



Establishing Kahoot!'s Evidence Base

Integrative Review and Meta-Analysis of the Effects of Kahoot! Quiz Games

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February, 2024

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Report summary

Purpose

This report has been produced to document the evidence base for Kahoot! Quiz Games from publicly available research by independent academics around the world.

Method

Having search various research databases for publications involving Kahoot!, 155 research articles were systematically analysed. 16 of these articles used an experimental design to test the quantitative effect of Kahoot! on learning outcomes. Since these learning outcomes were measured in different ways on different scales, learning gains were standardized by converting them to *effect sizes*¹ which expresses gains in terms of increases in standard deviations. These standardized learning effects were then combined using a multilevel model to estimate an average quantitative effect of using Kahoot! on learning.

Results

In line with results from previous reviews², this review finds that Kahoot! promotes motivation, engagement, and learning, with an average effect size on learning outcomes of 0.72 standard deviations. This means that, on average, studies in which some students used Kahoot! Quiz games and others did not, found that using Kahoot! Quiz games improved students' learning by 0.72 standard deviations. In practical terms, this improvement equates to shifting a student from the 50th to the 72nd percentile or increasing performance on a typical test with a full letter grade.

Compared to typical educational interventions, 0.72 is a large effect size. For example, in his groundbreaking study³, John Hattie found an average effect size of 0.4 of the educational interventions that he studied. He consequently deemed interventions with effect sizes higher than 0.4 to be in the "zone of desired effects". More recent reviews of average effect sizes of educational interventions have found the median effect size to be lower at 0.1, with less than 10% of studies reporting effect sizes higher than 0.5⁴. For example, offering universal free breakfasts have been found to improve achievement in math by 0.09 standard deviations⁵, and intelligent tutoring systems (compared to text- and workbooks) have been found to improve learning outcomes by 0.35 standard deviations⁶.

Although the effect size estimation of this report is based on only 16 studies that varied in research design and rigour, and more randomized controlled experiments with large numbers of students would strengthen the effect estimation, this report does provide comprehensive evidence for Kahoot! as a powerful learning technology across a wide range of educational contexts.

¹ Cohen's d was chosen and calculated from available statistics from the studies (means, standard dev., correlations, F-values, and t-values).

² Wang, A. I., & Tahir, R. (2020). The effect of using Kahoot! for learning—A literature review. *Computers & Education*, 149, 103818.; Zhang, Q., & Yu, Z. (2021). A literature review on the influence of Kahoot! On learning outcomes, interaction, and collaboration. *Education and Information Technologies*, 26(4), 4507-4535.

³ Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.

⁴ Evans, D. K., & Yuan, F. (2022). How big are effect sizes in international education studies?. *Educational Evaluation and Policy Analysis*, 44(3), 532-540.; Kraft, M. A. (2020). Interpreting effect sizes of education interventions. *Educational Researcher*, 49(4), 241-253.

⁵ Frisvold, D. E. (2015). Nutrition and cognitive achievement: An evaluation of the School Breakfast Program. *Journal of public economics*, 124, 91-104.

⁶ Ma, W., Adesope, O. O., Nesbit, J. C., & Liu, Q. (2014). Intelligent tutoring systems and learning outcomes: A meta-analysis. *Journal of educational psychology*, 106(4), 901.

Background

Kahoot! is a game-based learning platform that makes it easy to create, share and play learning games or trivia quizzes. Within minutes, users can delve into an interactive learning experience, merging education with entertainment.

Kahoot! as a learning tool has been extensively researched around the world with findings published in scientific articles. In one such effort to understand research conducted on Kahoot, researchers from the Norwegian University of Science and Technology analysed and compared 93 scientific studies on Kahoot! as a learning tool. Their findings, which were published in the leading scientific journal *Computers & Education* concluded that Kahoot has a positive effect on learning performance, classroom dynamics, attitudes, and anxiety (Wang, & Tahir, 2020).

In 2023, Kahoot! partnered with WiKIT a research consultancy based in Norway to evaluate the strength of its evidence base. The project started with an integrative review, followed by a systematic review and a meta-analysis to estimate the effect of using Kahoot! on students' learning. An integrative review gathers and synthesises empirical and theoretical evidence relevant to a clearly defined scenario or problem and adheres to guidelines for Systematic Reviews and with extension for scoping reviews (for example, PRISMA-ScR). It may include all types of research and allows for a combination of different methodologies. It is a transparent and systematic method for mapping the body of existing literature in terms of type, features, and volume, and for identifying existing gaps in the research, without the requirement for assessing the quality of individual studies, or the risk of bias.

A meta-analysis is a statistical technique that is used to combine the results of multiple studies on a specific topic to determine the overall effect size across all studies. It quantifies the strength and direction of the effect, offering a more precise estimate than any single study could provide. By pooling data from various research findings, a meta-analysis enhances the statistical power to detect significant effects, thereby overcoming the limitations of smaller, individual studies that may have conflicting results or insufficient sample sizes. This method involves employing criteria for selecting studies, assessing their quality, and systematically coding and analysing their data. The goal is to produce a comprehensive, objective, and reliable summary of the evidence on a given question, which can inform practice, policy, and future research directions. Through this approach, a meta-analysis provides valuable insights into the effectiveness of interventions, the prevalence of phenomena, or associations between variables, making it a cornerstone of evidence-based practice.

Part I: Integrative literature review

Study screening, eligibility, and data extraction

The criteria for the initial search of items (research publications) for this review was that the item included “Kahoot” anywhere in the text. The databases ERIC, Web of Science, Science Direct, and SCOPUS were searched on 26. September 2023. The list of studies published on the Kahoot! website as well as those items identified in an earlier systematic search (Wang & Tahir, 2020) were manually included in the library. This library was then checked for obvious duplicates and items without author or date and then screened as per the PRISMA-ScR flow diagram, displayed in Figure 1.

Following duplicate removal, the resulting database (n = 1063) was uploaded into the JBI System for the Unified Management, Assessment, and Review of Information and titles and abstracts were screened against the inclusion criteria for the review.

These inclusion criteria were:

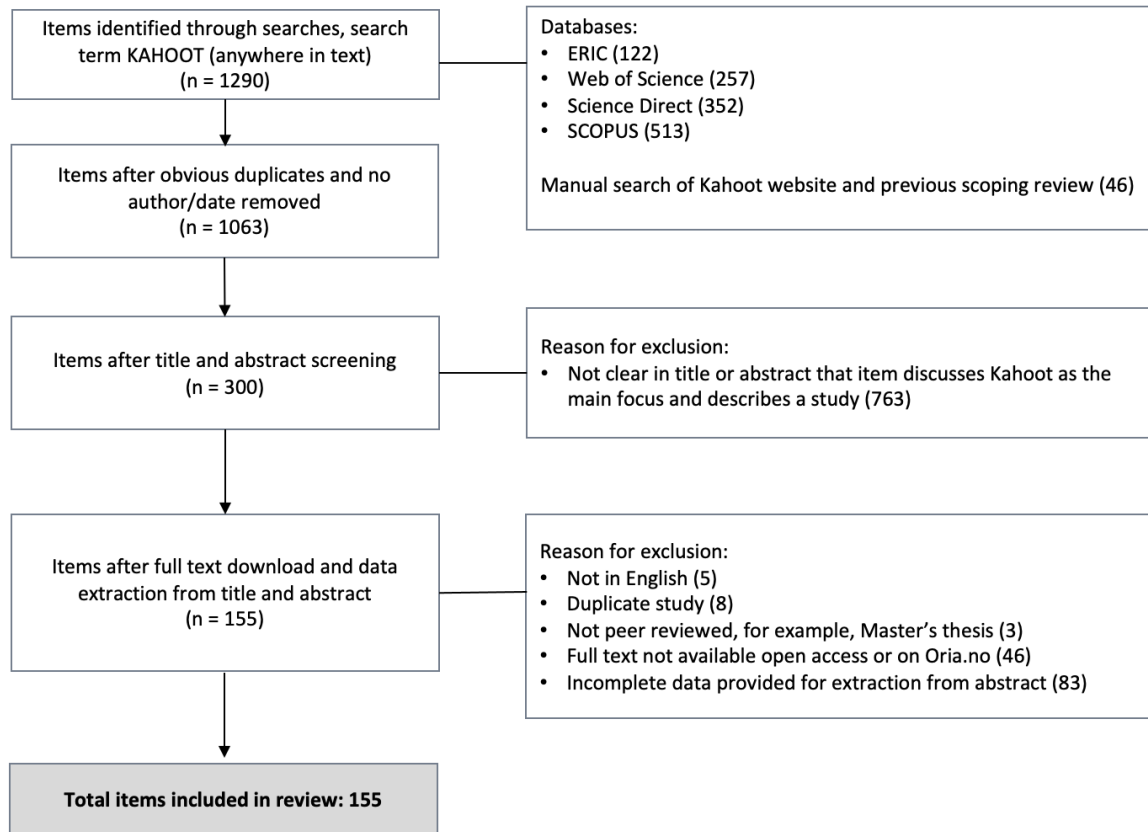
- Kahoot! is the main focus of the item.
- The item discusses a study with Kahoot! as the key factor.

The library of items that passed title and abstract screening (n = 300) was too large for a typical full text review in the available time. Therefore, data was extracted from the title and abstract according to the following procedure:

1. Title and abstract were reviewed for data on the following:
 - Type of study
 - Country
 - Field of education (High school, University, etc.)
 - Sample size
 - Positive / Neutral / Negative findings(EXCLUDE: if data was missing on more than 1 of these characteristics)
2. Full text document was located and retrieved.
(EXCLUDE: if full text was not available open access or on Oria.no)
(EXCLUDE: full text was found to be in a language other than English)
(EXCLUDE: if full text was found to be a duplicate)
(EXCLUDE: if full text was not peer reviewed, such as a master’s thesis)
3. Extracted data was recorded in tabular form (where 1 piece of data was missing, usually country or sample size, the full text was scanned for that data). Positive / neutral / negative findings were recorded with exact wording from abstract. Full references for each included study were listed. Reasons for exclusion of full text sources of evidence were recorded.

This multi-stage screening was completed over a period of one week and resulted in 155 included items (See Figure 1: PRISMA Flow Chart).

Figure 1: PRISMA flow chart



Data analysis

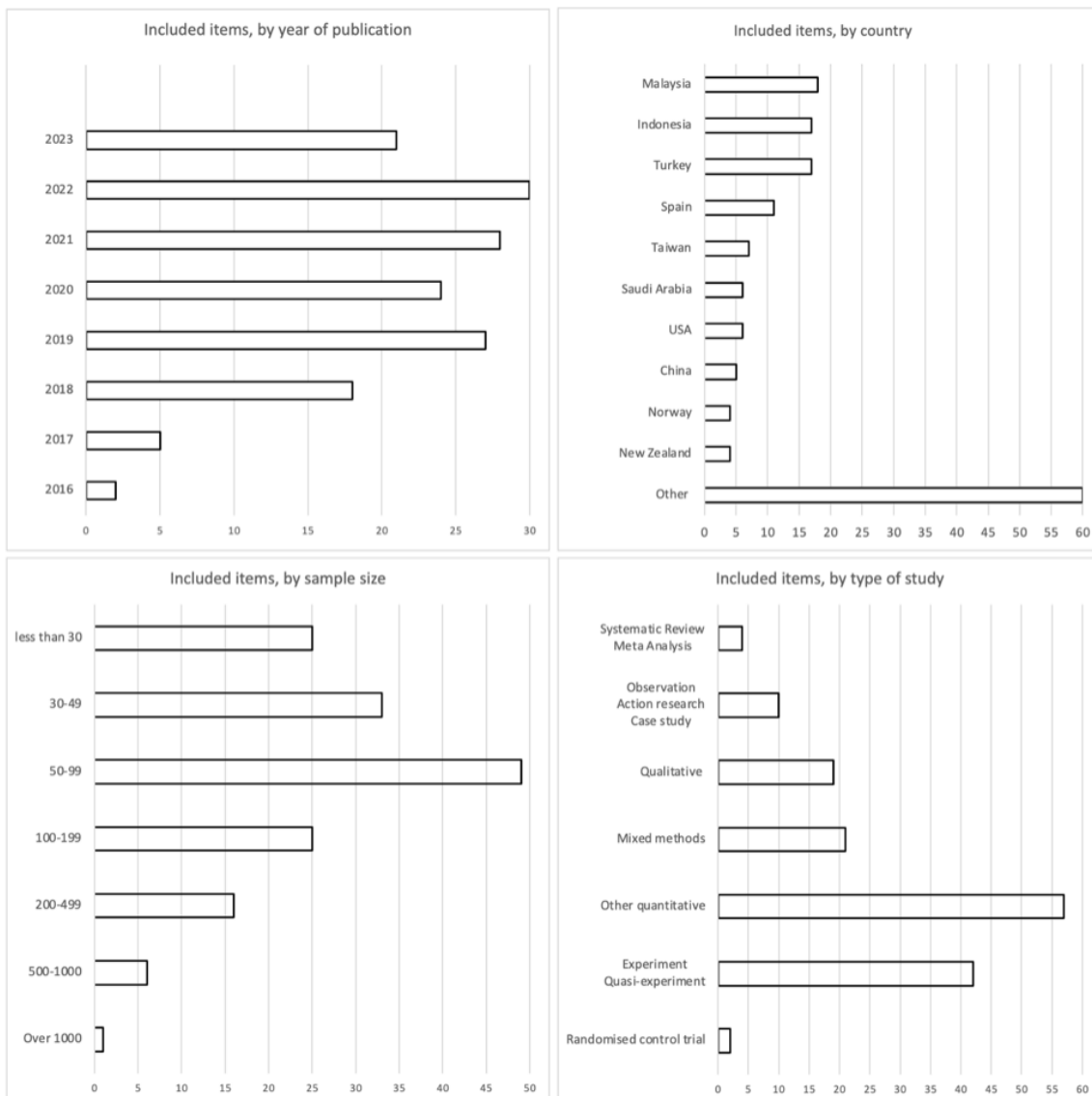
The 155 items in our final sample represented a variety of empirical studies, published in a broad range of media. We summarised the findings with narrative and tabular syntheses, as well as visual representations including graphs and diagrams. Data tabulation and analysis were conducted manually in Word and Excel. A complete table of extracted data for the 155 items are in the appendix to this report.

