ASSESSING LEARNING OUTCOMES OF THE DUOLINGO KIDS' APP USING YOUTUBE VIDEOS

by

BLAKE A. EUGENE

B.S., University of New Orleans,

2019

M.S., Middle Georgia State University,

2023

A Research Paper Submitted to the School of Computing Faculty of

Middle Georgia State University in

Partial Fulfillment for the Requirements for the Degree

DOCTOR OF SCIENCE IN INFORMATION TECHNOLOGY

MACON, GEORGIA
2026

Assessing learning outcomes of the Duolingo Kids app using YouTube videos

Blake Eugene, *Middle Georgia State University, blake.eugene@mga.edu*

Abstract

This qualitative study used publicly available YouTube video data to investigate engagement patterns and observable learning outcomes connected with the Duolingo Kids app. Although artificial intelligence-driven and gamified learning systems are becoming increasingly popular in early education, limited research has examined how children interact with these technologies in real-world settings. A qualitative content analysis with thematic analysis was performed to detect patterns of engagement, responses to gamified feedback, and observable indications of language learning. According to the findings, children demonstrated persistent engagement, emotional responsiveness, and adaptive behavior in response to AI-generated feedback. Observable learning markers included vocabulary recognition, pronunciation attempts, and successful task completion. This study advances information technology research by demonstrating how secondary digital video data can be used to examine human-computer interaction in AI-powered educational systems.

Keywords*:* Duolingo Kids, gamification, artificial intelligence, language learning, qualitative analysis

Introduction

Technology-driven education has revolutionized how young students acquire linguistic abilities in the digital age. Mobile applications powered by artificial intelligence (AI) and gamification are increasingly being utilized to encourage interactive and self-paced language learning (Lampropoulos & Sidiropoulos, 2024). The Duolingo Kids app exemplifies this trend by personalizing learning through visual cues, auditory prompts, and reward-based learning mechanisms (Aulia et al., 2020).

Despite its extensive use, limited qualitative research has been conducted to examine how early learners interact with Duolingo Kids in real-world, non-instructional settings. This study addresses this gap by examining publicly available YouTube footage of real user interactions with the Duolingo Kids application. These videos provided naturalistic observations of engagement behaviors, responses to gamified elements, and observable markers of learning outcomes.

To maintain ethical integrity, the study used only secondary, publicly available data. There was no direct interaction with human subjects, and no personally identifiable data was gathered or disclosed.

Although AI-driven and gamified learning platforms have grown in popularity, empirical research examining authentic learner interactions remains limited. Prior research has primarily concentrated on self-reported motivation, usability surveys, and classroom-based assessments, leaving out observed learning behaviors in natural digital contexts (Antonopoulou, 2024; Zhou & Wei, 2023).

The lack of qualitative observational data limited knowledge of how design aspects like gamification, adaptive feedback, and incentive systems influenced engagement and learning outcomes among early learners. Addressing this gap was important to gain a better understanding of how children interacted with AI-powered educational applications outside of supervised teaching environments (Luo, 2023; Zhang & Hasim, 2022).

The purpose of this qualitative study was to examine engagement behaviors and visible learning effects in publicly accessible YouTube videos of children using the Duolingo Kids app. The study used thematic content analysis to identify patterns related to user engagement, responses to gamified feedback, and visual evidence of language acquisition. Prior research has stressed the importance of observational methodologies to better understand real-time engagement in gamified environments (Luo, 2023; Shortt et al., 2021). By demonstrating how secondary video footage might be ethically utilized to examine human–computer interaction in AI-driven educational applications, this study advanced information technology scholarship.

The overarching research question guiding this study was:
RQ: What themes emerge from publicly available YouTube videos regarding engagement behaviors and observable learning outcomes associated with the Duolingo Kids application?

The following sub-questions supported the primary research question:

RQ1: What observable engagement behaviors do children demonstrate while interacting with the Duolingo Kids application?
RQ2: How do gamified features and AI-driven feedback affect children's engagement and persistence when using the Duolingo Kids application?
RQ3: How do observable language learning behaviors indicate the effectiveness of the Duolingo Kids application in supporting early language development?

