Central Lancashire Online Knowledge (CLoK)

Title	Gamified E-Quizzes with Accountable Academic Role-Play in an Interactive Narrative Scenario
Type	Article
URL	https://clok.uclan.ac.uk/id/eprint/57000/
DOI	https://doi.org/10.1109/SeGAH65397.2025.11168434
Date	2025
Citation	Xu, Dongjie and Doumanis, Ioannis (2025) Gamified E-Quizzes with Accountable Academic Role-Play in an Interactive Narrative Scenario. 2025 IEEE Conference on Serious Games and Applications for Health (SeGAH). ISSN 2330-5649
Creators	Xu, Dongjie and Doumanis, Ioannis

Gamified E-Quizzes with Accountable Academic Role-Play in An Interactive Narrative Scenario

Dongjie Xu
School of Engineering and Computing
University of Central Lancashire
Preston, United Kingdom
dxu6@uclan.ac.uk

Ioannis Doumanis
School of Engineering and Computing
University of Central Lancashire
Preston, United Kingdom
idoumanis@uclan.ac.uk

While previous research on gamified e-quizzes is not scarce, the impact of accountable academic role-play in gamified e-quizzes remains underexplored. Most role-play in gamified e-quizzes is designed to shift students' attention from mundane tasks to engaging adventures or immersive storylines. In practice, however, students, regardless of age, are often motivated by exams and assignment deadlines. Therefore, it may not be necessary to distract them from their academic roles to enhance performance. For example, the teacher-in-role method has been shown to effectively engage young learners and improve learning outcomes. A strong sense of responsibility could serve as a key driving force for improved learning outcomes and engagement.

This study investigated whether pupils' learning performance and engagement could be enhanced through a gamified e-quiz incorporating accountable academic role-play within an interactive narrative, compared to traditional e-quiz usage. Two academic roles, student and teacher, were selected, as they are the most familiar to pupils. In one experimental group, participants' sense of being a student was reinforced by providing a non-player character (NPC) mentor to guide them through the process of answering the e-quiz. In the other group, they assumed the role of a teacher, assisting an NPC student in answering the same questions. The role-plays were embedded within an exam preparation scenario to immerse pupils in an academic environment and heighten their sense of responsibility. A quasi-experimental approach was implemented, as participants were drawn from three schools and were not randomly assigned.

The study found no significant improvements in learning performance or engagement in the experimental groups. After comparing its setup with that of previous research, possible reasons and suggestions were discussed. Future research will aim to deepen the academic role-play experience and create a more immersive virtual academic environment, thereby reinforcing pupils' sense of responsibility to perform better.

Keywords—gamified e-quizzes, accountable academic role-play, digital game-based learning (DGBL)

I. Introduction

Presenting instructional content followed by quizzes is a common practice on e-learning platforms. It can be effective, but not necessarily engaging. Many studies have examined the effects of gamifying quizzes, yielding various findings. The role-playing aspect in these integrations tends to redirect the sense of traditional academic roles, such as the student role, into an immersive fantasy world. The predominant strategy has been to distract students from their academic world with playful elements. However, interest is not the only factor that drives engagement. Responsibility, particularly in the context of academic achievement, can also motivate learners. Students who desire better academic performance can also engage in learning and often achieve better results. Research also indicates that students may achieve more when teaching their peers or parents (teacher-in-role).

This study investigates whether reinforcing academic roles, rather than distracting from them, within a gamified quiz environment can improve pupil engagement and performance. If proven successful, this setup could be an effective alternative to costly storyline development.

A quasi-experiment was conducted during the Mess Day event at the University of Central Lancashire using an in-house-built virtual learning environment (VLE), Learnvoy. There was one control group and two experimental groups: one with a reinforced sense of being a student, and the other with a teacher-in-role setting. T-tests were employed to gain insight into the data collected. Together with this study, the identified studies in the literature review were compared to highlight differences and suggest directions for future research.

II. Literature Review

A. The "Learning and Then Answering Questions" Approach

Answering questions after a learning activity has been a popular approach because it forces students to recall what has been learned, an effective tactic to reinforce memory and assess understanding [1], [2]. This tactic has been adopted by VLEs. For example, platforms such as Khan Academy, Coursera, edX, and LinkedIn Learning primarily deliver content through videos, followed by quizzes to reinforce and consolidate knowledge.