Findings

Characteristics of Included Studies

The characteristics of the 155 included items are graphically represented in Figure 2. Studies on Kahoot! have risen steadily in number since 2016, with the lower number in 2023 (21) attributable to the fact that the searches were conducted in September 2023. The studies were conducted across 51 countries, with the most represented countries being Malaysia, Indonesia, and Turkey, and the region of Asia accounting for 49% of the included items (76 items). The majority of the included items are reported as quantitative (65%, 101 items). The majority of the included items also reported sample sizes of less than 100 (69%, 107 items).

Figure 2: Graphical summary of the included studies



Of particular relevance for this review, across the 155 included items, only 24 items reported studies with school aged children, and just 13 of those studies were conducted in elementary school (with children under 13 years of age). These 13 items were scrutinised closely to evaluate which of the Kahoot! Kids Learning Applications was specifically used, but the only information found was reference towards quizzes. Therefore, without additional information, it can be assumed that the Kahoot! Quiz Game has been used in all of these studies.

Frequently reported positive outcomes

The most frequently mentioned positive outcomes in the 155 included items were analysed through a word cloud and word count. The ten most frequently used words to describe positive outcomes in the abstracts were (in order of frequency): Learning (62), Motivation (or motivating) (58), Engagement (44), Active (17), Enjoyment (15), Exam (or test) (15), Performance (14), Fun (14), Vocabulary (14), Knowledge (13). To visualise the relative importance of these words, see Figure 3 which displays the top 40 positive outcome words, sized by frequency.

Figure 3: Word Cloud of the top 40 positive outcome words, sized by frequency.



When word frequency was compared across large or small studies, regions, school or university, dates of studies, or types of studies, the same general order and grouping of frequently occurring positive outcomes were observed. “Learning”, “motivation”, and “engagement” were always the top three, followed by slightly differing combinations of the above words.

Neutral and negative findings

Only 32 of the 255 included items mentioned neutral or negative findings in their abstracts. Almost half of these were related to no measurable improvement in academic performance (test or exam scores, for example) when Kahoot! was compared with a control group or a traditional method. This is an interesting juxtaposition to the frequently mentioned positive outcome words of exam (or test) (15 mentions), performance (14), and knowledge (13). The second most frequently mentioned neutral or negative finding was that mobile technology and internet connectivity issues hindered learning or produced anxiety (10 mentions). Also worth noting were several mentions of the countdown feature, the time limit, of the aspect of competition being distracting and/or anxiety producing (7 mentions). These findings are interesting considering that competition, focus, and anxiety (the reduction of) were all also within the 40 words most frequently used to describe positive outcomes of using Kahoot!.

The largest studies

The three largest studies identified in this review were conducted in Hong Kong (Ting, et al., 2019, n=1017), Romania (Grigoriu & Branet, 2021, n=934), and the USA (Adkins-Jablonsky, et al., 2021, n=754). In Hong Kong, Ting and colleagues (2019) used correlational analysis and stepwise regression to study the relationship between active engagement in lectures with Kahoot! and academic performance with 1017 students of undergraduate mathematics at a large university. Participants were randomly assigned to classes with game-based active learning via Kahoot! (4-6 Kahoot! quiz questions per lecture) or traditional instructor-led lecture-based methods. The researchers found that students' perception of active engagement and time spent in active learning through Kahoot! was positively related to their academic performance in calculus concepts and in the midterm exam. Their findings were published in the peer reviewed, online open access journal, Education Science published by MDPI in Switzerland (Ting, et al., 2019).

In Romania, Grigoriu & Branet (2021) conducted a student satisfaction survey with 934 first-year students of physical education at the Politecha University of Bucharest, to assess the perceived effectiveness of using Kahoot! to consolidate and verify theoretical knowledge acquired during online classes. No in-depth analysis was conducted, but through observation of response distribution, the authors concluded that Kahoot! was a viable, easy and fun e-learning option that fostered the teaching-learning process by improving the acquisition of new content and providing an appropriate formative assessment during online learning. Their study was presented at the 17th International Scientific Conference on eLearning and Software for Education (Bucharest, April 22-23, 2021) and published in the peer-reviewed proceedings from the conference (Grigoriu & Branet, 2021).

Finally, in the USA, Adkins-Jablonsky and colleagues (2021) studied 754 undergraduate biology students across two universities (Alabama and California), to understand the relationship between Kahoot! and student anxiety. Student perceptions of anxiety were captured in pre- and post-surveys after a semester of classes incorporating Kahoot! for formative assessment. Results were analysed with linear mixed effects models,

and the findings were published in the peer reviewed, electronic journal, CBE Life Sciences Education, published by the American Society for Cell Biology. The study found that Kahoot! was considered less stressful than many other techniques, including common practices like studying for exams and answering questions in class, and that lower-performing students were more likely to report positive experiences with Kahoot! including feeling less anxious for the exam, less stressed while studying, and more engaged in the lecture material (Jablonsky, et al., 2021).

Although very different in their foci, when considered together, these studies support the use of Kahoot! for engagement, active learning, and focussed knowledge acquisition with undergraduate students in diverse global contexts and education fields.

Gaps in this body of evidence

The body of evidence on the use of Kahoot! for learning, described in this report, is substantial. It is also probably larger than described here, as some of the items excluded due to lack of data in the abstract, may in fact describe eligible studies (despite poorly written abstracts). There are, however, three clear gaps in this body of evidence.

1. A lack of large-scale, rigorous randomized controlled experiments (Randomized controlled trials). Although 42 items report being experiments, many of them are quasi-experiments or experiments with limited information on randomization, background variables of participants, attrition, and fidelity.
2. A lack of studies with young children (only 13 studies were conducted with children under 13 years of age).
3. A lack of studies with specific Kahoot! Learning Applications (no evidence was found of studies using any Kahoot! Kids learning apps other than Kahoot! Quiz).

Part II: Meta-analysis

Research question

The main Research Question for the meta-analysis was:

What is the effect of using Kahoot! in the classroom on students' learning compared to traditional or alternative instruction schemes?

Study screening, eligibility, and data extraction

Inclusion/Exclusion criteria

All eligible studies identified through the systematic search were reviewed for their suitability for the meta-analysis. The eligible studies needed to be either experiments with a control group or interventions with pre- and post-testing procedures. Studies were divided into two groups of between-subject group comparison utilising pre-existing groups or within-subject design. As in the integrative review, the focus was on kahoots (quizzes) only and for learners of any age, background or ability.

Quality Assessment

After finalizing the selection of eligible studies, we employed an assessment of potential bias (RoB 2: a revised tool for assessing risk of bias in randomised trials) in the included studies which was guided by the domain-based framework described in the Cochrane Handbook (Sterne et al., 2019). This framework examines five key areas: (1) randomisation process: Were participants randomly assigned to treatment groups to minimise selection bias?, (2) baseline equivalence: Did baseline differences between intervention groups suggest a problem with the randomisation process?, (3) implementation fidelity: Is the numerical result being assessed likely to have been selected, on the basis of the results, from multiple eligible outcome measurements (e.g., scales, definitions, time points) within the outcome domain?, (4) missing data: Is there evidence that the result was not biased by missing outcome data?, and (5) blinding of outcome assessment: Were outcome assessors aware of the intervention received by study participants?. Two independent reviewers assessed the eligible studies with the second reviewers assessing 10% of all studies. Additionally, Cohen's kappa was calculated to evaluate the agreement between the two coders resulting in a good agreement, with $\kappa = 0.89$ (95% CI, 0.57 to 0.99) and a p-value of less than 0.0001. In instances of disagreements between reviewers, the lowest assessment

was adopted, following the recommendation of Murphy and Unthiah (2015). The Quality Assurance table for the studies included in the analysis is included in in Table 2.

Coding Procedure

The data extraction was conducted by the first author. A coding procedure that specified the outcomes for each study was developed, with the following coding parameters: authors, publication year, status, and format (i.e., peer-reviewed, unpublished), sample size (and attrition rates), allocation to condition (i.e, random, targeted), study design (i.e., within- or between-subject) and outcome measures. Since it is generally not recommended to calculate effect sizes in within-group meta-analysis (Cuijpers et al., 2017), the final meta-analysis only included effects from between-subjects studies. The outcomes measures for the between-subject studies are captured in Table 1 below.

Table 1: Outcome measures coded for the between-subject meta-analysis

Between-subject
Language Acquisition and Learning exam
Assessment of vocabulary, grammar, and writing skills
Vocabulary Test (immediate)
Vocabulary Test (delayed)
Vocabulary Levels Test (VLT) by Schmitt et al. (V1 and V2)
Post test grammar scores
Learning achievement
Homework 4
Homework 5
Homework 6
Quizzes
Retention
Achievement Test 1 and 2
SGQ (Self-generated questioning)
Skill performance
Performance (Exam Scores)
Midterm exam performance
Neuroanatomy Image exam
Neuroanatomy Theory exam
Neuroanatomy Final exam
Histology Image exam
Histology Theory exam
Histology Practice exam
Histology Final grade

Sample of studies

Seventeen between-subjects studies (i.e. with experiment and control groups) were identified as potentially eligible for inclusion in the meta-analysis. However, during data coding, Jankovic et al. (2023) was excluded due to insufficient information for calculating an effect size. The researchers attempted to retrieve the necessary data by contacting the corresponding author via email, but no reply was received within the project period. Thus, **sixteen studies** remained for analysis and data extraction/transformation.

Table 2: List of included studies in the meta-analysis

Year	Author(s)	Country	Sample size	Educational level (setting)	Academic subject/ domain	Risk of Bias variables (low risk—unclear risk—high risk – not reported “NR”)				
						Randomised assignment	Baseline equivalence	Check of implementation	Missing data	Blinding of outcome assessment
2023	Lv	China	108	Tertiary	Chinese	high	low	low	NR	NR
2022	Ahmed, et al.	Iran	50	Other	English	low	low	high	NR	NR
2022	Ali & Abdalgane	Saudi Arabia	60	Tertiary	English	low	low	high	NR	NR
2022	Hong, et al.	Taiwan	299	Primary	Taiwanese	NR	high	high	low	NR
2022	Jankovic & Lambic	Serbia	113	Primary	Natural Sciences	low	low	low	low	NR
2022	Sevim-Cirak & Islim	Turkey	91	Tertiary	IT	high	low	low	low	low
2022	Yang & Bae	South Korea	141	Secondary	English	low	low	high	NR	NR
2021	Aras & Çiftçi	Turkey	65	Tertiary	Infection Control	low	low	low	NR	NR
2021	Öz & Ordu	Turkey	110	Tertiary	Intramuscular injection	low	low	low	low	NR
2020	Alharti	Saudi Arabia	36	Tertiary	English	low	low	low	low	NR
2020	Cárdenas-Moncada, et al.	Chile	50	Tertiary	English	high	low	high	NR	NR
2020	Mays, et al.	Taiwan	48	Primary	English	high	low	high	NR	NR
2020	Tan & Goh	Malaysia	180	Tertiary	Academic vocabulary	high	NA	high	NR	NR
2019	Bawa	USA	96	Tertiary	Business	low	NR	high	NR	NR
2019	Lee, et al.	Taiwan	39	Secondary	Earth Science	low	low	high	NR	NR
2023	Garza, et al.	Spain	584	Tertiary	Neuro-anatomy	high	NR	high	NR	NR

Note: Risk of bias variables (nr denotes “not reported”):

Randomised assignment: if randomized = low risk, if not = high risk

Baseline equivalence: if important difference reported = high risk, if not reported but large group (>20) = low risk, if not reported but small group <20= high risk)