These questions are significant because they provide insight into not only how users interact with AI-powered educational applications, but also how these interactions contribute to meaningful learning outcomes in real-world settings.

Review of Literature

Language Learning Outcomes with Duolingo

Mobile-assisted language learning (MALL) applications have been widely explored (Zhang & Hasim, 2022). Because of its widespread use and gamified educational design, Duolingo is one of the most studied platforms in this field. Early large-scale reviews indicated that adult learners using Duolingo demonstrated quantifiable gains in vocabulary and reading skills like university-level language courses (Vesselinov & Grego, 2012). Although these results confirmed the platform's instructional effectiveness, the research was carried out in controlled settings with an emphasis on adult learners.

With a focus on learner achievement and satisfaction in formal educational situations, further studies began to assess Duolingo's efficacy. Smith (2024) reported increases in receptive and productive language abilities among adult users; however, the study relied on standardized testing and self-reported metrics rather than direct observation of learner behavior. Similarly, Aulia et al. (2020) showed Duolingo enhanced vocabulary knowledge among students but did not analyze how learners engaged with the tool during use. These results imply that although Duolingo might aid language acquisition, current research offers little understanding of the behavioral processes that take place during real-world, self-directed use, especially among younger learners (Shortt et al., 2021; Luo, 2023).

Gamification and Engagement in Language Learning

In digital learning environments, gamification has been found to be essential for maintaining learner interest. In language learning applications, gamified elements like points, levels, visual rewards, and progress tracking have been demonstrated to boost motivation and perseverance (Zhang & Hasim, 2022).

Lampropoulos and Sidiropoulos (2024) found that gamified instructional designs resulted in higher engagement and enhanced short-term learning results compared to traditional and non-gamified digital training.

Despite these encouraging results, methodological flaws in gamification research have been identified by several systematic studies. According to Luo (2023), a large portion of the work currently in publication mostly relies on surveys, questionnaires, or test results, providing little information about how students engage with gamified features in real time. Antonopoulou (2024) further emphasized that while gamification may boost motivation, the cognitive and behavioral reasons behind engagement are typically inferred rather than objectively evaluated. These gaps underline the necessity for qualitative techniques that capture observable learner activities rather than presumed outcomes.

Duolingo in the Broader Research Landscape

An imbalance in study focus has been brought to light by thorough assessments of studies pertaining to Duolingo. Shortt et al. (2021) showed that most Duolingo studies emphasized usability, learner satisfaction, and motivation, whereas fewer studied engagement behaviors or learning processes during actual app use. Even though Duolingo Kids was created especially for younger students, there is still a dearth of empirical evidence on its actual application.

Seldom have previous studies examined how kids interact with gamified aspects outside of formal school settings, navigate the app, or react to adaptive feedback. Because of this, little is known about how AI-driven incentive systems and personalization work in naturalistic learning contexts. The literature on educational technology and information systems is limited in observational research specifically examining real-world learner interactions with gamified language learning applications (Shortt et al., 2021; Luo, 2023).

Utilizing YouTube Video Information for Academic Studies

A useful technique for researching real-world learning patterns is the utilization of publicly accessible video content. YouTube videos are increasingly being used by researchers to watch how students interact with educational technologies without having to intervene directly (Bello-Bravo et al., 2021; Sui et al., 2022). This approach allows researchers to collect spontaneously occurring behaviors, including verbal answers, emotional reactions, and interaction patterns that may not be visible through surveys or experimental assessments.

Qualitative content analysis of video data has been demonstrated to be particularly helpful for evaluating human–computer interaction and engagement processes (Fazeli, 2023). However, issues such as variable video quality, inadequate demographic information, and selective self-presentation by content makers have been observed (Snelson, 2021). Purposive sampling, open coding practices, and precise inclusion criteria help to lessen these restrictions in qualitative video analysis (Fazeli et al., 2023; Hsieh & Shannon, 2005).