B. Gamified E-Quizzes on Applications

To enhance engagement, many VLEs are built with gamified quizzes that feature points, leaderboards, badges, progress bars, instant feedback, and timers, such as Kahoot!, Duolingo, and

Socrative. Some platforms employ power-ups that allow students to use hints or skip questions, and custom avatars that allow students to personalize their in-game representation, fostering emotional investment, as seen in Adventure Academy and Prodigy. Embedding quizzes within a storyline to make the experience more immersive is also common, as in Prodigy. In summary, each VLE adopts a mix of these approaches (Fig. 1).

C. E-Quiz Gamification on Individual Questions

With the popularity of gamified e-quizzes, there are notable studies exploring this kind of setup. Areed et al. [3] gamified quizzes by incorporating a spinning wheel for random quiz selection, color-coded immediate feedback with green for correct answers and red for incorrect answers, and real-time score tracking (Fig. 2). The app motivated Egyptian university students by showcasing their progress and encouraging iterative quiz attempts. Areed et al. [3] concluded that this format made learning more interactive and engaging than traditional paper-based quizzes. However, the study did not compare gamified e-quizzes with non-gamified e-quizzes.

Another study comparing gamified e-quizzes with traditional paper-based quizzes was conducted by Zainuddin et al. [4]. They utilized three gamified platforms (Socrative, Quizizz, and iSpring Learn LMS) and conducted experiments with Indonesian secondary school students. In addition to the common gamification elements such as points, leaderboards, badges, and real-time feedback, these platforms also provided more advanced features. For example, Playful elements such as memes, which deliver humorous visual feedback based on response accuracy, appeared after each question on Quizizz (Fig. 3), timed questions encouraged focus and quick thinking on Quizizz and iSpring Learn LMS, and Socrative featured competitive space-race games based on correct answers to enhance engagement.
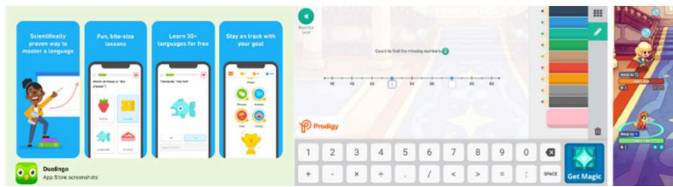

Fig. 1. Duolingo: points, leaderboards, badges, progress bars, instant feedback, and timers; Prodigy: power-ups, avatar, and storyline. Screenshots taken in January 2025 (duolingo.com, play.prodigygame.com)
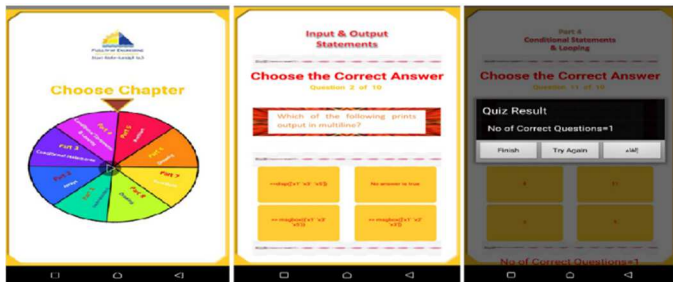

Fig. 2. The gamified quiz by Areed et al. [3]

Fig. 3. A Screenshot of Quizizz, taken in January 2025 (quizizz.com)

Both studies agree on the engagement benefits of gamified e-quizzes compared to paper-based versions. However, Zainuddin et al. [4] found no significant difference in overall learning achievement. Instead of paper-based quizzes, Zhang and Crawford [5] compared gamified e-quizzes with PDF-based quizzes, which can be considered similar in format. Their participants were elementary school students in China. They only used Quizizz to gamify quizzes and concluded that gamified assessments could significantly enhance both engagement and learning outcomes. This aligns with Zainuddin et al.'s [4] findings on engagement, but not with their conclusions regarding learning impact.

