12.

Participants were junior high school students in geometry class. The subject teacher and the researcher were two distinct individuals to maintain objectivity in the instructional and research processes. The researcher conducted preliminary activities related to EDS, while the Geometry teacher facilitated the instruction on geometry topics.

Orientation and Intervention

Before incorporating Educational Digital Storytelling (EDS) into the instructional process, the researcher conducted a thorough orientation session for the student participants. This session encompassed an introduction to the concept of EDS, its fundamental components and structure, and an examination of pertinent studies that illustrate its effectiveness in enhancing mathematical comprehension, particularly in the domain of Geometry. To provide students with tangible examples and conceptual clarity regarding the expected outcomes, the researcher presented sample EDS projects previously developed.

The instruction in Geometry was conducted in two distinct phases, each lasting four weeks. During the initial phase, foundational topics such as points, lines, planes, angles, and polygons were delivered by the subject teacher through traditional pedagogical methods. Subsequently, students were required to develop their own EDS projects based on the concepts acquired during the four-week instructional period. These projects were then submitted and made available online for evaluation.

The second phase concentrated on more advanced topics, encompassing quadrilaterals, circles, and three-dimensional geometric solids, which were instructed

over a four-week duration. Upon the conclusion of this phase, students completed a second EDS project, which was similarly submitted online for evaluation.

Evaluation of Student Outputs

All EDS submissions were evaluated by the subject teacher based on two primary domains: (1) content knowledge in Geometry and (2) technical aspects of digital storytelling, including narrative coherence, visual and audio integration, and overall creativity. This approach ensured a balanced assessment that acknowledged both cognitive understanding and technical proficiency.

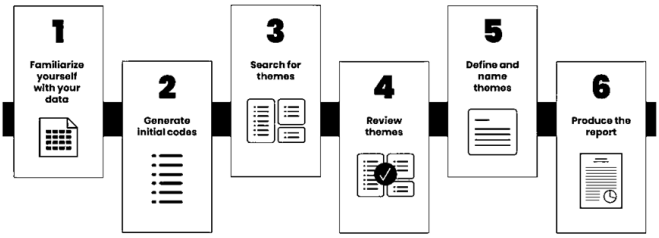
Qualitative Data Collection

To obtain a more comprehensive understanding of students' experiences and perceptions concerning EDS and its impact on their Geometry learning, qualitative feedback was collected through an open-ended online survey conducted via Google Forms. Students were encouraged to articulate their thoughts freely and were given the option to respond in their native dialect to facilitate more genuine and uninhibited reflection.

Data Analysis

Thematic analysis, as delineated by Braun and Clarke (2012), was utilized to examine the qualitative responses. This approach facilitated the identification, examination, and reporting of recurring patterns or themes within the dataset. The analysis adhered to a six-phase process: familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. An overview of this process is presented in Figure 1.

Figure 1: Braun & Clarke's (2012) Thematic Analysis Model



Instrument Validation and Ethical Considerations

The instruments employed in the study, specifically the topic evaluation guide and the open-ended survey questionnaire, were subjected to content validation by a panel of three experts in Mathematics education. Two of these experts possessed academic backgrounds in Pure Mathematics, while the third had a background in Engineering. All three experts had extensive experience in the teaching and pedagogy of Mathematics.

Throughout the study, strict adherence to ethical standards was maintained. Prior to the commencement of data collection, formal approval was secured from the school administration. Informed consent was obtained from parents or legal guardians, and assent was acquired from all student participants, as they were minors (under 18

years of age). Participants were informed of the voluntary nature of their participation and were assured of the confidentiality and anonymity of their responses.

RESULTS and DISCUSSION

To explore students' perspectives on the integration of Educational Digital Storytelling (EDS) in Geometry education, qualitative data were collected through an online survey consisting of open-ended questions. Of the 30 student participants, 28 completed the questionnaire, which was distributed via Google Forms. The questions examined the students' experiences with EDS, emphasizing its effectiveness in enhancing conceptual understanding, developing digital literacy, and fostering an appreciation of local culture. Thematic analysis, as outlined by Braun and Clarke (2012), was employed to identify recurring patterns and themes within the responses.