Check of implementation fidelity: if it is only a few sessions = low risk, if not reported, but high number of sessions = high risk

Missing data: if high percentage of children dropped = high risk

Blinding of outcome assessment: (if experimenter/assessor aware of condition = high risk, if experimenter blind = low risk)

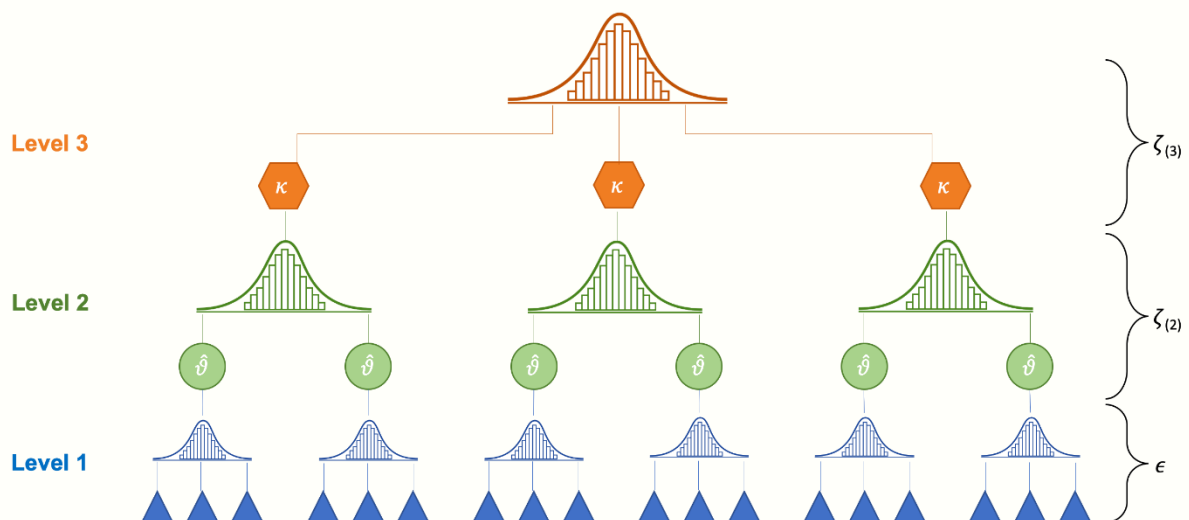
Data analysis

Cohen's d was chosen as the effect size measure for the meta-analysis. The choice of Cohen's d was justified by its purported superiority over other measures in situations with sample sizes >20 participants per group. When directly reported in the studies, Cohen's d values were extracted. For studies not reporting Cohen's d , it was calculated based on other provided data such as means, standard deviations, correlations, F-values, or t-values.

Three level analysis

Unlike traditional models that directly average individual participant data, three-level models address the inherent dependence of effect sizes by progressively aggregating data across three levels. First, individual participant results are combined within studies to generate study-level effect sizes (Level 1). These sizes are then grouped into clusters (κ) on the second level, reflecting either collections of individual studies or subgroups of studies. Finally, pooling these cluster-level averages yields the true overall effect size (Level 3). While conceptually similar to fixed- or random-effects models in terms of finding the average effect, this approach offers the advantage of explicitly modelling the dependence between effect sizes within clusters, leading to more accurate and robust estimates of the true effect (Figure 4).

Figure 4: Three level model. Taken from Harrer et al. (2021).



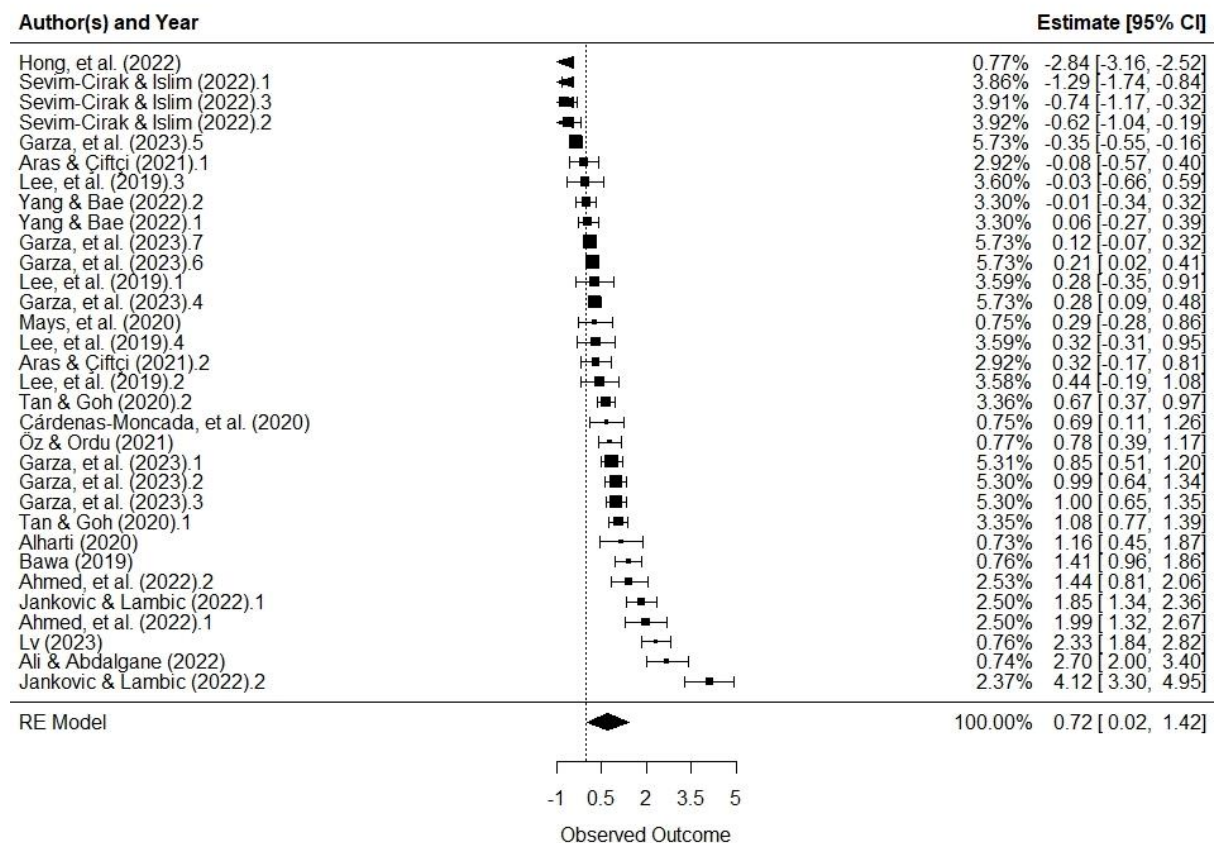
Findings

Multilevel Modelling Results

The model contains two variance components, for the level 3 between-cluster variance, analogous to the conventional meta-analysis between-study heterogeneity variance (τ^2), as well as the within-cluster variance (level 2). In this model, Level 3 has 16 groups, corresponding to the K=16 included studies which contribute a total of 32 effect sizes.

The estimated overall effect size is 0.72, with a standard error of 0.34 and a p-value of 0.043. The overall effect size is statistically significant, but the wide confidence interval (0.02 to 1.42) and significant heterogeneity among the studies (87%) suggests that more studies should be included to estimate the true effect size more precisely. See Figure 5.

Figure 5. Between-subjects meta-analysis forest plot



As depicted by the forest plot, in Hong, et al. (2022), inclusion of Kahoot! did not enhance the experimental effect. Hong, et al. (2022) found a significant difference in Taiwanese language achievement ($p < 0.01$), where participants using Shaking-On demonstrated better learning effectiveness than those using Kahoot!. Similarly, study by Sevim-Cirak & Islim (2022) indicated that participants who used paper-based quizzes scored higher on exam and retention test scores as opposed to those who employed online quizzes. Additionally, no difference in results between Kahoot group and traditional question/answer group was found in Aras and Çiftçi (2021) and Yang and Bae (2022) for Kahoot versus ClassCard condition. In remaining studies, a positive effect of Kahoot games on outcome measures was found.

Heterogeneity

Statistical tests for heterogeneity revealed significant differences in true effect sizes across the investigated data ($p < 0.001$). Further analysis revealed the percentage of total variance attributable to each of the three levels. Notably, the sampling error variance within level 1 was minimal, constituting only ~2%. Level 2 heterogeneity, representing variance within clusters, was higher, contributing approximately 11% of the total variance. However, the most significant contributor was level 3. Between-cluster (in this case, between-study) heterogeneity accounted for a substantial 87% of the total variance in the data. These findings indicate the presence of substantial between-study heterogeneity at level 3. However, it is important to acknowledge that 11% of the total variance can be attributed to differences within individual studies.

Comparison with 2-level model

The Full (three-level) model exhibited a significantly better fit compared to the Reduced model with two levels. This was evidenced by lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values for the Full model, indicative of superior performance. Furthermore, the likelihood ratio test (LRT) comparing both models yielded a significant result ($\chi^2_{1[<=]} 16.07, p < 0.0001$), further supporting the improved fit of the Full model. While the Full model introduces an additional parameter, increasing the degrees of freedom from 2 to 3, this added complexity appears justified. Modelling the nested data structure within the Full model led to a more accurate estimate of the pooled effect.

Summary of results

This between-subject meta-analysis focused on the effect of the use of Kahoot! Quiz games on students' learning. 16 eligible studies with a total of $N = 2070$ participants (1048 in experimental and 1022 in control groups) were included in the analysis. Between-group performance was assessed by the following measures: vocabulary and grammar scores, Vocabulary Levels Test (VLT), SGQ (Self-generated questioning), learning achievements, knowledge retention, skill performance, and subject exam scores.

The results of the meta-analysis of 32 effect sizes ($K = 16$ studies) revealed significant differences in true effect sizes across the investigated data ($g = 0.72$, 95% CI: 0.02-1.42, $p = 0.043$). This indicates a large and statistically significant positive effect of using Kahoot! Quiz games on student performance, meaning that students in experimental groups who used Kahoot! Quiz games performed significantly better than students in control groups who did not use Kahoot!. The students' greater performance was noted for a range of outcomes, variously defined by the authors of the analysed studies and including vocabulary and grammar scores, the students' knowledge retention, and overall skill performance, exam scores and learning achievements. Although the overall effect size is statistically significant, the confidence interval (0.02 to 1.42) is wide and there is significant heterogeneity among the studies (87%) which indicates that more studies should be included to estimate the true effect size more precisely.

Discussion

Both the integrative review and the meta-analysis support the notion that Kahoot Quiz Games promote student learning.

Why are quizzes effective? In a recent review, Murphy, Little & Bjork (2023) investigated the mechanics of testing and its consequential impacts on learning, yielding notable insights. The findings recommended a diversified approach to testing formats for enhanced student engagement, endorsing multiple options such as multiple choice, cued-recall tests, clickers, fill-in-the-blank, short answer, and knowledge contests. These, and other elements, are included in Kahoot!'s quizzes. Emphasizing the importance of competitiveness in multiple-choice or true-false tests, Murphy et al. (2023) suggested incorporating "competitive alternatives" in answers to encourage thorough scrutiny of all options, promoting the retrieval and consideration of learned material. Additionally, the study underscored the benefits of pretesting, indicating that quizzing students on unfamiliar material enhanced long-term performance and reduced mind wandering during subsequent lessons. Introducing a communal aspect to testing, particularly in group settings with specific, rather than open-ended questions, emerged as a strategy to improve retention, motivation, and alleviate anxiety.

The authors also advocated for self-testing methods, such as summarizing lecture points without reference to notes, and engaging in small study groups for collaborative testing, acknowledging that many students already partook in such activities. These features could further boost Kahoot's impact on learning outcomes. We recommend that future studies focus on investigating how Kahoot! works in various contexts, for which students it works best, particularly those with special educational needs.

Limitations

One key limitation with the integrative review is that it only included peer-reviewed articles. This criterion, while ensuring a higher standard of research quality and credibility, may also exclude relevant data from “grey literature”, conference proceedings, and unpublished studies, potentially limiting the results. Similarly, it should be noted that this meta-analysis is based on only published papers. Although this is common practice when conducting meta-analyses, it does make the findings prone to publication bias and overestimating the overall true effect size (Brand et al., 2008).

Another limitation is the low number of studies included and also high heterogeneity of outcome measures. We were not able to run additional analyses due to the missing data in some studies (i.e., age, gender). In the future, looking at students geographically might be possible with more empirical studies from diverse parts of the world.

We also highlight that few studies had a large number of participants and rigorous experimental designs. Most studies were quasi-experiments with less than 60 participants in either group. Although quasi-experiments are common in educational research for practical and ethical reasons, more randomized controlled experiments with more participants would reduce the risk of overestimating true effects.

These limitations with current research ought to be kept in mind with future empirical studies and replication studies of our meta-analysis.

Conclusion

The results of the integrative review of 155 items, albeit mostly in tertiary education contexts, indicate that, in essence, Kahoot! Quiz Games promote various aspects of student learning, engagement and motivation.