Kyung-Mi [6] also conducted a study on gamifying e-quizzes with Korean university students. Unlike the three studies comparing gamified and paper-based quizzes, Kyung-Mi's study compared gamified e-quizzes with conventional e-quizzes using a crossover design (AB/BA model). The platform Quizizz was used to create a game-like environment. Analysis of the collected data indicates that, although gamified e-quizzes may not outperform conventional ones in learning achievement, their primary benefits lie in enhancing engagement and reducing anxiety.

The four studies above used various features to gamify e-quizzes. They all reported success in enhancing engagement, but not necessarily in improving learning achievement. Generally speaking, the features adopted by these studies emphasize playful mechanics such as points, memes, and leaderboards for engagement. However, they lack an immersive background theme, narrative scenario, or fantasy-driven storyline that could fully immerse students in a role-based learning experience.

D. E-Quiz Gamification with Role-Play in a Theme

As mentioned above, besides gamifying individual question interactions, questions can be embedded into a theme, and students can play roles in that theme. The e-quizzes in the study by Scholefield and Shepherd [7] were gamified using a role-playing quiz (RPG) designed to teach password security. Their study involved participants over the age of 18. The RPG was based on a medieval theme where players took the role of a golden knight fighting a dark knight (Fig. 4). No overarching storyline was provided. Health bars, timers, instant feedback, and leaderboards were used to engage participants. The study does not compare the RPG-style quiz to other quiz formats. Instead, it focuses on assessing the engagement and educational
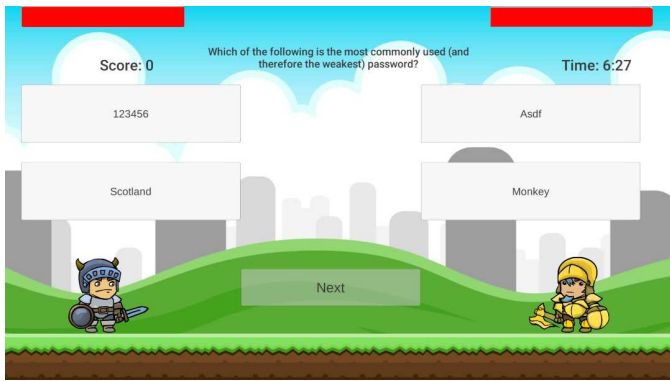
Fig. 4. A role-playing quiz (RPG) by Scholefield and Shepherd

value of the gamified RPG quiz, which was viewed positively by participants.

E. Quiz Gamification with Role-Play in a Storyline

Participants in Scholefield and Shepherd's [7] study commented that the application still felt like a quiz, suggesting that a more developed storyline could enhance immersion more effectively than a static theme. Prodigy is a good example of such an implementation. The platform reported that students aged 8–11 who extensively used it significantly outperformed their peers in California during 2018–2019 [8]. Their other studies also reported increased engagement. Rikkers and Sarmah [9] also conducted research on quiz gamification with role-play in a storyline using university students. Their participants acted as cybersecurity investigators in a decision-making narrative, where each choice influenced the learner's experience. Survey results confirmed its effectiveness in enhancing engagement and learning performance.

F. Gamified Quizzes with Accountable Academic Role-Play in an Interactive Narrative Scenario

Embedding a quiz into a storyline can be more effective than using a static theme, but full development is often more costly. A role-playing interactive narrative scenario offers a middle ground. As the name suggests, in role-playing games, individuals are assigned roles, with or without avatars. In some of the studies reviewed, students assumed roles within adventure storylines or thematic settings. Researchers and platform developers aimed to immerse students in a fantasy world, reducing their sense of an academic role in the learning journey and shifting their focus from potentially monotonous academic tasks to more entertaining activities centered on applying acquired knowledge. However, when people use a VLE, their default role is that of a student, and being a student does not mean they cannot achieve a good score. Students who hold themselves accountable for their progress tend to perform well. Deveci and Ayish [10] confirmed that students who take ownership of their learning tend to achieve higher academic outcomes. However, they do not always practice this consistently. This suggests a gap between awareness of responsibility and responsible behavior.

