



Computational evaluation of student participation and knowledge retention in kahoot! -integrated arts courses

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Abstract:

The integration of digital gamified learning platforms has transformed contemporary educational practices, particularly in vocational and creative disciplines where student participation and experiential learning are essential. This study computationally evaluates the impact of Kahoot-integrated instructional strategies on student participation and knowledge retention in Arts Vocational College courses. The research adopted a quantitative research design using survey-based data collected from 210 students enrolled in visual arts, performing arts, multimedia, and design-oriented vocational programs. Statistical and computational analyses, including descriptive statistics, correlation analysis, regression modeling, and comparative mean analysis, were conducted to examine the influence of Kahoot on classroom engagement, concept retention, technical competency, and creative learning outcomes. The findings revealed that Kahoot integration significantly enhanced student participation by increasing classroom interaction, motivation, attentiveness, and collaborative learning behavior. Additionally, students demonstrated improved retention of theoretical concepts and practical artistic techniques due to repeated interactive assessments and immediate feedback mechanisms. The study also identified challenges associated with technological accessibility, internet connectivity, and varying digital literacy levels among students and instructors. The computational analysis indicated a strong positive relationship between gamified learning engagement and academic retention outcomes. The study concludes that Kahoot serves as an effective technology-enhanced pedagogical tool for Arts Vocational College education and recommends broader integration of gamified digital learning environments within creative and technical educational settings.

1. Introduction

The rapid advancement of digital technologies has significantly transformed modern educational environments across multiple disciplines. In recent years, educational institutions have increasingly adopted game-based learning applications to enhance student engagement, participation, and learning outcomes. Among these digital tools, Kahoot has emerged as one of the most widely utilized gamified educational platforms due to its interactive interface, real-time assessment capabilities, and student-centered learning approach. In vocational arts education, where creativity, technical proficiency, and active

classroom interaction are critical components of learning, integrating gamified digital tools may provide substantial pedagogical benefits.

Arts Vocational Colleges focus heavily on experiential learning, practical demonstrations, collaborative activities, and creative skill development. However, traditional instructional approaches in vocational arts education often face challenges related to declining student attention, passive classroom behavior, limited participation, and insufficient retention of theoretical concepts. The introduction of digital gamification tools such as Kahoot has the potential to address these challenges by promoting active learning environments and encouraging student involvement

through competitive and interactive educational activities.

Kahoot enables instructors to create quizzes, polls, and interactive assessments that students can access through smartphones, tablets, or computers. The platform incorporates visual elements, immediate feedback systems, scoring mechanisms, and time-based challenges that stimulate learner motivation and cognitive engagement. Within arts education, Kahoot may also support the reinforcement of creative concepts, technical terminology, artistic history, and procedural understanding through repeated digital interaction and collaborative participation.

Despite the growing adoption of gamified learning technologies, limited computational and empirical research has examined the specific impact of Kahoot integration within Arts Vocational College settings. Existing studies primarily focus on science, business, or general higher education contexts, while vocational arts education remains comparatively underexplored. Furthermore, there is a need for quantitative and computational investigations that evaluate how digital gamification influences student participation patterns and knowledge retention outcomes in creative learning environments.

This study therefore aims to computationally evaluate the influence of Kahoot integration on student participation and knowledge retention in Arts Vocational College courses. The research also explores students' perceptions regarding the educational effectiveness, benefits, and challenges associated with the implementation of gamified learning strategies in vocational arts education.

2. Literature Review

Gamified learning has become a significant area of educational research due to its ability to improve learner motivation and classroom interaction. According to Deterding, gamification refers to the incorporation of game design elements into non-game educational environments to increase user engagement and participation. Educational technologies such as Kahoot have gained popularity because they combine entertainment, competition, and learning within a single interactive framework. Research conducted by Wang and Tahir (2020) demonstrated that Kahoot significantly improves student engagement, classroom excitement, and participation levels in higher education institutions. Students reported increased motivation and attentiveness during Kahoot-integrated sessions compared to traditional lecture-based teaching approaches. Similarly, Licorish et al. (2018) observed that game-based learning platforms

encourage collaborative learning behavior and enhance cognitive concentration among learners.