The meta-analysis based on 16 studies with 2070 participants across primary, secondary and tertiary education showed a large and statistically significant positive effect of using Kahoot! Quiz games on student learning in domains such as vocabulary and grammar scores, the students’ knowledge retention, and overall performance on exams in various subject areas. Students who used Kahoot! Quiz games performed significantly better than students in control groups who did not use Kahoot! ($g = 0.72$, 95% CI: 0.02-1.42, $p = 0.043$). This effect size of 0.72 is equivalent to shifting a student from the 50th to the 72th percentile. Although the effect size estimation in the meta-analysis is based on only 16 studies that varied in research design and rigour, and more randomized controlled experiments with large numbers of students would strengthen the effect estimation, the analysis support the findings from the integrative review. Moreover, the effect size estimate aligns with previous peer-reviewed meta-analyses that included Kahoot! as one of several gamified assessment tools (e.g. Bolat & Tas, 2023). Together, the work presented in this

report provides comprehensive evidence for Kahoot! as a powerful learning technology across a wide range of educational contexts.

Appendix: Table of findings from integrative review

Note: The data is extracted from title and abstract. The studies also formed the basis from which studies were screened for eligibility for the reported meta-analysis.

Year	Author(s)	(1) Type of study	(2) Country	(3) Area of education	(4) Sample size	(5) Results	
						Positive findings	Neutral / negative findings
2016	Wang & Lieberoth	Experiment	Norway	Undergraduate Information Technology	593	Significant impact of audio and points on concentration, engagement, enjoyment, motivation	
2016	Wang, et al.	Experiment	Norway	Undergraduate Information Technology	384	Motivation Engagement Enjoyment Concentration	No significant learning improvement
2017	Budiati	Mixed Methods	Indonesia	Undergraduate Nursing (English grammar)	40	Interest Attendance Attention	
2017	Liu & Wang	Survey	China	High School Chinese as a foreign language	18	Improved reading and speaking Motivation	No improvement listening and vocabulary
2017	Medina & Hurtado	Experiment	Ecuador	Undergraduate English	70	Enjoyment Learning Motivation Vocabulary acquisition	
2017	Tsihouridis, et al.	Experiment	Greece	High School Electrical Circuits	67	Active participation Motivation Learning Fun	
2017	Yapici & Karakoyun	Mixed Methods	Turkey	Undergraduate Teachers (Biology Education)	15	Motivation Positive attitude Enjoyment Participation	Technological skills Failure was demoralizing
2018	Aktekin, et al.	Observational	Turkey	Medical School (Anatomy)	45	Attendance Participation Engagement	
2018	Batsila & Tsihouridis	Qualitative Study	Greece	Secondary Teaching	149	Motivation for teaching and assessment	

						Make learning fun and creative	
2018	Bicen & Kocakoyun	Mixed Methods	Turkey	Undergraduate Preschool Teaching	65	Interest Ambition for success	
2018	Cetin	Mixed Methods	Turkey	Elementary Social Studies	23	Enjoyment Informative Useful	Difficult to use Connection Issues
2018	Chotimah & Rafi	Experiment	Indonesia	College EFL	77	Reading skill	
2018	Dolezal, et al.	Survey	Austria	Undergraduate Computer Science	25	Correlation with grades Improved grades Engagement Motivation Learning effect	
2018	Głowacki, et al.	Experiment	Poland Ukraine	Undergraduate English	43	Higher achievement Engagement Motivation	
2018	Guaqueta	Mixed Methods	Colombia	High School EFL	20	Vocabulary acquisition	
2018	Hou	Survey	Taiwan	Junior College EFL	130	Positive attitude Satisfaction Learning motivation	
2018	Ismail, et al.	Observational	Malaysia	Vocational Machining Industry	20	Motivation Attitude Perception Acceptance	
2018	Kinder & Kurz	Other Quantitative Study	USA	Undergraduate Senior Nursing	98	Improved test scores	
2018	Licorish, et al.	Qualitative Study	New Zealand	Undergraduate Information Systems and Governance	14	Quality of learning Classroom dynamics Engagement Motivation Learning experiences	
2018	Lin, et al.	Survey	Malaysia	Undergraduate English for Media	51	Motivation Engagement Fostering learning Reinforcing learning	
2018	Matsubara & Yoshida	Experiment	Japan	University English Reading	28	Academic performance Vocabulary acquisition Autonomy	

						Motivation Reading performance	
2018	Muhridza, et al.	Qualitative Study	Malaysia	Undergraduate Biomedical Engineering (English)	29	Engagement Language skills	
2018	Tsymbal	Other Quantitative Study	Ukraine	Undergraduate Life and Environmental Science	112	Motivation Confidence Positive attitudes	
2018	Turan & Meral	Experiment	Turkey	7 th Grade Social Studies	46	Achievement Engagement Decreased test anxiety	
2018	Videnovik, et al.	Survey	Norway Macedonia	12-13 year old students	89	Fun Motivation Competition Useful Learning	
2019	Arif, et al.	Qualitative Study	Malaysia	Undergraduate TESL	46	Information recall Knowledge	
2019	Aslam, et al.	Survey	Pakistan	Undergraduate Medical Studies	171	Classroom dynamics Learning support Assessment Consolidation of essential content No fear of failure	
2019	Bawa	Mixed Methods	USA	Undergraduates	96	Performance Engagement	
2019	Baydas & Çiçek	Mixed Methods	Turkey	Undergraduate pre-service teachers	91	Development of a reliable scale of factors affecting gamification: learning effect, expected outcome, competition, entertainment, engagement, intention	
2019	Cameron & Bizo	Survey	New Zealand	Undergraduate Animal Husbandry	72	Positive social learning Fun Competitive Immersive	Kahoot did not directly increase achievement
2019	Castro, et al.	Experiment	Spain	Management and Administration of Nursing	116	Correct response to more difficult exam questions	

						Content acquisition Comprehension Teacher-student interaction	
2019	Chacra, et al.	Survey	India	Undergraduate Computer Engineering	28	Engagement Active learning Fun	
2019	Chen & Yeh	Experiment	Taiwan	Undergraduate English	77	Enhanced performance Mental effort	
2019	Dell & Chudow	Other Quantitative Study	USA	Undergraduate Pharmaco- therapeutics	197	Correlation with grades Fun Effective	
2019	Felszeghy, et al.	Other Quantitative Study	Finland	Undergraduate Medical & Dental Histology	215	Learning gains Satisfaction Motivation Collaboration	
2019	Gist, et al.	Other Quantitative Study	USA	Undergraduate Special Education	56	Preference for private rather than public playing of Kahoot. No difference in scores public/private	
2019	Göksün & Gürsoy	Mixed Methods	Turkey	Undergraduate teachers (scientific research methods)	71	Academic achievement Engagement	Digital infrastructure Tool use
2019	Gündüz & Akkoyunlu	Mixed Methods	Turkey	High School Flipped Learning	53	Motivation Enjoyment	
2019	Hakim, et al.	Qualitative Study	Indonesia	Elementary Students (4 th Grade)	32	Interest Expression Active involvement Attractive	
2019	Hou	Survey	Taiwan	Junior College EFL	75	Reading comprehension Positive attitudes	Answering at own speed in Socrative was less stressful Unfavorable attitudes towards using mobile phones
2019	Ismail, et al.	Qualitative Study	Malaysia	Medical students	36	Motivation Prioritization of content to be studied Awareness of progress	

2019	Lee, et al.	Mixed Methods	Taiwan	Junior High Earth Science	39	Motivation Attention Efficient learning Achievement	
2019	Madzlan	Other Quantitative Study	Malaysia	Undergraduate ESL	70	Kahoot is the preferred tool	
2019	Saracoglu & Kocabatmaz	Qualitative Study	Turkey	Preservice Teachers	36	Attention Motivation Fun Active participation	Competitive Internet facilities
2019	Tewthanom	Other Quantitative Study	Thailand	Undergraduate Clinical Pharmacokinetics	21	Learning Skills	
2019	Ting, et al.	Other Quantitative Study	Hong Kong	Undergraduate Calculus	1017	Conceptual understanding Exam performance Engagement Active learning	
2019	Tóth, et al.	Experiment	Hungary	Undergraduate students	200	Exam scores Perception of learning	
2019	Warsihna, et al.	Experiment	Indonesia	Undergraduate Psychology	60	Significant effect Learning Effectiveness	
2019	Youhasan & Raheem	Survey	Sri Lanka	Undergraduate Medicine	61	Focus Fun Motivation Active learning Feedback	
2019	Yunus & Azman	Experiment	Malaysia	Primary (Year 3) English	35	Performance Memory retention	
2019	Yunus, et al.,	Other Quantitative Study	Malaysia	Undergraduate TESL	40	Engagement Active learning Enjoyment	
2019	Yürük	Action Research	Turkey	Undergraduate EFL	15	Engagement Active learning Mastery	
2020	Alharti	Mixed Methods	Saudi Arabia	EFL Learners	36	Motivation Engagement Classroom dynamics Learning	

2020	Bachur, et al.	Experiment	Brazil	Health (Blood Pressure Measurement)	81	Practical knowledge acquisition	
2020	Berbudi, et al.	Experiment	Indonesia	Undergraduate Medical Parasitology	277	Enthusiasm	No difference in learning with Kahoot
2020	Campillo-Ferrer, et al.	Experiment	Spain	Undergraduate Social Science	101	Active participation Conceptual knowledge Interaction	
2020	Cárdenas-Moncada, et al.	Experiment	Chile	Vocational EFL	50	Increased test scores Classroom environment Positive attitudes	
2020	Feroz, et al.	Survey	Malaysia	Undergraduate Engineering Statistics	72	Learning performance Engagement Usefulness Increased study skills	
2020	Halim, et al.	Other Quantitative Study	Malaysia	Primary School ESL	60	Motivation Acceptance Enjoyment Competition	
2020	Holbrey	Action Research	UK	Undergraduate Primary Education	44	Active participation Interactive learning Engagement Concentration Retention	
2020	Idowu, et al.	Other Quantitative Study	Cyprus	Randomly selected University students	250	Interactive Useful	
2020	Idris	Other Quantitative Study	Malaysia	Primary School (Year 3)	31	Motivation Captivation	
2020	Kapsalis, et al.	Experiment	Greece	Adult Foreign Language Learning (Greek)	66		No difference with traditional methods group in grammar learning
2020	Mays, et al.	Experiment	Taiwan	6 th Grade Reading Comprehension	48	Increased quality in questions Engagement Collaboration Active learning	No difference in test scores between Kahoot and traditional

2020	Neureiter, et al.	Other Quantitative Study	Austria	Undergraduate Histo-Pathology	51	Acceptance Faster answering Higher correct response rate Positive evaluation	
2020	Nurhadianti	Qualitative Study	Indonesia	Post-graduate English Education	8	Curiosity Motivation Learning goals	
2020	Owen & Licorish	Mixed Methods	New Zealand	Undergraduate Information Sciences	27	Content retention Knowledge Attention Motivation	
2020	Rahmahani, et al.	Other Quantitative Study	Indonesia	High School Chemistry	153	Fun Engagement Positive feelings	No impact on achievement
2020	Reynolds & Taylor	Experiment	South Korea	Undergraduate EFL	24	Vocabulary knowledge	Differences were not statistically significant
2020	Sartini	Action Research	Indonesia	Maritime English	21	Interactive Interesting Effective Vocabulary learning Enthusiasm	
2020	Tan & Goh	Other Quantitative Study	Malaysia	Undergraduate Academic Vocabulary	180	Vocabulary acquisition	
2020	Uzunboylu, et al.	Qualitative Study	Russia	Preservice teachers	38	Helpful for eliminating learning deficiencies	Internet based
2020	Wang & Tahir	Systematic Review	Norway	Learning effect	93	Learning performance Classroom dynamics Attitudes Reduces anxiety	Technical problems Time-pressure stress Fear of losing
2020	Ye, et al.	Other Quantitative Study	Taiwan	Undergraduate Thai Language and Culture	103	Game-play anxiety does not affect effectiveness of game-based learning	
2020	Yürük	Experiment	Turkey	Undergraduate EFL	60	Pronunciation skills	
2020	Zakaria & Hashim	Qualitative Study	Malaysia	Undergraduate ESL	32	Engagement	Technology anxiety
2021	Adkins-Jablonsky, et al.	Survey	USA	Undergraduate Biology	754	Engagement Reduced anxiety	