EDS Facilitated Conceptual Understanding of Geometry Through Real-Life Visualization and Personal Vocabulary

All respondents unanimously recognized that EDS significantly enhanced their comprehension of Geometry concepts. Students reported that contextualizing mathematical ideas within real-life scenarios—through the creation of narrative videos—facilitated their ability to internalize and apply abstract Geometry principles more effectively. This finding supports the proposition that digital storytelling functions as an inclusive and multimodal form of assessment, enabling learners to represent their knowledge through visual, auditory, and linguistic modalities (Spires, 2012; Sun, 2022). Several students underscored the significance of employing familiar vocabulary and local contexts, which aligns with the findings of Juman et al. (2022). These authors observed that activity-based and real-world contextual teaching markedly enhances Geometry learning. Furthermore, this approach resonates with the research of Kim et al. (2023), wherein students cultivated interpersonal and representational competencies by evolving from learners to reflective storytellers. The digital storytelling process thus served as both a reflective and expressive learning tool, consistent with constructivist paradigms (Osman, 2013).

EDS Encouraged Independent Research and Reinforced Understanding of Geometry Concepts

Respondents indicated that the process of developing EDS encouraged them to engage in independent research, thereby enhancing their comprehension of Geometry. The availability of online resources facilitated the rapid acquisition of information and enabled students to synthesize and simplify complex concepts. Several respondents emphasized the role of digital inquiry in promoting metacognitive reflection and conceptual integration, which aligns with Niemi and Niu's (2021) findings regarding digital storytelling's capacity to empower self-directed learning.

The concept of digital learning scaffolding is further supported by Engelbrecht and Borba (2023), who identified a preference among students for online platforms that offer immediate and easily comprehensible content. Respondents, such as Fred and Ina, described how they assimilated mathematical terminology and concepts through repeated exposure and digital exploration, consistent with Vygotsky's (1994, as cited in Steele, 1999) theory of mediated learning. Their digital narratives—published on social media platforms—demonstrate how dynamic, multimedia-based representations can enhance mathematical cognition (Venkatraman et al., 2019).

EDS Promoted Interactive, Enjoyable Learning and Development of Digital Literacy Skills

Students predominantly indicated that the experience of creating EDS was both engaging and enjoyable. Many expressed that the interactive nature of digital storytelling reduced the anxiety commonly associated with learning Geometry and facilitated meaningful educational experiences. These findings align with Niemi and Niu (2021), who discovered that contextualized digital activities—such as exploring Geometry in jewelry or architectural spaces—enhanced both enjoyment and academic engagement.

Furthermore, students reported improvements in technological skills, particularly in video editing and multimedia production. The dissemination of their work on social media acted as a motivational catalyst, fostering the self-directed acquisition of digital competencies. This phenomenon is consistent with the concept of "exhibition culture" as articulated by Engelbrecht and Borba (2023), wherein the public presentation of learning artifacts promotes elevated standards of output and encourages reflective learning.

EDS Augmented Prior Knowledge Gained from Classroom Instruction

Numerous respondents indicated that the process of creating digital stories enhanced their comprehension of Geometry by reinforcing and expanding their previously acquired knowledge. The iterative cycle of research, application, and multimedia representation facilitated learners in establishing connections between prior knowledge and new content, aligning with the experiential learning framework (Institute for Experiential Learning, 2023).

For example, students such as Roy and Stacy reported that utilizing supplementary learning resources while developing their EDS improved their conceptual understanding. This observation is consistent with Jian and Chen's (2020) assertion that EDS functions as a reflective artifact, documenting both the acquisition and application of knowledge, particularly when students are involved in self-reflective, project-based learning.