Ethical Considerations in Public Data Research

Even though videos that are accessible to the public might not always fit the legal definition of human subjects' research, ethical issues are still crucial, particularly when the content features children. According to the U.S. Department of Health and Human Services (2022), researchers must minimize potential harm, refrain from needless identifying, and provide a clear justification for using publicly available data. The significance of anonymization and openness when examining social media content for scholarly study was further emphasized by Cristello et al. (2024). Researchers can conduct a responsible

examination of digital learning habits while adhering to ethical requirements and using only secondary, publicly available data (U.S. Department of Health and Human Services, 2022; Snelson, 2021).

Identified Gaps and Justifications for the Study

The literature found several significant gaps. First, most of the research on Duolingo and gamified language learning has focused on adult learners or regulated classroom settings, leaving younger learners in informal settings unexplored. Second, previous research focused mostly on quantitative or self-reported measures, providing minimal insight into observed engagement behaviors. Third, few studies directly addressed ethical frameworks for evaluating publicly available video data of children.

This study addressed these gaps by conducting a qualitative thematic analysis of YouTube videos to investigate engagement behaviors and observable learning outcomes related to the Duolingo Kids application. By focusing on real-world interactions and ethical secondary data use, the study provided fresh insights into human-computer interaction and AI-supported learning in information technology.

Methodology

This study investigated engagement behaviors and observed learning results using a qualitative content analysis approach supplemented by thematic analysis. A qualitative approach was appropriate since the study sought to evaluate naturally occurring behaviors, interactions, and responses in real-world digital learning environments rather than numerically measuring variables or modifying situations.

Data Source and Sample

The data source consisted solely of publicly available YouTube recordings of children interacting with the Duolingo Kids application. There was no direct recruitment or engagement with human subjects.

An initial pool of publicly available YouTube videos was identified using predefined search terms, including *"Duolingo Kids app," "children using Duolingo,"* and *"Duolingo for kids learning."* Approximately 20 videos were initially reviewed for relevance. Videos were excluded if they did not clearly display the Duolingo Kids interface, lacked observable learner interaction, were shorter than two minutes, contained excessive editing that limited behavioral observation, or included identifiable personal information. After applying the inclusion and exclusion criteria, 12 videos were selected for the final analysis because they provided sufficient observable interaction patterns and supported thematic saturation.

A purposive sampling technique was used to identify videos that matched the following inclusion criteria: (1) clear visibility of the Duolingo Kids interface, (2) observable learner interaction with app activities, feedback, or prizes, and (3) a video length of at least two minutes. Videos with explicit personal identifiers, such as full names, geographic areas, or close-up facial imagery, were omitted or anonymized during the research. To ensure thematic saturation, the final dataset consisted of 12 videos that met these requirements.

Data Collection Procedure

Selected videos were stored and replayed several times to aid in familiarization and correct observation. Descriptive observational notes were taken to monitor engagement behaviors such as task perseverance, emotional reactions, vocal replies, task repetition, and reactions to AI-generated feedback. Each video was given a tagged identifier to ensure anonymity and prevent attribution to specific individuals or channels. Because the study used only secondary, publicly available data, no informed consent procedures

or institutional review board approval were necessary. The study adhered to ethical guidelines for doing research with publicly available web data. The use of repeated watching and organized observational notetaking is consistent with recognized qualitative video analysis methods (Fazeli, 2023; Snelson, 2021). Since the study involved publicly available YouTube data featuring minors, additional care was taken to avoid collecting identifying demographic information. Video data were analyzed only for behavioral interaction patterns and educational engagement indicators.

Data Analysis

Data were examined using Braun and Clarke's (2006) six-phase thematic analysis approach to discover patterns of engagement, gamified interaction, and observable learning results. The analysis procedure began with data familiarization via repeated viewings of specific YouTube videos. Descriptive observational notes were taken to document learner actions, emotional responses, interaction patterns, and signs of language practice.