2021	Ahmad, et al.	Other Quantitative Study	Malaysia	Technical and Vocational Education	50	Motivation Ambition	
2021	Alawadhi & Abu-Ayyash	Mixed Methods	United Arab Emirates	Undergraduate EFL	112	Engagement Motivation Learning experience	
2021	Ali, et al.	Qualitative Study	Pakistan	Oral Pathology	75	Comprehension Challenge Self-directed learning	
2021	Almusharraf	Other Quantitative Study	Saudi Arabia	Undergraduate English Literature	276	Attitude Enthusiasm Inquisitiveness Understanding	
2021	Anh, et al.	Case Study	Vietnam	High School Physics	138	Exam results (particular improvement for low scoring individuals)	
2021	Aras & Çiftçi	Experiment	Turkey	Undergraduate Nursing	65	No positive effect	No difference in results between Kahoot group and traditional question/answer group
2021	Asniza, et al.	Survey	Malaysia	Pre-University Biology	100	Participation Active learning Interaction Communication	
2021	Baguio, et al.	Experiment	Philippines	High School Geometry	66	Achievement Motivation	
2021	Chen	Qualitative Study	China	Undergraduate EFL	289	Motivation Positive learning	
2021	Djannah, et al.	Survey	Indonesia	Elementary School	149	Interest Motivation Focus on learning Results	
2021	Donkin & Rasmussen	Systematic Review	Australia	Histology, Anatomy, Medical Education	12	Positive student outcomes Collaborative learning Content knowledge Attendance Participation	Time on task Overwhelming content Gadget distraction
2021	Elkhamisy & Wassef	Experiment	Egypt	Undergraduate Pathology	110	Enhanced understanding Knowledge retention Fun	No explanation for answers

						Motivation Competitive Quick	
2021	Eltahir, et al.	Experiment	United Arab Emirates	University Arabic Language Grammar	107	Conceptual knowledge Motivation Engagement	
2021	Grigoriou & Branet	Survey	Romania	Undergraduate Physical Education and Sport	934	Knowledge acquisition Focus Active participation	
2021	Huber, et al.	Case Study	Germany	Undergraduate Medical Studies	202	Evaluation results Activating	
2021	Iman, et al.	Mixed Methods	Indonesia	Undergraduate Analytical Chemistry	53	Challenge Fun Motivation Effective for correcting mistakes	
2021	Korkmaz & Öz	Survey	Turkey	Undergraduate EFL	38	Improved test scores Increased vocabulary	
2021	Margalit, et al.	Other Quantitative Study	Israel	Undergraduate Engineering	25	Positive learning experience Engagement	No academic difference between Kahoot and traditional methods
2021	Marsa, et al.	Mixed Methods	Indonesia	Undergraduate English Education	39	Engagement Motivation Perception Positive attitude Reading comprehension	
2021	Nasu	Survey	Brazil	Undergraduate Accounting	77	Interactive Involvement Learning	
2021	Öz & Ordu	Experiment	Turkey	Undergraduate Nursing	110	Knowledge scores Skill performance Effective Motivation	
2021	Patil & Kumbhar	Experiment	India	Undergraduate Civil Engineering	76	Active learning Understanding Exam results	
2021	Poblaciones, et al.	Survey	Spain	Undergraduate Agricultural Engineering	48	Satisfaction Participation Entertainment Usefulness	Anxiety due to time limits for response

						Knowledge reinforcement	
2021	Quiroz, et al.	Experiment	Chile	High School EFL	67	Improved vocabulary Learning	
2021	Ruiz	Qualitative Study	Singapore	Undergraduate Spanish	32	Engagement Motivation Conceptual understanding Positive learning environment	
2021	Tao & Zou	Mixed Methods	China	Undergraduate EFL	80	Motivation Engagement Learning effectiveness Classroom interaction	
2021	Umboh, et al.	Other Quantitative Study	Indonesia	4 th Grade Mathematics	22	Learning outcomes	
2022	Ahmed, et al.	Experiment	Iran	Intermediate EFL	50	Vocabulary recall Vocabulary retention	
2022	Aidoune et al.	Qualitative Study	Malaysia	L2 Undergraduate Learners	31	Language learning	
2022	Ali & Abdalgane	Experiment	Saudi Arabia	English for Academic Purposes	60	Learning Motivation	
2022	Ardi & Rianita	Case Study	Indonesia	Undergraduate EFL	22	Engagement Goal setting Focus Collaboration Sense of competition	
2022	Barros, et al.	Other Quantitative Study	Brazil	Undergraduate Human Anatomy	53	Exam score prediction Motivation (influenced by age)	
2022	Castrillon, et al.	Other Quantitative Study	Colombia	Undergraduate Programming	58	Better performance Motivation through competition	
2022	Coveney, et al.	Observational	Ireland Italy	Undergraduate Nursing	83	Learning Useful Helpful Impactful	
2022	Fuchs	Other Quantitative Study	Thailand	Undergraduate International Business	113	Learning progress	Foreign students perceived Kahoot as more useful than local peers

2022	Garcia-Gill, et al.	Other Quantitative Study	Spain	Undergraduate Music and Physical Education	324	Active, innovative, collaborative Attractive to students Effective learning	
2022	Ghawail & Yahia	Action Research	Libya	Undergraduate Chemistry	30	Engagement Effective learning Enjoyment Participation	
2022	Hong, et al.	Experiment	Taiwan	Primary School (5 th Grade)	299	No difference in gameplay anxiety between Kahoot and Shaking-On	Better interest, flow experience, perceived learning value, learning achievement with Shaking-On
2022	Jankovic & Lambic	Experiment	Serbia	Primary School (3 rd Grade)	113	Content learning Academic achievement	
2022	Licorish & Lötter	Qualitative Study	New Zealand	Undergraduate Information Science	38	Motivation Engagement Classroom dynamics	
2022	Litually, et al.	Other Quantitative Study	Germany	German language	37	Learning outcomes	
2022	Lohitharajah & Youhasan	Mixed Methods	Sri Lanka	Undergraduate Medicine	72	Focus Understanding Knowledge retention Motivation Fun Active learning	Internet connectivity
2022	Madden	Mixed Methods	Jamaica	Undergraduate French as a foreign language	21	Vocabulary reinforcement Concept reinforcement Pronunciation Fun Interactive Motivation	Countdown feature can provoke stress and affect the thought process
2022	Mat Husin & Azmuddin	Other Quantitative Study	Malaysia	Undergraduate Science and Technology (English proficiency)	80	Fun Enjoyment Engagement Interesting	
2022	Mdlalose, et al.	Qualitative Study	South Africa	Undergraduate Physical Science Teachers	21	Academic performance Motivation Active engagement	

2022	Nieto-Garcia & Sit	Survey	UK	Undergraduate Marketing	47	Positive desirability Motivation Useful Attendance	
2022	Ortiz-Martínez, et al.	Other Quantitative Study	Spain	Undergraduate Financial Accounting	232	Academic results	
2022	Phelps & Moro	Survey	Australia	Undergraduate medicine and Health Science	174	Effective learning Enjoyment Engagement Valuable	
2022	Ristanto, et al.	Experiment	Indonesia	High School Genetics	46	Conceptual understanding	
2022	Rojabi, et al.	Mixed Methods	Indonesia	Undergraduate English	82	Deeper understanding Vocabulary Exam scores Engagement Motivation	
2022	Schultz, et al.	Experiment	USA	Pediatric Residents	73	Positive attitudes	No difference in knowledge or skill enhancement between control and Kahoot
2022	Sevim-Cirak & Islim	Experiment	Turkey	Undergraduate Teaching (Information Technology)	91		Paper-based quizzes resulted in higher exam scores and retention
2022	Shareef & Rauf	Other Quantitative Study	Iraq	Undergraduate Architecture (Construction)	21	Enjoyment Engagement	
2022	Wirani, et al.	Survey	Indonesia	University students	301	Competitiveness Enjoyment Continued use Perceived usefulness Enjoyment Satisfaction	
2022	Yang & Bae	Other Quantitative Study	South Korea	High School EFL	141	Vocabulary retention	Same effect for Kahoot and ClassCard
2022	Yassin & Abugohar	Experiment	Saudi Arabia	Undergraduate Medicine (English Language Preparation)	598	Language proficiency	

2022	Zhumasheva, et al.	Qualitative Study	Kazakhstan	Undergraduate Education Students	62	Motivation Interest Success Cooperation Kahoot is preferred	
2023	Almusharraf, et al.	Survey	Saudi Arabia	Undergraduate English Literature	276	No significant gender difference in motivation and engagement	
2023	Bienvenido-Huertas, et al.	Experiment	Spain	Undergraduate Architecture and Building Engineering	132	Exam performance (less failure, higher marks)	Kahoot performance not indicative of exam performance
2023	Cadet	Qualitative Study	USA	Undergraduate Nursing	37	Gain knowledge Improve critical thinking Prioritize patient care	
2023	Candan & Başaran	Meta-thematic Analysis	Turkey	Published Studies	40	Student understanding Learning Memory Reflection Entertaining Motivating Anxiety-relieving Supports collaboration Increases participation	
2023	Cortes-Perez, et al.	Experiment	Spain	Undergraduate Physiotherapy	313	Content acquisition Motivating Useful Content retention	
2023	Cuschiere & Narnaware	Other Quantitative Study	Malta	Undergraduate Physiotherapy	26	Knowledge retention Learning experiences	
2023	Ebadi, et al.	Qualitative Study	Iran	Undergraduate EFL	80		Connection problems High pace Competitive nature Demotivation Distraction
2023	Fortuna, et al.	Survey	Spain	Undergraduate Corporate Finance	133	Academic performance Engagement	

2023	Garza, et al.	Experiment	Spain	Undergraduate Neuroanatomy and Histology	584	Correlation with exam scores Prediction of final grade	
2023	Hu	Mixed Methods	China	Undergraduate Modern Educational Technology	40	Test scores Learning effect Entertainment Engagement Competition	
2023	Jankovic, et al.	Other Quantitative Study	Serbia	Primary School (3 rd Grade)	72	Better results than QUIZZIZ Conceptual understanding Content retention Concentration	
2023	Jurado-Castro, et al.	Meta Analysis	Spain	Education	23	Academic improvement Academic performance	
2023	Lobo	Experiment	Philippines	Undergraduate Physical Education	32	Accessible Motivation Improved Test scores	
2023	Lv	Experiment	China	College of Commerce	108	Motivation Engagement	
2023	Mohtar, et al.	Other Quantitative Study	Malaysia	Middle-aged women Arabic Learners	61	Enjoyment Memorization Motivation Effective	
2023	Ortiz-Martínez, et al.	Other Quantitative Study	Spain	Undergraduate Financial Accounting	392	Learning Grades	
2023	Portela	Experiment	Portugal	Undergraduate Computer Science	507	Engagement Motivation Learning outcomes	
2023	Pratiwi, et al.	Experiment	Indonesia	Undergraduate Railway Mechanical Technology	48	Learning Vocabulary achievement	
2023	Sercemeli & Onlu	Other Quantitative Study	Turkey	Undergraduate Accounting	40	Engagement Perceived learning Participation	No longer-term effects
2023	Shakhmalova & Zotova	Experiment	Russia	Undergraduate English Grammar	114	Effective tool Motivation Entertaining Language acquisition	Academic performance did not significantly improve

2023	Shawwa & Kamel	Mixed Methods	Saudi Arabia	Undergraduate Medicine (Pharmacology)	274	Practical Agreeable Interactive Engagement Motivation Academic achievement	
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References

- Adkins-Jablonsky, S.J., Shaffer, J.F., Morris, J.J., England, B.J., & Raut, S.A. (2021). A Tale of Two Institutions: Analyzing the Impact of Gamified Student Response Systems on Student Anxiety in Two Different Introductory Biology Courses. *CBE Life Sciences Education*, 20. <https://doi.org/10.1187/cbe.20-08-0187>
- Ahmad, M.F., Zakaria, N., Wan Hassan, W.A., Razali, S.S., Abd Mutalib, N.N., & Bokhari, N.H. (2021). Educational Game Platform Kahoot! in Teaching and Learning Process: A Case Study of New Norms. *2021 IEEE 9th Conference on Systems, Process and Control (ICSPC 2021)*, 147-152. <https://doi.org/0.1109/ICSPC53359.2021.9689146>
- * Ahmed, A., Sayed, B.T., Wekke, I.S., Widodo, M., Rostikawati, D.A., Ali, M.H., Abdul Hussein, H.A., & Azizian, M. (2022). An Empirical Study on the Effects of Using Kahoot as a Game-Based Learning Tool on EFL Learners' Vocabulary Recall and Retention. *Education Research International*. <https://doi.org/10.1155/2022/9739147>
- Aidoune, Y., Nordin, N., & Singh, M.K. (2022). Effect of Online English Learning Game 'Kahoot' on L2 Undergraduate Learners in a Malaysian University. *Journal of Intercultural Communication*, 22(3), 13-18. <https://doi.org/10.36923/jicc.v22i3.66>
- Aktekin, N.Ç., Çelebi, H., & Aktekin, M. (2018). Let's Kahoot! Anatomy. *International Journal of Morphology*, 36(2), 716-721.
- Alawadhi, A.Y., & Abu-Ayyash, E.A. (2021). Students' perceptions of Kahoot!: An exploratory mixed-method study in EFL undergraduate classrooms in the UAE. *Education and Information Technologies*, 26, 3629 - 3658. <https://doi.org/10.1007/s10639-020-10425-8>
- * Alharti, S. (2020). Assessing Kahoot's Impact on EFL Students' Learning Outcomes. *TESOL International Journal*, 15(5), 31-64.
- Ali, M.F., Askary, G., Mehdi, H.M., Khan, A., Kaukab, H., & Qamar, R. (2021). To assess students' perception about Kahoot! as an innovative learning tool in oral pathology: A qualitative study. *The Journal of the Pakistan Medical Association*, 71(10), 2426-2428.
- * Ali, R., & Abdalgane, M. (2022). The Impact of Gamification "Kahoot App" in Teaching English for Academic Purposes. *World Journal of English Language*, 12(7), 18-27. <https://doi.org/10.5430/wjel.v12n7p18>
- Almusharraf, N.M. (2021). Incorporation of a game-based approach into the EFL online classrooms: students' perceptions. *Interactive Learning Environments*, 31, 4440 - 4453. <https://doi.org/10.1080/10494820.2021.1969953>