EDS Fostered Critical Thinking Across Multiple Literacies

The integration of EDS into the educational process has been shown to enhance the development of critical thinking skills, particularly in the evaluation of digital content and engagement in multimodal expression. Respondents reported instances where misconceptions in Geometry were effectively addressed through digital inquiry and collaborative editing processes. These findings are corroborated by Yilmaz et al. (2018), who documented the effectiveness of digital storytelling in rectifying student misconceptions and facilitating conceptual repair through learner-generated content.

In the context of contemporary learners increasingly interacting with complex digital environments, the cultivation of critical digital literacy is of paramount importance (Ungvarsky, 2023). The students' EDS outputs and self-reported reflections demonstrated their capacity to identify credible sources and integrate diverse forms of information, indicating that the activity facilitated both mathematical comprehension and critical media engagement.

EDS Enabled Students to Integrate Cultural Identity and Mathematics Learning

Students reported that the incorporation of local cultural materials into their EDS narratives enhanced both their appreciation of cultural heritage and their engagement with Geometry. Many emphasized that tangible cultural artifacts—such as textiles, crafts, and architecture—offered meaningful contexts for the application of Geometry concepts. This finding is consistent with Reyes' (2019) assertion that contextualizing mathematical learning within students' lived experiences enhances both relevance and engagement.

Respondents, including Xavier and Yvonne, indicated that the activity enhanced their sense of cultural identity and nationalism. This finding aligns with the argument presented by Kim and Li (2020), who posited that multimedia tools enable students to articulate their voices and identities within academic settings. Dewey's observation, as cited in Peppler (2021), that artistic expression cultivates attention and awareness, is pertinent here, as the students' EDS videos functioned as platforms for reflection, identity formation, and knowledge construction.

Furthermore, the integration of abstract mathematical concepts with culturally significant experiences illustrates the reciprocal relationship between art and mathematics, as observed by Kerscher (2023). By linking cultural and academic spheres, EDS facilitated a space for enhanced cognitive and emotional engagement in the study of Geometry.

Educational Digital Storytelling (EDS) has been shown to have the potential to enhance geometry students' conceptual understanding, critical thinking, and digital literacy. EDS employs visual and narrative representations to facilitate students' comprehension and personalization of abstract mathematical concepts by situating them in real-life and culturally relevant contexts. This approach fosters autonomous inquiry, metacognitive reflection, and reinforcement of classroom knowledge. Students reported enjoying the creation of digital stories and recognized their utility in developing technological skills and promoting self-directed learning. Furthermore, the activity supports the development of 21st-century multiple literacies and encourages critical engagement with digital content. Notably, the integration of local cultural elements into storytelling enabled students to connect mathematics with their identities and traditions, thereby enhancing academic engagement and cultural appreciation. These studies underscore the reflective, creative, and culturally responsive benefits of EDS in geometry education.

CONCLUSION AND RECOMMENDATION

The study demonstrates that Educational Digital Storytelling (EDS) constitutes an innovative, effective, and culturally responsive pedagogical approach that enhances students' conceptual understanding and engagement in Geometry. By integrating narrative, visual, and multimedia elements, EDS facilitates the assimilation of abstract geometric concepts by contextualizing them within students' personal experiences and regional material culture. This method fosters a learner-centered educational environment, wherein students participate as content creators, reflective thinkers, and culturally conscious individuals. Through this process, students not only deepen their understanding of Geometry but also advance their digital literacy, critical thinking skills, and capacity for independent learning.

The integration of cultural resources has significantly enhanced the educational experience by connecting traditional mathematical instruction with the identities and contexts of students. This highlights the importance of incorporating socio-cultural relevance into STEM education. The findings underscore the transformative potential of EDS as an alternative evaluative tool that accommodates diverse learning styles, fosters creativity, and facilitates substantial knowledge construction.

Given its multifaceted advantages, Educational Digital Storytelling (EDS) merits further investigation and systematic incorporation into the mathematics curriculum, particularly in areas that students frequently perceive as abstract and challenging to conceptualize. Future research should examine its enduring effects on student performance and propose scalable strategies for its implementation across various educational contexts and disciplines. Through intentional design and ongoing educator support, digital storytelling can act as a catalyst for academic success and student empowerment in the digital era.