A controlled video selection procedure was employed to maintain uniformity and transparency. Videos were found using predetermined search terms and reviewed according to inclusion criteria such as the visibility of the Duolingo Kids interface, observable learner involvement, and minimum duration. The coding technique used standard qualitative content analysis procedures, such as open coding, category construction, and theme generation (Braun & Clarke, 2006; Hsieh & Shannon, 2005).

Coding was conducted using a multi-stage qualitative approach aided by NVivo qualitative data analysis software. Open coding was first utilized to uncover early behavioral markers of engagement, emotional reaction, and learning interaction. Axial coding was then utilized to organize comparable codes into larger conceptual groups. Finally, selective coding was performed to refine and group themes related to the research questions.

The main coding categories were engagement behaviors, gamification response patterns, and observable language acquisition markers. Task persistence, repeated attempts following incorrect responses, and autonomous problem-solving were among the engagement characteristics observed. Gamification responses included responses to reward animations, point systems, and adaptive feedback methods. Language acquisition metrics included vocabulary recognition, pronunciation attempts, and task completion success.

Learner engagement, user engagement, and perseverance were measured using observable behavioral variables discovered during video analysis. Engagement was identified through visible attention to the activity, which included continuous contact with the program, responsiveness to prompts, and continuing participation without external urging. User persistence was assessed via multiple task attempts after inaccurate responses, willingness to retry activities, and task completion despite initial failures. Other indicators included emotional reaction, such as emotions of joy or displeasure, as well as involvement with gamified aspects such as prizes, animations, and feedback mechanisms. These observable behaviors were found and studied by qualitative content analysis and thematic coding (Braun & Clarke, 2006; Hsieh & Shannon, 2005).

To boost research credibility, data were examined several times to ensure consistency in coding interpretations. Prolonged interaction with video data increased analytical depth and reduced observational bias. Dependability was enhanced by the uniform use of coding definitions across all video observations. Because this study used only publicly available secondary data, no direct human subject interaction occurred, and no personally identifiable information was recorded.
Thematic saturation occurred when subsequent video observations yielded no new behavioral patterns or topics. The final thematic structure revealed learner engagement patterns in AI-driven educational

environments. The qualitative findings' trustworthiness was reinforced by credibility, transferability, dependability, and confirmability methodologies typically employed in qualitative educational technology research.

Results

Participant Overview

The final dataset consisted of 12 publicly available YouTube videos that met inclusion requirements. The videos ranged in duration from 2 to 8 minutes and showed children autonomously interacting with the Duolingo Kids application interface. No identifying demographic information was collected.

Table 1

Summary of Identified Themes and Observations

Theme	Description	Example Observations
Sustained engagement	Continued engagement and repeated task attempts	Multiple retries after incorrect responses
Emotional responsiveness	Positive and negative responses to feedback	Smiling, laughter, temporary frustration, and repeated attempts
Gamification response	Reaction to rewards and incentives	Excitement after earning points or animations
AI feedback interaction	Corrective feedback-driven behavioral modification	Changing answers after prompts
Observable learning indicators	Evidence of language development	Vocabulary recognition and pronunciation attempts

Results from RQ1: Observable Engagement Patterns

The analysis identified three primary engagement patterns:

1. Sustained Task Persistence

Most users made numerous attempts after receiving incorrect responses. Children frequently re-engaged with tasks without external prompting, demonstrating autonomous persistence.

2. Emotional responsiveness to feedback

There was visible excitement (smile, laughter, verbal celebration) shortly after rewarding animations, sound effects, or point accumulation. Frustration behaviors (pauses, loud sighs) were brief and frequently followed by additional attempts.

3. Focused Interaction with Interface Elements

Users regularly responded to visual cues and audio prompts. Children followed on-screen highlights and repeated audio pronunciation prompts as needed.

Results for RQ2: The Impact of Gamification and AI Features

Gamified features were shown to have a considerable influence on user persistence and motivation.