- Almusharraf, N.M., Aljasser, M., Dalbani, H., & AlSheikh, D. (2023). Gender differences in utilizing a game-based approach within the EFL online classrooms. *Heliyon*, 9. <https://doi.org/10.1016/j.heliyon.2023.e13136>
- Anh, T.T. (2021). Effectiveness of kahoot on exam scores in physics of high-school students: A case study in Vietnam. *Journal of Legal, Ethical and Regulatory Issues*, 24(1).
- * Aras, G.N., & Çiftçi, B. (2021). Comparison of the effect of reinforcement with question-answer and kahoot method on the success and motivation levels of nursing students: A quasi-experimental review. *Nurse Education Today*, 102, 104930. <https://doi.org/10.1016/j.nedt.2021.104930>
- Ardi, P., & Rianita, E. (2022). Leveraging Gamification into EFL Grammar Class to Boost Student Engagement. *Teaching English with Technology*, 22(2), 90-114.
- Arif, F.K., Zubir, N.Z., Mohamad, M., & Yunus, M.M. (2019). Benefits and challenges of using game-based formative assessment among undergraduate students. *Humanities & Social Sciences Reviews*, 7(4), 203-213. <https://doi.org/10.18510/hssr.2019.7426>
- Aslam, S., Rasheed, S., & Bukhari, S. (2019). Preclinical medical students' perspective on technology enhanced assessment for learning. *Asian Journal of Multidisciplinary Studies*, 7(6), 898-903 .
- Asniza, I.N., Zuraidah, O.S., Baharuddin, A.R., Zuhair, Z., & Nooraida, Y. (2021). Online Game-Based Learning Using Kahoot to Enhance Pre-University Students Active Learning: A Students Perception in Biology Classroom. *Journal of Turkish Science Education*, 18(1), 145-160. <https://doi.org/10.36681/tused.2021.57>
- Assink, M., Wibbelink, C. J. M., et al. (2016). Fitting Three-Level Meta-Analytic Models in r: A Step-by-Step Tutorial. *The Quantitative Methods for Psychology* 12 (3): 154–74.
- Bachur, C.K., Bachur, J.A., Candido, S.S., Pereira, J., Machado, Daniel, A.C., Silva, C.M., & Veiga, E.V. (2020). The use of active methodologies as teaching strategies of measuring blood pressure. *Journal of Human Growth and Development*, 30(3), 443-450. <https://doi.org/10.7322/jhgd.v30.11112>
- Baguio, F., Rama, F.M., Rico, J.M., & Salazar, D.A. (2021). Grade 8 learner's achievement and motivation level in geometry using kahoot! as a formative assessment. *Journal of Physics: Conference Series*, 1835. <https://doi.org/10.1088/1742-6596/1835/1/012014>
- Barros, D.P., Santana, D.A., Costa, T.K., Pereira, A.K., & Medeiros, A.R. (2022). Kahoot!'s contribution to immediate learning feedback for anatomy students. *European Journal of Anatomy*, 26(1), 107-116. <https://doi.org/10.52083/NCEH9192>
- Batsila, M., & Tsihouridis, C. (2018). "Let's Go... Kahooting" - Teachers' Views on C.R.S. for Teaching Purposes. *International Conference on Interactive Collaborative Learning*. https://doi.org/10.1007/978-3-319-73210-7_66

- * Bawa, P. (2019). Using Kahoot to Inspire. *Journal of Educational Technology Systems*, 47(3), 373 - 390. <https://doi.org/10.1177/0047239518804173>
- Baydas, O., & Çiçek, M. (2019). The examination of the gamification process in undergraduate education: a scale development study. *Technology, Pedagogy and Education*, 28, 269 - 285. <https://doi.org/10.1080/1475939X.2019.1580609>
- Berbudi, A., Rahmaputri, M.D., Wahyudi, K., & Ramadhanti, J. (2020). Does Online Real-Time Quiz "Kahoot!" Increase Students' Knowledge and Enthusiasm During Laboratory Activity Lesson? *Universal Journal of Educational Research*, 8(10), 4716-4722. <https://doi.org/10.13189/ujer.2020.081041>
- Bicen, H., & Kocakoyun, Ş. (2018). Perceptions of Students for Gamification Approach: Kahoot as a Case Study. *International Journal of Emerging Technologies in Learning*. <https://doi.org/10.3991/ijet.v13i02.7467>
- Bienvenido-Huertas, D., Rubio-Bellido, C., & León-Muñoz, M. (2023). Analysis of the effectiveness of using Kahoot! in university degrees in building engineering. *Journal of Technology and Science Education*, 13(1), 288-300. <https://doi.org/10.3926/jotse.1984>
- Bolat, Y. I., & Taş, N. (2023). A meta-analysis on the effect of gamified-assessment tools' on academic achievement in formal educational settings. *Education and Information Technologies*, 28(5), 5011-5039.
- Budiati, B. (2017). ICT (information and communication technology) use: Kahoot program for English students' learning booster. *The 1st Education and Language International Conference Proceedings Center for International Language Development of Unissula*.
- Brand, A., Bradley, M. T., Best, L. A., and Stoica, G. (2008). Accuracy of effect size estimates from published psychological research. *Percept. Mot. Skills* 106, 645–649. doi: 10.2466/pms.106.2.645-649
- Cadet, M. (2023). Application of game-based online learning platform: Kahoot a formative evaluation tool to assess learning. *Teaching and Learning in Nursing*, 18, 419-422. <https://doi.org/10.1016/j.teln.2023.03.009>
- Cameron, K.E., & Bizo, L.A. (2019). Use of the game-based learning platform KAHOOT! to facilitate learner engagement in Animal Science students. *Research in Learning Technology*, 27. <http://dx.doi.org/10.25304/rlt.v27.2225>
- Campillo-Ferrer, J., Miralles-Martínez, P., & Sánchez-Ibáñez, R. (2020). Gamification in Higher Education: Impact on Student Motivation and the Acquisition of Social and Civic Key Competencies. *Sustainability*, 12, 4822. <https://doi.org/10.3390/su12124822>

- Candan, F., & Başaran, M. (2023). A meta-thematic analysis of using technology-mediated gamification tools in the learning process. *Interactive Learning Environments*. <https://doi.org/10.1080/10494820.2023.2172589>
- * Cárdenas-Moncada, C., Véliz-Campos, M., & Veliz, L. (2020). Game-Based Student Response Systems: The Impact of Kahoot in a Chilean Vocational Higher Education EFL Classroom. *Computer Assisted Language Learning Electronic Journal*, 21(1), 64-78.
- Castrillon, S., Barbosa, T. Castrillon, A. (2022). Knowledge assessment using a games-based learning platform. *Journal of Language and Linguistic Studies*, 18(4), 444-452.
- Castro, M., López, M., Cao, M., Fernandez-Castro, M., García, S., Frutos, M., & Jiménez, J.M. (2019). Impact of educational games on academic outcomes of students in the Degree in Nursing. *PLoS ONE*, 14(7). <https://doi.org/10.1371/journal.pone.0220388>
- Çetin, H.S. (2018). Implementation of the Digital Assessment Tool Kahoot in Elementary School. *International Technology and Education Journal*, 2(1), 9-20.
- Chacra, S., Naiksatam, A., & Khanchandani, K. (2019). Use of Kahoot as a formative assessment tool in engineering education. *Journal of Engineering Education Transformations*, 32(4), 28-33.
- Chen, C., & Yeh, H. (2019). Effects of integrating a questioning strategy with game-based learning on students' language learning performances in flipped classrooms. *Technology, Pedagogy and Education*, 28(3), 347-361. <https://doi.org/10.1080/1475939X.2019.1618901>
- Chen, Y. (2021). Understanding foreign language learners' perceptions of teachers' practice with educational technology with specific reference to Kahoot! and Padlet: A case from China. *Education and Information Technologies*, 27, 1439 - 1465. <https://doi.org/10.1007/s10639-021-10649-2>
- Cheung, M (2014). Modeling Dependent Effect Sizes with Three-Level Meta-Analyses: A Structural Equation Modeling Approach. *Psychological Methods* 19 (2): 211.
- Chotimah, I.C., & Rafi, M.F. (2018). The effectiveness of using kahoot as a media in teaching reading. *E-link Journal*, 5(1), 19-29.
- Cortés-Pérez, I., Zagalaz-Anula, N., López-Ruiz, M.D., Díaz-Fernández, Á., Obrero-Gaitán, E., & Osuna-Pérez, M.C. (2023). Study Based on Gamification of Tests through Kahoot!™ and Reward Game Cards as an Innovative Tool in Physiotherapy Students: A Preliminary Study. *Healthcare*, 11, 578. <https://doi.org/10.3390/healthcare11040578>
- Coveney, K., Somanadhan, S., Nicholson, E., Piga, S., Pizziconi, V., D'Elpidio, G., & Gazzelloni, A. (2022). First year nursing students' evaluation of Kahoot! to facilitate learning and testing knowledge. A pilot study in Ireland and Italy. *Teaching and Learning in Nursing*, 17, 163-168. <https://doi.org/10.1016/j.teln.2021.11.004>

- Cuschieri, S., & Narnaware, Y. (2023). Improving physiotherapy students' anatomy learning experience and short-term knowledge retention-An observational study in Malta. *Anatomical Sciences Education*, 2023, 1-10. <https://doi.org/10.1002/ase.2307>
- Dell, K.A., & Chudow, M. (2019). A web-based review game as a measure of overall course knowledge in pharmacotherapeutics. *Currents in Pharmacy Teaching & Learning*, 11, 838-842. <https://doi.org/10.1016/j.cptl.2019.04.012>
- Djannah, M., Zulherman, & Nurafni (2021). Kahoot Application for Elementary School Students: Implementations of Learning Process from Distance during Pandemic period of COVID 19. *Journal of Physics: Conference Series*, 1783. <https://doi.org/10.1088/1742-6596/1783/1/012121>
- Dolezal, D., Posekany, A., Motschnig, R., & Pucher, R. (2018). Effects of Introducing a Game-Based Student Response System into a Flipped, Person-Centered Classroom on Object-Oriented Design. *International Conference on Advances in Web-Based Learning*.
- Donkin, R., & Rasmussen, R. (2021). Student Perception and the Effectiveness of Kahoot!: A Scoping Review in Histology, Anatomy, and Medical Education. *Anatomical Sciences Education*, 14, 572-585. <https://doi.org/10.1002/ase.2094>
- Ebadi, S., Rasouli, R., & Mohamadi, M. (2023). Exploring EFL learners' perspectives on using Kahoot as a game-based student response system. *Interactive Learning Environments*, 31(4), 2338 - 2350. <https://doi.org/10.1080/10494820.2021.1881798>
- Elkhamisy, F.A., & Wassef, R.M. (2021). Innovating pathology learning via Kahoot! game-based tool: a quantitative study of students' perceptions and academic performance. *Alexandria Journal of Medicine*, 57(1), 215 - 223. <https://doi.org/10.1080/20905068.2021.1954413>
- Eltahir, M.E., Alsalhi, N.R., Al-Qatawneh, S., Alqudah, H., & Jaradat, M. (2021). The impact of game-based learning (GBL) on students' motivation, engagement and academic performance on an Arabic language grammar course in higher education. *Education and Information Technologies*, 26, 3251 - 3278. <https://doi.org/10.1007/s10639-020-10396-w>
- Felszeghy, S., Pasonen-Seppänen, S., Koskela, A.K., Nieminen, P., Härkönen, K., Paldanius, K.M., Gabbouj, S., Ketola, K., Hiltunen, M., Lundin, M., Haapaniemi, T.P., Sointu, E.T., Bauman, E.B., Gilbert, G.E., Morton, D.A., & Mahonen, A. (2019). Using online game-based platforms to improve student performance and engagement in histology teaching. *BMC Medical Education*, 19, 273. <https://doi.org/10.1186/s12909019-1701-0>
- Feroz, F., Subramaniam, I.D., & Subramaniam, S. (2020). Undergraduates' Increased Acceptance and Positive Attitude toward Gamification: Its Relation to Increased

Engagement. *The International Journal of Science, Mathematics, and Technology Learning*, 27(2), 13-24. <https://doi.org/10.18848/23277971/CGP/v27i02/13-24>

Fortuna, J.M., de la Fuente, G., & Velasco, P. (2023). Does gamification mediate the relationship between digital social capital and student Performance? A survey-based study in Spain. *The International Journal of Management Education*, 21, 100846. <https://doi.org/10.1016/j.ijme.2023.100846>

Fuchs, K. (2022). Bringing Kahoot! Into the Classroom: The Perceived Usefulness and Perceived Engagement of Gamified Learning in Higher Education. *International Journal of Information and Education Technology*, 12(7), 625-630. <https://doi.org/10.18178/ijiet.2022.12.7.1662>

García-Gil, D., Bonastre-Vallés, C., Avilés-Villarroel, C., & Ramón-Otero, I. (2022). Kahoot! in Music and Physical Education Classes in Higher Education. *Aloma*, 40(1), 45-54. <https://doi.org/10.51698/aloma.2022.40.1.45-54>

* Garza, M., Olivan, S., Monleón, E., Cisneros, A.I., García-Barrios, A., Ochoa, I., Whyte, J., & Lamiquiz-Moneo, I. (2023). Performance in Kahoot! activities as predictive of exam performance. *BMC Medical Education*, 23, 413. <https://doi.org/10.1186/s12909-023-04379-x>

Ghawail, E.A., & Yahia, S.B. (2022). Using the E-Learning Gamification Tool Kahoot! to Learn Chemistry Principles in the Classroom. *International Conference on Knowledge-Based Intelligent Information & Engineering Systems*.