Additionally, especially for children, role-playing as teachers has been shown to enhance both engagement and learning outcomes [11] [12] [13]. This method, often referred to as the teacher-in-role technique, involves children adopting the role of a teacher and being responsible for explaining concepts or teaching lessons. However, this technique has been applied primarily in classroom settings, and few studies have directly combined e-quiz gamification with academic role-play.

III. HYPOTHESES

As identified in the literature review, gamified e-quizzes can effectively engage learners across age groups when compared to paper-based and conventional digital quizzes, but their effect on learning achievement varies. While some gamified e-quizzes incorporate role-playing elements, these are typically designed to immerse students in fantasy worlds rather than hold them accountable in academic roles, whether as students or teachers. Therefore, two hypotheses were proposed:

- H1: Students will achieve higher scores with gamified e-quizzes incorporating accountable academic role-play in an interactive narrative scenario than with non-gamified e-quizzes

- H2: There is a significant difference in learning performance between role-playing as a student and as a teacher (teacher-in-role) in gamified e-quizzes using an interactive narrative.

IV. METHODOLOGY

A. The Participants

To test the hypotheses, a quasi-experiment was conducted during the 2024 Mess Day event at the University of Central Lancashire (UCLan). Sixty-five pupils aged 8–11 from three primary schools participated. Four pupils who were not native English speakers were excluded from the data analysis, as all participants were required to watch a five-minute English video without captions.

The first group (n = 13) served as a control group. They watched the video and proceeded directly to the quiz without any game elements. The second group (n = 25) experienced a gamified quiz from a student perspective. The third group (n = 23) had a similar experience but adopted a teacher-in-role perspective. Each group came from a different school, and roles were assigned based on a pre-agreed schedule with the schools. While no preference was given in assigning roles, it is acknowledged that pupils from different schools may behave differently, and randomization could not be achieved, which may have influenced the results. For example, pupils from a discipline-oriented school may outperform those from a less structured one, particularly in settings requiring sustained attention and focus, as discipline and time management are known to support academic performance [14]. However, given the short duration of the experiment and the consistency of the learning materials, this impact was expected to be minimal.

B. The Experiment

The UCLan e-learning platform, Learnvoy, was used to deliver the learning content and gamification elements. The materials were organized into four pages. Each page required a password to access, ensuring participants focused only on the activities permitted at each stage. All data was collected anonymously.

After hearing the instructions from the facilitator, participants completed a brief personal questionnaire on the first page. On the second page, the "Taste" phase, they sampled the learning activity to familiarize themselves with the quiz rules:

- Rule 1: Answers must be based solely on the video.

- Rule 2: Participants had only one attempt per question.

- Rule 3: No feedback on correctness was provided, but participants could view their anonymous performance on a leaderboard after completing the quiz.

The third page contained the full learning activity ("Full activity" phase), following the same rules. Participants watched a five-minute video about Big Data - a topic not explicitly covered in their school curriculum [15]. They then answered quiz questions related to how certain Big Data terms were explained in the video. This design aimed to reduce the influence of any prior knowledge, should some participants have encountered the topic before.

The control group answered the same multiple-choice questions in a non-gamified format. The experimental groups received the same questions, but within role-play scenarios. At the end of the quiz, all participants viewed a leaderboard showing their results: green for their own score and orange for their peers (Fig. 5). The activities in the "Taste" and "Full activity" phases were identical, except that the former was intended only for familiarization with the rules. A post-activity survey was completed on the final page.

C. Performance Assessment

Quiz scores were used to evaluate the performance of each group. Ten questions on Big Data were presented, with one point awarded for each correct answer. Accuracy was calculated as the percentage of correct responses. Independent samples t-tests were conducted to compare the accuracy between the control and experimental groups. The analysis aimed to determine whether the experimental intervention resulted in improved performance compared to the control condition.

V. THE GAMIFICATION

Both experimental groups watched the same video as the control group, but subsequently interacted with a non-player character (NPC) while answering questions. The two games shared a similar structure, and the sense of accountable academic role-play was conveyed through a pre-exam preparation narrative and interactive dialogue.

A. Role-Play as a Student

In this scenario, the NPC acted as a mentor and addressed participants as "you," reinforcing the feeling that the participant was personally taking the test.