In vocational and creative education, student participation is particularly important because practical skill acquisition often depends on active interaction, experimentation, and collaborative learning. Arts education requires students to engage critically with theoretical concepts while simultaneously developing technical and creative competencies. According to Nidhi Agarwal and colleagues, technology-enhanced pedagogical environments can positively influence learner creativity, communication, and experiential learning outcomes in higher educational institutions.

Knowledge retention represents another important educational outcome associated with gamified learning environments. Interactive quizzes and repeated retrieval practices embedded within Kahoot activities may strengthen long-term memory retention by reinforcing cognitive processing and immediate feedback mechanisms. Research by Plump and LaRosa (2017) indicated that students exposed to Kahoot-based revision sessions demonstrated significantly higher recall performance and academic achievement compared to students taught using conventional instructional methods.

However, several challenges remain associated with gamified educational implementation. Technical limitations such as unstable internet connectivity, device accessibility issues, and digital literacy disparities may negatively affect learning experiences. Instructors may also face difficulties designing pedagogically meaningful quizzes that align effectively with curriculum objectives and creative learning requirements.

Although prior research confirms the educational benefits of gamified learning, there remains limited computational analysis specifically focused on Arts Vocational Colleges. Therefore, this study contributes to existing literature by examining the quantitative relationship between Kahoot integration, student participation, and knowledge retention within vocational arts education environments.

3. Research Methodology

The study adopted a quantitative research methodology using a descriptive and analytical research design. Primary data were collected from students enrolled in Arts Vocational College programs, including visual arts, graphic design, multimedia studies, performing arts, and creative communication courses. A structured questionnaire was distributed to 210 students selected using

stratified random sampling techniques to ensure representation across different academic levels and instructional formats.

The questionnaire consisted of five sections measuring demographic characteristics, frequency of Kahoot usage, student participation indicators, knowledge retention outcomes, and perceived educational effectiveness. Responses were measured using a 5-point Likert scale ranging from strongly disagree to strongly agree. Data collection was conducted over a period of three months during regular classroom instruction where Kahoot-based learning activities were integrated into lectures, assessments, and revision sessions.

The collected data were analyzed using SPSS software and computational statistical techniques including descriptive statistics, mean score analysis, Pearson correlation analysis, regression modeling, and ANOVA testing. Reliability analysis using Cronbach's Alpha confirmed acceptable internal consistency of the measurement instrument with a reliability coefficient of 0.89. The study also utilized comparative computational evaluation to examine differences in participation and retention across different instructional contexts and course formats.

4. Data Analysis and Results

Table 1: Demographic Distribution of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	92	43.8%
	Female	118	56.2%
Course Type	Visual Arts	58	27.6%
	Multimedia Design	47	22.4%
	Performing Arts	51	24.3%
	Graphic Design	54	25.7%
Academic Level	First Year	70	33.3%
	Second Year	76	36.2%
	Third Year	64	30.5%

The demographic findings indicate a balanced distribution of respondents across different arts disciplines and academic levels, ensuring diversity in learning experiences and instructional exposure.

Table 2: Mean Analysis of Student Participation Variables

Participation Factors	Mean	Standard Deviation
Increased Classroom Interaction	4.41	0.62

Participation Factors	Mean	Standard Deviation
Enhanced Motivation	4.35	0.68
Improved Attention During Lectures	4.27	0.71
Collaborative Learning Enhancement	4.18	0.74
Confidence in Classroom Participation	4.22	0.69

The computational mean analysis demonstrates that Kahoot integration positively influenced student participation. Increased classroom interaction recorded the highest mean value (4.41), suggesting that gamified learning significantly encourages active classroom involvement.