Gist, C., Andzik, N.R., Smith, E., Xu, M.L., & Neef, N.A. (2019). The Effects of Gaming on University Student Quiz Performance. *Journal of Effective Teaching in Higher Education*, 2(1), 109-119.

Głowacki, J., Kriukova, Y., & Avshenyuk, N. (2018). Gamification in higher education: experience of poland and ukraine. *Advanced Education*, 10, 105-110. <https://doi.org/10.20535/2410-8286.151143>

Göksün, D.O., & Gürsoy, G. (2019). Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz. *Computers & Education*, 135, 15-29. <https://doi.org/10.1016/j.compedu.2019.02.015>

Grigoriou, C., Pelin, R.A., Branet, C., Pricop, A., & Teodora, W. (2021). Usefulness of the kahoot! Digital tool in the physical education and sport lesson in online university education. The 17th International Scientific Conference *eLearning and Software for Education*. <https://doi.org/10.12753/2066-026X-21-186>

Guaqueta, C.A., & Castro-Gárce, A.Y. (2018). The Use of Language Learning Apps as a Didactic Tool for EFL Vocabulary Building. *English Language Teaching*, 11(2), 61-71. <https://doi.org/10.5539/elt.v11n2p61>

- Gündüz, A. Y., & Akkoyunlu, B. (2019). The gamification tool for the classroom response systems: Kahoot!. *Hacettepe University Journal of Education*, 35(3), 480-488. <https://doi.org/10.16986/HUJE.2019052870>
- Hakim, A.R., Rahayu, S., & Affida, R. (2019). Kahoot On Thematic Learning. *Journal of Physics: Conference Series*, 1381. <https://doi.org/10.1088/1742-6596/1381/1/012035>
- Halim, M.S., Hashim, H., & Yunus, M.M. (2020). Pupils' Motivation and Perceptions on ESL Lessons through Online Quiz-Games. *Journal of Education and e-Learning Research*, 7(3), 229-234. <https://doi.org/10.20448/journal.509.2020.73.229.234>
- * Holbrey, C. (2020). Kahoot! Using a game-based approach to blended learning to support effective learning environments and student engagement in traditional lecture theatres. *Technology, Pedagogy and Education*, 29, 191-202. <https://doi.org/10.1080/1475939X.2020.1737568>
- * Hong, J., Tai, K., Luo, W., Sher, Y., & Kao, Y. (2022). Comparing the Taiwanese learning effects of Shaking-On and Kahoot. *Journal of Computer Assisted Learning*, 38(3), 892–905. <https://doi.org/10.1111/jcal.12655>
- Hou, Y. (2018). Integration of Kahoot into EFL Classroom. *HCII Posters, CCIS 852*, 31-37. https://doi.org/10.1007/978-3-319-92285-0_5
- Hou, Y. (2019). Thinking and Educational Technology in EFL Classrooms: Effects on Students' Reading Comprehension and Engagement. *The International Journal of Literacies*, 26(2), 19–34. <https://doi.org/10.18848/2327-0136/CGP/v26i02/19-34>
- Hu, Y. (2023). Kahoot! in the classroom: Examining the impact of a game-based student response system on pre-service teachers' academic achievement and perceptions. *Innovations in Education and Teaching International*. <https://doi.org/10.1080/14703297.2023.2250757>
- Huber, J., Wittl, M.J., Schunk, M., Fischer, M.R., & Tolks, D. (2021). The use of the online Inverted Classroom Model for digital teaching with gamification in medical studies. *GMS Journal for Medical Education*, 38(1).
- Idowu, A., Nat, M., & Kissi, P.S. (2020). Student perception of usefulness and ease using Kahoot, a free web-based tool in a tertiary education setting. *Acta Scientiarum-technology*, 43. <https://doi.org/10.4025/actascitechnol.v43i1.47347>
- Idris, M.I., Said, N.S., & Tan, K.H. (2020). Game-Based Learning Platform and its Effects on Present Tense Mastery: Evidence from an ESL Classroom. *International Journal of Learning, Teaching and Educational Research*, 19(5), 13-26. <https://doi.org/10.26803/ijlter.19.5.2>

- Iman, N., Ramli, M., & Saridewi, N. (2021). Kahoot as an Assessment Tools: Students' Perception of Game-based Learning Platform. *Jurnal Penelitian dan Pembelajaran IPA*, 7(2), 245-259.
- Ismail, M.A., Ahmad, A., Mohammad, J.A., Fakri, N.M., Nor, M.Z., & Pa, M.N. (2019). Using Kahoot! as a formative assessment tool in medical education: a phenomenological study. *BMC Medical Education*, 19, 230. <https://doi.org/10.1186/s12909-019-1658-z>
- Ismail, M.E., Sa'adan, N., Samsudin, M.A., Hamzah, N., Razali, N., & Mahazir, I.I. (2018). Implementation of The Gamification Concept Using KAHOOT! Among TVET Students: An Observation. *Journal of Physics: Conference Series*, 1140. <https://doi.org/10.1088/1742-6596/1140/1/012013>
- * Janković, A., & Lambić, D. (2022). The effect of game-based learning via kahoot and quizzz on the academic achievement of third grade primary school students. *Journal of Baltic Science Education*. <https://doi.org/10.33225/jbse/22.21.224>
- * Janković, A., Maričić, M., & Cvjetičanin, S. (2023). Comparing science success of primary school students in the gamified learning environment via Kahoot and Quizizz. *Journal of Computers in Education*. <https://doi.org/10.1007/s40692-023-00266-y>
- Jurado-Castro, J.M., Vargas-Molina, S., Gómez-Urquiza, J.L., & Benítez-Porres, J. (2023). Effectiveness of real-time classroom interactive competition on academic performance: a systematic review and meta-analysis. *PeerJ Computer Science*, 9. <http://doi.org/10.7717/peerj-cs.1310>
- Kapsalis, G., Galani, A., & Tzafea, O. (2020). Kahoot! As a Formative Assessment Tool in Foreign Language Learning: A Case Study in Greek as an L2. *Theory and Practice in Language Studies*, 10(11), 1343-1350. <https://doi.org/10.17507/tpls.1011.01>
- Kinder, F.D., & Kurz, J.M. (2018). Gaming Strategies in Nursing Education. *Teaching and Learning in Nursing*, 13. 212-214. <https://doi.org/10.1016/j.teln.2018.05.001>
- Korkmaz, S., & Öz, H (2021). Using Kahoot to improve reading comprehension of English as a foreign language learners. *International Online Journal of Education and Teaching (IOJET)*, 8(2). 1138-1150.
- Kraft, M. A. (2020). Interpreting effect sizes of education interventions. *Educational Researcher*, 49(4), 241-253.
- * Lee, C., Hao, Y., Lee, K.S., Sim, S.C., & Huang, C. (2019). Investigation of the effects of an online instant response system on students in a middle school of a rural area. *Computers in Human Behavior*, 95, 217-223. <https://doi.org/10.1016/j.chb.2018.11.034>
- Licorish, S. A., & Lötter, A. L. J. (2022). When Does Kahoot! Provide Most Value for Classroom Dynamics, Engagement, and Motivation?: IS Students' and Lecturers' Perceptions. *Journal of Information Systems Education*, 33(3), 245-260.

- Licorish, S.A., Owen, H.E., Daniel, B. *et al.* (2018). Students' perception of Kahoot!'s influence on teaching and learning. *Research and Practice in Technology Enhanced Learning* 13(9). <https://doi.org/10.1186/s41039-018-0078-8>
- Lin, D., Ganapathy, M., & Kaur, M. (2018). Kahoot! It: Gamification in higher education. *Social Sciences & Humanities*, 26(1), 565-582.
- Litually, S.J., Serpara, H., & Wenno, E.C. (2022). The effect of Kahoot! learning media on learning outcomes of German language students. *Journal of Education and Learning (EduLearn)*, 16(2), 254-261. <https://doi.org/10.11591/edulearn.v16i2.20458>
- Liu, X., & Wang, L.C. (2017). Motivation, Learning Strategies, and Language Competency in a Technology Facilitated Chinese as a Second Language Classroom. *Chinese Language Teaching Methodology and Technology*, 1(2).
- Lobo, J.T. (2023). Lecture-based performance augmentation via game-based application 'Kahoot!' in Physical Education: a 5-week experimental study. *Physical Education of Students*. <https://doi.org/10.15561/20755279.2023.0101>
- Lohitharajah, J., & Youhasan, P. (2022). Utilizing gamification effect through Kahoot in remote teaching of immunology: Medical students' perceptions. *Journal of Advances in Medical Education & Professionalism*, 10, 156-162. <https://doi.org/10.30476/JAMP.2022.93731.1548>
- * Lv, J. (2023). Improving college student engagement and motivation in a gamified learning environment: the pilot study in China. *Current Psychology*. <https://doi.org/10.1007/s12144-023-04884-8>
- Madden, O. N. (2022). Edutainment: assessing students' perceptions of Kahoot! as a review tool in French L2 classes. In B. Arnbjörnsdóttir, B. Bédi, L. Bradley, K. Friðriksdóttir, H. Garðarsdóttir, S. Thouësny, & M. J. Whelpton (Eds), *Intelligent CALL, granular systems, and learner data: short papers from EUROCALL 2022* (pp. 240-245). <https://doi.org/10.14705/rpnet.2022.61.1465>
- Madzlan, N.A. (2019). Promoting Active Learning in the ESL Classroom: Tertiary Level Students' Perspectives on Lecturing Approaches. *International Journal of Innovation, Creativity and Change*, 7(4), 134-144.
- Margalit, T., Rosenzweig, L., Stanchescu, Y., & Gabel, M. (2021). Utilizing gamification in mathematics courses for engineers to promote learning. *Proceedings of the 17th International CDIO Conference, Bangkok, Thailand, June 21-23, 2021*.
- Marsa, S.S., Kuspiyah, H.R., & Agustina, E.S. (2021). The Effect of Kahoot! Game in Teaching Reading Comprehension Achievement. *Journal of English Teaching*, 7(2), 133-149. <https://doi.org/10.33541/jet.v7i2.2738>