- Reward animations and point systems produced visible excitement and audible affirmation (e.g., “I got it!”).

• Adaptive correction prompts resulted in rapid response adjustments in several instances.
• Progress tracking indicators encouraged work completion until level progression was reached.

AI-powered feedback methods aided immediate error correction, as numerous children changed their responses after receiving corrective voice or visual cues.

Results of RQ3: Observable Learning Indicators

Three observable indicators of language learning were identified:

1. Vocabulary Recognition
Children properly matched words to images after multiple exposures.

2. Pronunciation Attempts
Users spoke words aloud, frequently altering pronunciation after hearing model audio.

3. Successful Task Completion
Individual sessions showed progressive accuracy improvement, particularly in repetitive exercises.

Across videos, behavioral patterns indicated gradual skill reinforcement via repetition and adaptive feedback mechanisms. The findings show observable engagement behaviors reinforced through repetition throughout learning sessions.

Discussion of Findings

The findings of this study provide insight into how the Duolingo Kids app encourages participation and identifiable language learning habits in real-world online settings. Children demonstrated sustained engagement, emotional response, and adaptive interaction while using the program. These behaviors suggest that incorporating gamified components and AI-powered feedback is crucial for sustaining user interest and promoting ongoing involvement.

The findings are in line with earlier studies showing that gamification improves student motivation and perseverance in online learning settings (Lampropoulos & Sidiropoulos, 2024; Zhang & Hasim, 2022). Children's responses to incentives, including point systems and animated rewards, demonstrate how crucial reinforcement mechanisms are for maintaining engagement. Furthermore, repeated attempts after incorrect responses show tenacity, which is an important aspect of language acquisition.

Additionally, the study discovered that AI-driven feedback affected user behavior by encouraging quick repetition and correction. This bolsters previous research highlighting how adaptive feedback can increase learning effectiveness and engagement (Luo, 2023). The ability of children to modify their replies in response to feedback suggests that AI-supported systems can enable real-time learning changes.

All the examined videos revealed observable signs of learning outcomes, such as vocabulary recognition, pronunciation attempts, and successful task completion. These results are consistent with earlier studies on Duolingo's capacity to facilitate language learning (Aulia et al., 2020). However, by showing how similar learning practices take place in unsupervised, real-world contexts as opposed to controlled ones, this study expands earlier research.

Overall, the results highlight how crucial it is to integrate AI-driven feedback with gamification in educational applications to promote early language learning and engagement.

Implications of Findings

The findings of this study have significant ramifications for educational application design as well as information technology. From a technological standpoint, the findings demonstrate how well gamification and artificial intelligence may be used to improve user engagement and aid in learning. Educational application developers can use these insights to create systems with interactive rewards, adaptive learning pathways, and real-time feedback.

According to the findings, mobile learning applications can be effective supplemental resources for early language development in school settings. Children's capacity to remain interested and demonstrate observable learning habits suggests that AI-powered platforms can help with self-directed learning outside of traditional classroom settings. However, while the analyzed videos appeared to reflect genuine user interactions, it is possible that some information was manipulated, staged, or generated using artificial intelligence, which could influence the interpretation of the results.

This study also highlights the importance of qualitative video analysis as an information technology research tool. Researchers can watch real user interactions without directly involving participants by using YouTube content that is accessible to the public. This method can be applied to various digital learning systems and offers an ethical and scalable way to analyze human-computer interaction in real-world scenarios.

Conclusion

Through qualitative analysis of publicly accessible YouTube videos, this study investigated engagement behaviors and observable learning outcomes related to the Duolingo Kids application. The results indicate that, in naturalistic settings, gamified elements and AI-driven feedback support sustained engagement and observable language learning behaviors. This study sheds light on how kids interact with AI-powered educational technology outside of controlled environments by concentrating on real-world user interactions.