Fig. 5. Screenshots of Learnvoy as experienced by the control group (The leaderboard includes test accounts)

During the quiz, the NPC presented each question and provided neutral feedback and encouragement after each response. For example: "Nice effort! Let's move on. How is 'Map Reduce' explained in the video?" A cutscene shown after the gamified quiz implied that participants were sitting in an exam room (Fig. 6). This sequence had been introduced during the "Taste" phase.

B. Role-Play as a Professor (Teacher-in-Role)

In this scenario, participants took on the role of a teacher responding to questions posed by an NPC "student," who addressed them as "professor." The more correct answers the participants provided, the better the NPC performed in a later test. This sense of responsibility was introduced during the "Taste" phase. In the quiz, the NPC asked a question, waited for the participant's response, and then replied respectfully to show trust in their "professor." The same cutscene played at the end of the gamified quiz, and the participants saw the NPC student appear in the exam room, reinforcing the idea that they had prepared their 'student' for the test (Fig. 7).

VI. EVALUATION

Table I shows the percentages of accuracy across the groups. The control group had a higher mean accuracy ($M = 60.77$, $SD = 21.78$), while both experimental groups had lower mean accuracy scores (Student: $M = 40.40$, $SD = 21.111$; Professor: $M = 33.04$, $SD = 17.434$). This suggests an unexpected trend, as the experimental groups were hypothesized to outperform the control group. Levene's test for equality of variances was non-significant for both comparisons (vs. Student: $F = 0.019$, $p = 0.890$; vs. Professor: $F = 0.470$, $p = 0.498$), indicating that the assumption of equal variances holds. Therefore, the equal variances assumed t-test was used for interpretation.

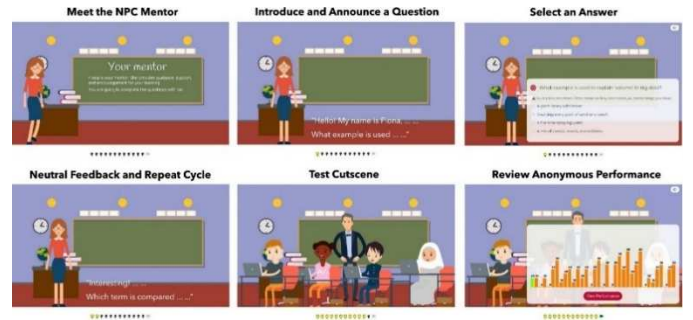
Fig. 6. Learnvoy gamified quiz in the "Role-Play as a Student" condition (leaderboard includes test accounts)
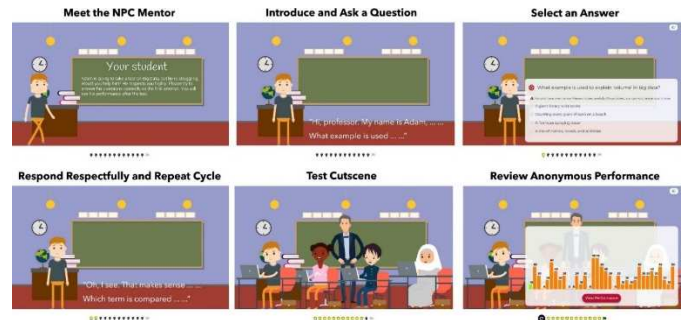

Fig. 7. Learnvoy gamified quiz in the "Role-Play as a Professor" condition (leaderboard includes test accounts)

TABLE I. DESCRIPTIVE STATISTICS FOR ACCURACY SCORES

Group	N	Mean Accuracy (%)	Standard Deviation (SD)	Standard Error Mean
Control group	13	60.77	21.780	6.041
As a student	25	40.40	21.111	4.222
As a professor	23	33.04	17.434	3.635

One-tailed t-tests were performed to determine whether the experimental groups would outperform the control group. The results revealed statistically significant differences for both comparisons (vs. Student: $t(36) = 2.792$, $p = 0.004$; $d = 0.955$, 95% CI [0.243, 1.654]; vs. Professor: $t(34) = 4.188$, $p = 0.001$; $d = 1.453$, 95% CI [0.682, 2.207]). However, the difference was in the opposite direction, with the control group achieving significantly higher accuracy than both experimental groups.