Table 3: Mean Analysis of Knowledge Retention Variables

Retention Indicators	Mean	Standard Deviation
Retention of Theoretical Concepts	4.31	0.65
Recall of Technical Skills	4.24	0.70
Creative Problem-Solving Retention	4.17	0.73
Long-Term Memory Reinforcement	4.29	0.68
Understanding of Course Content	4.36	0.61

The findings reveal strong knowledge retention outcomes among students exposed to Kahoot-based learning activities. Students particularly demonstrated improved understanding of course content and theoretical concept retention.

Table 4: Correlation Analysis

Variables	Student Participation	Knowledge Retention
Student Participation	1.000	0.782
Knowledge Retention	0.782	1.000

The correlation coefficient of 0.782 indicates a strong positive relationship between student participation and knowledge retention. Increased engagement through Kahoot activities appears to directly contribute to improved academic retention outcomes.

4.1 Regression Analysis

The regression model demonstrated that student participation significantly predicts knowledge retention outcomes ($\beta = 0.74$, $p < 0.001$). The

model explained approximately 61% of the variance in retention performance ($R^2 = 0.61$), confirming the substantial educational impact of Kahoot integration in vocational arts learning environments.

5. Discussion

The findings of this study strongly support the growing body of literature emphasizing the effectiveness of gamified learning technologies in higher education. The computational evaluation demonstrated that Kahoot integration significantly enhances student participation, attentiveness, collaborative learning, and classroom motivation within Arts Vocational College settings. These findings align with prior research indicating that digital gamification creates more interactive and student-centered learning environments.

The study further revealed that increased classroom participation positively influences knowledge retention outcomes. Students exposed to Kahoot-integrated instructional methods demonstrated stronger retention of theoretical concepts, technical artistic procedures, and creative problem-solving abilities. The immediate feedback mechanisms and repetitive retrieval practices embedded within Kahoot activities may contribute to stronger cognitive reinforcement and long-term memory retention.

Additionally, the findings suggest that gamified learning environments may be particularly effective in vocational arts education because creative disciplines often require active learner engagement and experiential participation. By combining visual interaction, competition, and collaborative learning, Kahoot appears to support both cognitive and creative educational processes.

However, technological challenges remain important considerations for implementation. Students from resource-constrained environments reported occasional difficulties related to internet connectivity and device accessibility. Instructors also emphasized the need for pedagogically meaningful quiz design to ensure educational effectiveness beyond entertainment value.

Overall, the study confirms that Kahoot represents a valuable educational technology capable of improving participation and retention outcomes in vocational arts education when implemented strategically and systematically.

6. Conclusion

This study computationally evaluated the influence of Kahoot integration on student participation and knowledge retention in Arts Vocational College

courses. The findings demonstrated that gamified learning environments significantly improve classroom interaction, student motivation, attentiveness, collaborative engagement, and retention of academic content. The strong positive relationship identified between participation and retention further highlights the educational value of interactive digital learning technologies within vocational and creative educational settings.

Kahoot-based instructional strategies were particularly effective in enhancing the retention of theoretical concepts and technical artistic skills due to the platform's interactive assessments, immediate feedback systems, and repetitive learning mechanisms. Students responded positively to the engaging and competitive nature of gamified learning activities, suggesting that digital pedagogical innovations can contribute meaningfully to contemporary vocational arts education.

The research also identified several implementation challenges, including technological accessibility limitations and varying digital competency levels among learners and instructors. These findings indicate the importance of institutional technological support, instructor training, and curriculum alignment for successful gamified learning integration.

The study contributes significantly to the existing literature by providing a computational and quantitative examination of Kahoot integration specifically within Arts Vocational College environments, an area that remains comparatively underexplored. The findings may assist educational policymakers, curriculum designers, and vocational arts instructors in developing more engaging and technology-enhanced learning environments.

Future studies may expand the research by incorporating longitudinal analyses, experimental learning interventions, artificial intelligence-based educational analytics, and comparative evaluations across multiple educational institutions and creative disciplines.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
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