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REFERENCES

1. Barrett, H. C. (2006). *Researching electronic portfolios and learner engagement: The REFLECT initiative*. The Journal of Adolescent & Adult Literacy, 50(1), 30–37.
2. Dogan, B., & Robin, B. R. (2008). Implementation of digital storytelling in the classroom by teachers trained in a digital storytelling workshop. In K. McFerrin et al. (Eds.), *Proceedings of the Society for Information Technology & Teacher Education International Conference* (pp. 902–907). AACE.
3. Engelbrecht, J., & Borba, M. C. (2023b). Recent developments in using digital technology in mathematics education. ZDM. https://doi.org/10.1007/s11858-023-01530-2
4. Figa, E. (2007). The Emergent Properties of Multimedia Applications for Storytelling Pedagogy in a Distance Education Online Learning Community. Storytelling, Self, Society, 3(1), 50–72. http://www.jstor.org/stable/41948975 https://www.slideshare.net/safetoleave/grade-7-learning-module-in-math
5. Figa, E. (2007). Digital storytelling in K–12 education. *Multimedia and Internet@Schools*, 14(3), 6–9.
6. Institute for Experiential Learning. (2023, December 27). What is experiential learning? - Institute for Experiential Learning. https://experientiallearninginstitute.org/what-is-experiential-learning/
7. Jian, W., & Chen, D. V. (2020). *A systematic review of educational digital storytelling*. Computers & Education, *147*, 103786. https://doi.org/10.1016/j.compedu.2019.103786
8. Jian, H., & Chen, X. (2020). Digital storytelling as a tool for reflective learning: A case study in teacher education. *International Journal of Emerging Technologies in Learning (iJET)*, 15(1), 200–215.
9. Juman, Z. a. M. S., Mathavan, M., Ambegedara, A. S., & Udagedara, I. G. (2022). *Difficulties in learning geometry component in mathematics and Active-Based learning methods to overcome the difficulties*. Shanlax International Journal of Education, 10(2), 41–58. https://doi.org/10.34293/education.v10i2.4299
10. Kajder, S. (2004). *The tech-savvy English classroom*. Stenhouse Publishers.
11. Kearney, M. (2011). A learning design for student-generated digital storytelling. *Learning, Media and Technology*, 36(2), 169–188. https://doi.org/10.1080/17439884.2011.553623
12. Kerscher, M. M., & Flores, C. R. (2023). Geometry in Art? Scenes of a colonisation of the look and the thinking in mathematics education. Acta Scientiae, 24(8), 42–68. https://doi.org/10.17648/acta.scientiae.7144
13. Kim, D., & Li, M. (2020). *Digital storytelling: facilitating learning and identity development*. Journal of Computers in Education, 8(1), 33–61. https://doi.org/10.1007/s40692-020-00170-9
14. Lambert, J. (2013). *Digital storytelling: Capturing lives, creating community* (4th ed.). Routledge.
15. Liu, Y., Huang, X., & Xu, H. (2018). Digital storytelling and self-directed learning: Students' engagement and perceptions. *Journal of Educational Technology Development and Exchange (JETDE)*, 11(1), 1–15.
16. Niemi, H., & Niu, S. J. (2021). *Digital Storytelling Enhancing Chinese Primary School Students' Self-Efficacy in Mathematics Learning*. Journal of Pacific Rim Psychology, 15, 183449092199143. https://doi.org/10.1177/1834490921991432
17. Ohler, J. (2013). *Digital storytelling in the classroom: New media pathways to literacy, learning, and creativity* (2nd ed.). Corwin Press.
18. Osman, R. (2013). Assessment of prior learning: a South African perspective. In S. Laher & K. Cockcroft (Eds.), Psychological Assessment in South Africa: Research and applications (pp. 509–515). Wits University Press. https://doi.org/10.18772/22013015782.39