There was no significant difference between the performances of the two experimental groups ($t(46) = 1.310$, $p = 0.197$; $d = 0.378$, 95% CI [−0.195, 0.948]), as indicated by Levene's test for equality of variances ($F = 0.361$, $p = 0.551$).

In the survey, participants were asked to rate how enjoyable the activity was. They were given five response options: "Loved it," "Liked it," "Neutral," "Disliked it," and "Hated it," assigned values from 5 to 1, respectively. Although the enjoyment scores of the experimental groups were slightly higher than those of the control group, the difference was not statistically significant (Table II) (vs. Student: $F = 0.420$, $p = 0.521$; $t(36) = −0.578$, $p = 0.567$; $d = −0.198$, 95% CI [−0.868, 0.476]; vs. Professor: $F = 1.855$, $p = 0.182$; $t(34) = −1.363$, $p = 0.182$; $d = −0.473$, 95% CI [−1.159, 0.220]).

The statistics for enjoyment scores are presented in Table II. The results do not support the initial hypotheses. The level of enjoyment provided by gamification was insufficient to generate enough engagement and, consequently, improve answer accuracy.

VII. DISCUSSION

The reason for the decline in answer accuracy remains unclear, but two potential explanations can be considered: cognitive load and interference. Instead of answering the questions immediately after watching the Big Data video, the experimental groups were first required to learn and follow the rules of the gamified e-quizzes, as well as navigate an additional interface. This extra cognitive load may have overwhelmed their working memory [16], making it more difficult to store and retrieve relevant information during the quiz.

TABLE II. DESCRIPTIVE STATISTICS FOR ENJOYMENT SCORES

Group	N	Mean	Standard Deviation (SD)	Standard Error Mean
Control group	13	3.85	1.068	0.296
As a student	25	4.04	0.935	0.187
As a professor	23	4.26	0.752	0.157

According to Underwood [17], interference can occur when previously learned material impedes the retrieval of newly acquired information. Learning the gamified quiz rules beforehand may have contributed to proactive interference, hindering their ability to recall content from the Big Data video.

Furthermore, participants had to wait for the NPC to present each question and deliver commentary afterwards. This not only introduced further interference but also increased cognitive load, potentially distracting participants and disrupting their ability to retrieve correct answers, thereby leading to memory lapses [18].

Table III provides an overview of the studies reviewed in the literature and this study. The test results indicate that this study did not significantly improve academic performance compared to non-gamified quizzes, aligning with the findings of Zainuddin et al. [4] and Kyung-Mi [6]. In terms of learning engagement, unlike the seven studies reviewed, the setup in this study did not lead to a significant improvement.

Compared to the gamification traits used in other studies, this study relied almost exclusively on accountable academic role-play in an interactive narrative approach. It lacked key motivational elements such as playful features, timers, and competition, as used in other studies. While an anonymous leaderboard was displayed at the end, it may not have effectively conveyed a sense of responsibility to win. Research suggests that the motivational effects of leaderboards depend on continuous exposure [19], and a final-only display is unlikely to produce the same impact. Thus, the relatively simple design and absence of robust motivational elements may have contributed to the contrast with prior studies and should be considered a limitation of the present study.

Therefore, a key takeaway from this study is that accountable academic role-playing, in the form of student or professor (teacher-in-role), within an interactive narrative scenario, does not, on its own, significantly enhance learning performance or engagement. Integrating it with other motivational features, embedding it in a sophisticated storyline, or blending it with competition could lead to more positive outcomes. If future research continues to focus on accountable academic role-play, gradually fostering a sense of responsibility and mapping performance against a responsibility curve could be a valuable direction. More academic roles with specific responsibilities could also be explored, such as prefects, head students, teaching assistants, and head teachers, to examine how varying levels of responsibility and authority influence engagement and learning outcomes.

Another limitation of this study pertains to the sampling method and sample size. Although the inclusion of 61 pupils from three pre-arranged schools provides a foundation for exploratory research, the participants were not randomly selected, and the sample size was relatively small. Future studies should aim to employ random sampling techniques and recruit a larger, more diverse student population to enhance the reliability and generalizability of the findings.