Limitations of the Study

This study had several shortcomings despite its merits. First, control over data quality, such as video clarity, consistency, and completeness of observable activities, was restricted by using publicly accessible YouTube videos. Second, the lack of demographic data made it more difficult to extrapolate results to other demographics and educational settings. Third, rather than being measured through formal evaluations, learning outcomes were deduced from observable behaviors, which may have limited the accuracy of the conclusions.

Recommendations for Future Research

To provide a more thorough assessment of learning outcomes, future research should consider using mixed-method approaches that integrate qualitative video analysis with quantitative measurements. To investigate how consistent usage of the Duolingo Kids app affects language development over time, longitudinal research may potentially be carried out. Future research could also examine further AI-powered educational programs to assess learning efficacy and engagement trends across various platforms.

References

Antonopoulou, H. (2024). The role of gamification in enhancing cognitive and neuropsychological learning: A review. *Technium BioChemMed, 11*, 45–61. https://doi.org/10.47577/biochemmed.v11i.11970

Aulia, H. R., Wahjuningsih, E., & Andayani, R. (2020). Effect of Duolingo application on students' English vocabulary mastery. *ELTR Journal, 4*(2), 131–139. https://doi.org/10.37147/eltr.v4i2.71

Bello-Bravo, J., Payumo, J., & Pittendrigh, B. (2021). Measuring the impact and reach of informal educational videos on YouTube: The case of Scientific Animations Without Borders. *Heliyon, 7*(12), e08508. https://doi.org/10.1016/j.heliyon.2021.e08508

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Cristello, J. V., Strowger, M., Moreno, M. A., & Trucco, E. M. (2024). Navigating the modern landscape of social media: Ethical considerations for research with adolescents and young adults. *Translational Issues in Psychological Science, 10*(2), 123–134. https://doi.org/10.1037/tps0000408

Fazeli, S., Sabetti, J., & Ferrari, M. (2023). Performing qualitative content analysis of video data in social sciences and medicine: The visual-verbal video analysis method. *International Journal of Qualitative Methods, 22*. https://doi.org/10.1177/16094069231185452

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Lampropoulos, G., & Sidiropoulos, A. (2024). Impact of gamification on students' learning outcomes and academic performance: A longitudinal study comparing online, traditional, and gamified learning. *Education Sciences, 14*(4), 367. https://doi.org/10.3390/educsci14040367

Luo, Z. (2023). The effectiveness of gamified tools for foreign language learning: A systematic review. *Behavioral Sciences, 13*(4), 331. https://doi.org/10.3390/bs13040331

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., & Akinkuolie, B. (2021). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from 2012 to early 2020. *Computer Assisted Language Learning, 36*(3), 517–554. https://doi.org/10.1080/09588221.2021.1933540

Smith, B., Jiang, X., & Peters, R. (2024). The effectiveness of Duolingo in developing receptive and productive language knowledge and proficiency. *Language Learning & Technology, 28*(1), 1–26. https://doi.org/10.64152/10125/73595

Snelson, C. (2021). Analyzing YouTube videos for educational research: A review of methods and ethical considerations. *International Review of Research in Open and Distributed Learning, 22*(4). https://doi.org/10.19173/irrodl.v22i4.5400

Sui, W., Sui, A., & Rhodes, R. E. (2022). What to watch: Practical considerations and strategies for using YouTube for research. *Digital Health, 8*. https://doi.org/10.1177/20552076221123707

U.S. Department of Health and Human Services. (2022). Guidance on research using publicly available online data. https://www.hhs.gov/ohrp

Vesselinov, R., & Grego, J. (2012). Duolingo effectiveness study: Final report. City University of New York. https://www.vesselinov.com/RV_Duolingo.pdf

Zhang, S., & Hasim, Z. (2022). Gamification in EFL/ESL instruction: A systematic review of empirical research. *Frontiers in Psychology, 13*, 1030790. https://doi.org/10.3389/fpsyg.2022.1030790

Zhou, Y., & Wei, M. (2024). Gamification and language learning. In *Advances in educational technologies and instructional design* (pp. 341–374). https://doi.org/10.4018/979-8-3693-2687-9.ch012