19. Peppler, K., Davis-Soylu, H. J., & Dahn, M. (2021). Artifact-oriented learning: a theoretical review of the impact of the arts on learning. Arts Education Policy Review, 124(1), 61–77. https://doi.org/10.1080/10632913.2021.1925609
20. Reed, W. M. (2011). Digital storytelling and the standards movement: Finding a balance. *Journal of Computing in Teacher Education*, 27(2), 79–85.
21. Reyes, J. (2019, March 6). *Conception and Application of contextualization in Mathematics Education*. https://dergipark.org.tr/en/pub/ijesim/issue/43715/454218
22. Robin, B. R. (2008). Digital storytelling: A powerful technology tool for the 21st-century classroom. *Theory Into Practice*, 47(3), 220–228. https://doi.org/10.1080/00405840802153916
23. Robin, B. R. (2016). The power of digital storytelling to support teaching and learning. *Digital Education Review*, 30, 17–29.
24. Sadik, A. (2008). Digital storytelling: A meaningful technology-integrated approach for engaged student learning. *Educational Technology Research and Development*, 56(4), 487–506. https://doi.org/10.1007/s11423-008-9091-8
25. Spires, H. A., Hervey, L. G., Morris, G., & Stelpflug, C. (2012). Energizing Project-Based inquiry: Middle-Grade students read, write, and create videos. Journal of Adolescent & Adult Literacy, 55(6), 483–493. https://doi.org/10.1002/jaal.00058
26. Steele, D. (1999). Student knowledge of geometric concepts: The van Hiele model. *School Science and Mathematics*, 99(5), 244–250.
27. Steele, D. F. (1999). Learning Mathematical Language in the Zone of Proximal Development. Teaching Children Mathematics, 6(1), 38–42. http://www.jstor.org/stable/41197322
28. Sun, L. (2022). *Integrating digital storytelling into science and mathematics instruction*. School Science and Mathematics. https://doi.org/10.1111/ssm.12560
29. Ungvarsky, J. (2023). *Research Starters: Connectivism* [Online Document (Salem Press Encyclopedia)]. Salem Press, Inc. https://research.ebsco.com/c/4sm6pu/viewer/html/2ukzgvrosz?authcallid=96a2219f-5439-9124-9958-272f2b756cd9
30. Venkatraman, S., Overmars, A., & Wahr, F. (2019). Visualization and Experiential Learning of Mathematics for Data Analytics. Computation, 7(3), 37. https://doi.org/10.3390/computation7030037
31. Walters, J., Green, C., Wang, D., & Robertson, D. (2018). Digital storytelling in mathematics: Promoting deep learning and creative engagement. *Contemporary Issues in Technology and Teacher Education*, 18(1), 123–139.
32. Walters, L. M., Green, M., Goldsby, D., & Parker, D. (2018). Digital Storytelling as a Problem-Solving Strategy in Mathematics Teacher Education: How Making a Math-eo Engages and Excites 21st Century Students. Retrieved July 14, 2022, from https://files.eric.ed.gov/fulltext/EJ1227054.pdf
33. Yang, Y.-T. C., & Wu, W.-C. I. (2012). Digital storytelling for enhancing student academic achievement, critical thinking, and learning motivation: A year-long experimental study. *Computers & Education*, 59(2), 339–352. https://doi.org/10.1016/j.compedu.2011.12.012
34. Yılmaz, R., Özdemir, B. G., & Yaşar, Z. (2018). *Using digital stories to reduce misconceptions and mistakes about fractions: an action study*. International Journal of Mathematical Education in Science and Technology. https://doi.org/10.1080/0020739x.2017.1418919
35. Yuksel, P., Robin, B. R., & McNeil, S. G. (2011). Educational uses of digital storytelling around the world. In T. Bastiaens & M. Ebner (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2011* (pp. 1264–1271). AACE.
36. Dovetail Editorial Team. (2023, February 8). Thematic Analysis: A Step-by-Step Guide. https://dovetail.com/research/thematic-analysis/