TABLE III.   STUDIES IN GAMIFIED QUIZZES

Study	Enhancing learning performance	Enhancing learning engagement	Gamification traits beyond points, badges, leaderboard, and instant feedback	Participants
Areed et al. [3]	Not tested	Yes	Spinning wheel for random quiz selection, progress tracking, iterative attempts	University students
Zainuddin et al. [4]	No	Yes	Playful elements, timed questions (Quizizz, iSpring), space-race games (Socrative)	Secondary school pupils
Zhang and Crawford [5]	Yes	Yes	Playful elements, timed questions (Quizizz LMS)	Elementary school pupils
Kyung-Mi [6]	No	Yes	Playful elements, timed questions (Quizizz LMS)	University students
Scholefield and Shepherd [7]	Agreed by most participants	Agreed by most participants	Role-playing as knights in a medieval setting with health bars and timers	Adults (18+)
Prodigy [8]	Yes	Yes	Role-playing in an interactive adventure with power-ups and pet battles	Elementary school pupils
Rikkers and Sarmah [9]	Agreed by most participants	Agreed by most participants	Role-play in a decision-making storyline	University students
This study	No	Not significant	Academic role-play in an interactive narrative scenario	Primary school pupils

VIII. CONCLUSION

Integrating role-play elements into gamified quizzes is an emerging educational strategy aimed at enhancing student engagement and learning outcomes. While research specifically combining gamified quizzes and academic role-play is limited, this study aimed to explore this area.

Two hypotheses were tested:

- H1: Students will achieve higher scores with gamified e-quizzes incorporating accountable academic role-play in an interactive narrative scenario than with non-gamified e-quizzes.

- H2: There is a significant difference in learning performance between role-playing as a student and as a teacher (teacher-in-role) in gamified e-quizzes using an interactive narrative.

A quasi-experiment was conducted with 61 pupils aged 8–11 from three primary schools at UCLan during the 2024 Mess Day event. The rules were introduced to all three groups. After a trial to familiarize participants with the activity, they engaged in the designed learning journey. They learned about Big Data through a video and then answered memory-retrieval questions. The experimental groups completed the same quiz as the control group, but in a gamified format. One experimental group role-played as students, while the other assumed the role of a professor (teacher-in-role) in the gamified quiz.

Unfortunately, the results do not statistically support the hypotheses. The control group performed significantly better than the experimental groups in answer accuracy, and the differences in activity enjoyment among the three groups were negligible. Between the two experimental conditions, the group that role-played as a professor (teacher-in-role) showed lower average performance than the student-role group, although this difference was not statistically significant.

In summary, accountable academic role-playing within a scenario alone appears insufficient to enhance learning outcomes or engagement. Future research should focus on integrating academic role-play with other motivational techniques, particularly by gradually fostering a sense of responsibility, possibly through specific roles with varied responsibilities, to better support engagement and performance.

REFERENCES

[1] H. L. Roediger, P. K. Agarwal, M. A. McDaniel, and K. B. McDermott, "Test-enhanced learning in the classroom: Long-term improvements from quizzing.," *Journal of Experimental Psychology: Applied*, vol. 17, no. 4, pp. 382–395, 2011, DOI:10.1037/a0026252.

[2] K. B. McDermott, P. K. Agarwal, L. D'Antonio, H. L. Roediger, and M. A. McDaniel, "Both multiple-choice and short-answer quizzes enhance later exam performance in middle and high school classes.," *Journal of Experimental Psychology: Applied*, vol. 20, no. 1, pp. 3–21, 2014, DOI:10.1037/xap0000004.

[3] M. F. Areed, M. A. Amasha, R. A. Abougalala, S. Alkhalaf, and D. Khairy, "Developing gamification e-quizzes based on an android app: the impact of asynchronous form," *Education and Information Technologies*, vol. 26, no. 4, pp. 4857–4878, Mar. 2021, DOI:10.1007/s10639-021-10469-4.

[4] Z. Zainuddin, M. Shujahat, H. Haruna, and S. K. W. Chu, "The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system," *Computers & Education*, vol. 145, no. 1, p. 103729, Feb. 2020, DOI:10.1016/j.compedu.2019.103729.

[5] Z. Zhang and J. Crawford, "EFL learners' motivation in a gamified formative assessment: The case of Quizizz," *Education and Information Technologies*, vol. 29, no. 2024, pp. 6217–6239, Jul. 2023, DOI:10.1007/s10639-023-12034-7.

[6] Kyung-Mi O, "Impact of Quiz Mode on Students' Learning Achievement: A Gamified e-Quiz Study," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 18, no. 12, pp. 158–177, Jun. 2023, DOI:10.3991/ijet.v18i12.34155.

[7] S. Scholefield and L. A. Shepherd, "Gamification Techniques for Raising Cyber Security Awareness," in *Moallem, A. (eds) HCI for Cybersecurity, Privacy and Trust. HCII 2019*, Cham: Springer, Jun. 2019, pp. 191–203. DOI:10.1007/978-3-030-22351-9_13

[8] S. Oskin and J. Chen, "Efficacy Analysis Retrospective QED using CAASPP data with updated ELSi records," 2020. Accessed: Jan. 15, 2025. [Online]. Available: https://marketing.prodigygame.com/California+Efficacy+Report+-+Updated.pdf

[9] V. Rikkers and Dipti Kapoor Sarmah, "A story-driven gamified education on USB-based attack," *Journal of Computing in Higher Education*, vol. 37, no. 1, pp. 248–272, Mar. 2025, DOI:10.1007/s12528-023-09392-z.

[10] T. Deveci and N. Ayish, "Personal responsibility and interpersonal communication in a project-based learning environment," *International Journal of Social Sciences and Education Research*, vol. 4, no. 1, pp. 1–17, Jan. 2018, DOI:10.24289/ijsser.331780.

[11] F. Firdaus and M. Melani, "Students' Perception of Applying Teacher-in-Role during English Learning Process: A Descriptive Study of Middle School Students," *JELITA Journal of Education Language Innovation and Applied Linguistics*, vol. 3, no. 1, pp. 41–52, Jan. 2024, DOI:10.37058/jelita.v3i1.6317.

[12] C. S. Rathore, "Teacher-in-Role as a Tool for Scaffolding Role Plays in the English Classroom," *JALT PIE SIG: Mask and Gavel*, vol. 9, no. 1, pp. 28–43, Jan. 2021, DOI:10.37546/jaltsig.pie9.1-3.

[13] S. Maniam, M. K. A. Rahman, and J. Batubara, "The Use of 'Teacher in Role' to Facilitate Teaching and Learning of History: Lessons in a Primary School," *International Journal of Academic Research in Business and Social Sciences*, vol. 9, no. 5, May 2019, DOI:10.6007/ijarbss/v9-i5/5858.

[14] E. O. Stanley, "Discipline and Academic Performance (A Study of Selected Secondary Schools in Lagos, Nigeria)," *International Journal of Academic Research in Progressive Education and Development*, vol. 3, no. 1, pp. 165–176, Mar. 2014, DOI:10.6007/IJARPED/v3-i1/758

[15] Department For Education, "National Curriculum in England: Primary Curriculum," *GOV.UK*, Sep. 11, 2013. Accessed: Feb. 16, 2025. [Online]. https://www.gov.uk/government/publications/national-curriculum-in-england-primary-curriculum.

[16] J. Sweller, P. Ayres, and S. Kalyuga, *Cognitive Load Theory*. New York, NY: Springer New York, 2011. DOI:10.1007/978-1-4419-8126-4.

[17] B. J. Underwood, "Interference and forgetting.," *Psychological Review*, vol. 64, no. 1, pp. 49–60, 1957, DOI:10.1037/h0044616.

[18] J. A. McGeoch, "Forgetting and the law of disuse.," *Psychological Review*, vol. 39, no. 4, pp. 352–370, 1932, DOI:10.1037/h0069819.

[19] K. Na and K. Han, "How leaderboard positions shape our motivation: the impact of competence satisfaction and competence frustration on motivation in a gamified crowdsourcing task," *Internet Research*, vol. 33, no. 7, Feb. 2023, DOI:10.1108/intr-12-2021-0897.