- Mat Husin, M.Z., & Azmuddin, R.A. (2022). Learner Engagement in Using Kahoot! within a University English Proficiency Course. *Educational Process International Journal*, 11(2), 167-180. <https://dx.doi.org/10.22521/edupij.2022.112.9>
- Matsubara, M., & Yoshida, H. (2018). Fostering autonomous learners of vocabulary acquisition using content-based ict methods. *Humanities and Social Sciences*, 6, 36-43. <https://doi.org/10.18510/hssr.2018.617>
- * Mays, B.R., Yeh, H., & Chen, N. (2020). The Effects of Using Audience Response Systems Incorporating Student-Generated Questions on EFL Students' Reading Comprehension. *The Asia-Pacific Education Researcher*, 29(6), 553-566. <https://doi.org/10.1007/s40299-020-00506-0>
- Mdlalose, N., Ramaila, S., & Ramnarain, U. (2022). Using Kahoot! As A Formative Assessment Tool in Science Teacher Education. *International Journal of Higher Education*, 11(2), 43-51. <https://doi.org/10.1007/s40299-020-00506-0>
- Medina, E.G., & Hurtado, C. (2017). Kahoot! A Digital Tool for Learning Vocabulary in a language classroom. *Revista Publicando*, 4(12), 441-449.
- Mohtar, S., Jomhari, N., Omar, N.A., Mustafa, M.B., & Yusoff, Z.B. (2023). The usability evaluation on mobile learning apps with gamification for middle-aged women. *Education and Information Technologies*, 28, 1189-1210. <https://doi.org/10.1007/s10639-022-11232-z>
- Muhridza, N.H., Rosli, N.A., Sirri, A., & Samad, A.A. (2018). Using Game-based Technology, KAHOOT! for Classroom Engagement. *LSP International Journal*, 5(2), 37-48. <https://doi.org/10.11113/lspi.v5n2.77>
- Murphy, D. H., Little, J. L., & Bjork, E. L. (2023). The Value of Using Tests in Education as Tools for Learning—Not Just for Assessment. *Educational Psychology Review*, 35(3), 89.
- Nasu, V.H., Afonso, L.E., & Nogueira, D.R. (2021). Usage of a Web-Based Student Response System (SRS) in the Classroom: An Analysis of Accounting Students' Perception. *Revista Evidenciação Contábil & Finanças*, 9(1), 134-151. <http://periodicos.ufpb.br/ojs2/index.php/recfin>
- Neureiter, D., Klieser, E., Neumayer, B., Winkelmann, P., Urbas, R., & Kiesslich, T. (2020). Feasibility of Kahoot! as a Real-Time Assessment Tool in (Histo-)pathology Classroom Teaching. *Advances in Medical Education and Practice*, 11, 695-705. <http://doi.org/10.2147/AMEP.S264821>
- Nieto García, M., & Sit, J. (2022). Students' recalled desirability of using game-based student response systems (gsrss): a user experience (ux) perspective. *Marketing Education Review*. <https://doi.org/10.1080/10528008.2022.2117989>

- Nurhadianti, B.W. (2020). Students' Perception toward the Application of Kahoot! as an Assessment Tool in EFL Class. *Universal Journal of Educational Research*, 8(5), 2150-2155. <https://doi.org/10.13189/ujer.2020.080554>
- Ortiz-Martínez, E., Santos-Jaén, J.M., & Marín-Hernández, S. (2023). Kahoot! and its effect on financial accounting marks at the university. *Education and Information Technologies*, 28, 12671-12686. <https://doi.org/10.1007/s10639-023-11612-z>
- Ortiz-Martínez, E., Santos-Jaén, J.M., & Palacios-Manzano, M. (2022). Games in the classroom? Analysis of their effects on financial accounting marks in higher education. *The International Journal of Management Education*, 20. <https://doi.org/10.1016/j.ijme.2021.100584>
- Owen, H.E., & Licorish, S.A. (2020). Game-Based Student Response System: The Effectiveness of Kahoot! on Junior and Senior Information Science Students' Learning. *J. Inf. Technol. Educ. Res.*, 19, 511-553. <https://doi.org/10.28945/4608>
- * Öz, G.Ö., & Ordu, Y. (2021). The effects of web based education and Kahoot usage in evaluation of the knowledge and skills regarding intramuscular injection among nursing students. *Nurse education today*, 103, 104910. <https://doi.org/10.1016/j.nedt.2021.104910>
- Patil, Y.M., & Kumbhar, P.D. (2021). Learning by Gamification: An Effective Active Learning Tool in Engineering Education. *Journal of Engineering Education Transformations*, 34, 447-453.
- Phelps, C., & Moro, C. (2022). Using live interactive polling to enable hands-on learning for both face-to-face and online students within hybrid-delivered courses. *Journal of University Teaching and Learning Practice*, 19(3).
- Poblaciones, M., Garcia-White, T., & Marin, C. (2021). Students' Perception of Real-Time Quiz Kahoot! As a Review Tool in Higher Education: A Case of Study. *International Journal in Engineering Pedagogy*, 11, 165-174.
- Portela, F. (2023). A New Approach to Perform Individual Assessments at Higher Education Using Gamification Systems. *International Computer Programming Education Conference*. <https://doi.org/10.4230/OASlcs.ICPEC.2023.8>
- Pratiwi, D.I., Puspitasari, A., & Fikria, A. (2023). Mind-Mapping Technique and Writeabout Application Integration in an Online Writing Class: An Indonesian Vocational University Context. *The Electronic Journal for English as a Second Language*, 26(4). <https://doi.org/10.55593/ej.26104a4>
- Quiroz, M., Gutiérrez, R., Rocha, F., Valenzuela, M., & Vilches, C. (2021). Improving English vocabulary learning through Kahoot!: A quasi-experimental high school experience. *Teaching English with Technology*, 21(2), 3-13.

- Rahmahani, D., Suyoto, & Pranowo (2020). The Effect Of Gamified Student Response System On Students' Perception and Achievement. *International Journal in Engineering Pedagogy*, 10, 45-59. <https://doi.org/10.3991/ijep.v10i2.11698>
- Reynolds, E., & Taylor, B. (2020). Kahoot!: EFL instructors' implementation experiences and impacts on students' vocabulary knowledge. *Computer-Assisted Language Learning Electronic Journal*, 21(2), 70-92.
- Ristante, R.H., Kristiani, E., & Lisanti, E. (2022). Flipped Classroom–Digital Game-Based Learning (FC-DGBL): Enhancing Genetics Conceptual Understanding of Students in Bilingual Programme. *Journal of Turkish Science Education*, 19(1), 328-348. <https://doi.org/10.36681/tused.2022.1124>
- Rojabi, A.R., Setiawan, S., Munir, A., Purwati, O., Safriyani, R.R., Hayuningtyas, N., Khodijah, S., & Amumpuni, R.S. (2022). Kahoot, is it fun or unfun? Gamifying vocabulary learning to boost exam scores, engagement, and motivation. *Frontiers in Education*, 7. <https://doi.org/10.3389/feduc.2022.939884>
- Ruiz, C.G. (2021). The effect of integrating Kahoot! and peer instruction in the Spanish flipped classroom: the student perspective. *Journal of Spanish Language Teaching*, 8(1), 63-78. <https://doi.org/10.3389/feduc.2022.939884>
- Saracoglu, G. & Kocabatmaz, H. (2019). A Study on Kahoot and Socrative in Line with Preservice Teachers' Views. *Educational Policy Analysis and Strategic Research*, 14(4), 31-46. <https://doi.org/10.3389/feduc.2022.939884>
- Sartini, S. (2020). Kahoot in Maritime English Teaching: Its Impact on Nautical Science Cadet's Oral Reproduction and Vocabulary. *English Language Teaching Educational Journal*, 3(1), 41-51.
- Schultz, K., Klein, M.D., Sucharew, H.J., McDonald, J., DeBlasio, D.J., Cooperstein, E., Poynter, S.E., Huggins, J., & Real, F.J. (2022). The Impact of a Gamified Curriculum using Kahoot! on Musculoskeletal Knowledge and Skill Acquisition among Pediatric Residents. *View from the Association of Pediatrics Program Directors*.
- Sercemeli, M., & Baydas Onlu, O. (2023). Prediction of students' learning outcomes by various variables in gamified online accounting courses. *Education and Information Technologies*. <https://doi.org/10.3389/feduc.2022.939884>
- * Sevim-Cirak, N., & Islim, O. F. (2022). Paper versus online quizzes: Which is more effective? *Active Learning in Higher Education*. <https://doi.org/10.1177/14697874221079737>
- Shakhmalova, I.Z., & Zotova, N. (2023). Techniques for Increasing Educational Motivation and the Need to Assess Students' Knowledge: The Effectiveness of Educational Digital Games in Learning English Grammatical Material. *Journal of Psycholinguistic Research*, 52, 1875-1895. <https://doi.org/10.3389/feduc.2022.939884>

- Shareef, S.S., & Rauf, H.L. (2022). Learning technical courses in architectural education through gamification. *Computer Applications in Engineering Education*, 30, 1872 - 1884. <https://doi.org/10.1002/cae.22562>
- Shawwa, L.A., & Kamel, F.O. (2023). Assessing the Knowledge and Perceptions of Medical Students After Using Kahoot! in Pharmacology Practical Sessions at King Abdulaziz University, Jeddah. *Cureus*, 15(3). <https://doi.org/10.7759/cureus.36796>
- * Tan, A., & Goh, L. (2020). Comparing the Effectiveness of Direct Vocabulary Instruction and Incidental Vocabulary Learning in Improving the Academic Vocabulary of Malaysian Tertiary Students. *Pertanika Journal of Social Sciences & Humanities*, 28(2), 263-279.
- Tao, Y., & Zou, B. (2021). Students' perceptions of the use of Kahoot! in English as a foreign language classroom learning context. *Computer Assisted Language Learning*. <https://doi.org/10.1080/09588221.2021.2011323>
- Tewthanom, K. (2019). The Effect of Kahoot Web-Based Learning on Learning Skills of Pharmacy Students: The Trend in Clinical Pharmacokinetics Course for 2 Generations. *Indian Journal of Pharmaceutical Education and Research*, 53(2), 212-215.
- Ting, F.S., Lam, W.H., & Shroff, R.H. (2019). Active Learning via Problem-Based Collaborative Games in a Large Mathematics University Course in Hong Kong. *Education Sciences*, 9, 172. <http://dx.doi.org/10.3390/educsci9030172>
- Tóth, Á., Lógó, P., & Lógó, E. (2019). The Effect of the Kahoot Quiz on the Student's Results in the Exam. *Periodica Polytechnica Social and Management Sciences*, 27(2), 173-179. <https://doi.org/10.3311/PPso.12464>
- Tsihouridis, C., Vavougiou, D., & Ioannidis, G.S. (2017). Assessing the Learning Process Playing with Kahoot - A Study with Upper Secondary School Pupils Learning Electrical Circuits. *ICL2017 – 20th International Conference on Interactive Collaborative Learning*, 1108.
- Tsymbol, S. (2018). Gamified training sessions as means of enhancing students' motivation in learning english. *Psychological Journal*, 7(17), 151-161. <https://doi.org/10.3311/PPso.12464>
- Turan, Z., & Meral, E. (2018). Game-Based Versus to Non-Game-Based: The Impact of Student Response Systems on Students' Achievements, Engagements and Test Anxieties. *Informatics in Education*, 17(1), 105-116. <https://doi.org/10.15388/infedu.2018.07>
- Umboh, D., Tarusu, D.T., Marini, A., & Sumantri, M.S. (2021). Improvement of student mathematics learning outcomes through Kahoot learning games application at elementary school. *Journal of Physics: Conference Series*, 1869. <https://doi.org/10.1088/1742-6596/1869/1/012124>

- Uzunboylu, H., Galimova, E.G., Kurbanov, R.A., Belyalova, A.M., Deberdeeva, N., & Timofeeva, M. (2020). The Views of the Teacher Candidates on the Use of Kahoot as A Gaming Tool. *International Journal of Emerging Technologies in Learning*, 15, 158-168. <https://doi.org/10.3991/ijet.v15i23.18811%0d>
- Videnovik, M., Trajkovic, V., Kiønig, L.V., & Vold, A.T. (2018). Kahooting and Learning – a study from Macedonia and Norway. *Proceedings of the European Conference on Games-based Learning*.
- Wang, A., & Lieberoth, A. (2016). The effects of points and audio on concentration, engagement, enjoyment, learning, motivation, and classroom dynamics using Kahoot! *10th European Conference on Game-Based Learning*.
- Wang, A.I., & Tahir, R. (2020). The effect of using Kahoot! for learning - A literature review. *Computers & Education*, 149, 103818. <https://doi.org/10.1016/j.compedu.2020.103818>
- Wang, A.I., Zhu, M., & Sætre, R. (2016). The Effect of Digitizing and Gamifying Quizzing in Classrooms. *10th European Conference on Game-Based Learning*.
- Warsihna, J., Ramdani, Z., & Prakoso, B.H. (2019). Using Kahoot to improve students' achievement and critical thinking in undergraduate of psychology students. *Proceedings of the 16th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2019)*.
- Wirani, Y., Nabarian, T., & Romadhon, M.S. (2022). Evaluation of continued use on Kahoot! as a gamification-based learning platform from the perspective of Indonesia students. *Procedia Computer Science*, 197, 545-556. <https://doi.org/10.1016/j.procs.2021.12.172>
- * Yang, G., & Bae, J. (2022). The Effect of Mobile Application Types on Learner's Vocabulary Ability and Affective Domain. *The Journal of Asia TEFL*, 19(4), 1219-1233. <https://doi.org/10.1016/j.procs.2021.12.172>
- Yapici, I.Ü., & Karakoyun, F. (2017). Gamification in Biology Teaching: A Sample of Kahoot Application. *Turkish Online Journal of Qualitative Inquiry*, 8(4), 396-414. <https://doi.org/10.17569/tojqi.335956>
- Yassin, B., & Abugohar, M.A. (2022). Gamified mobile-assisted formative assessment for reviving undergraduate learners' overall language proficiency: A quasi-experimental study. *Teaching English with Technology*, 22(2), 69-89.
- Ye, J.H., Watthanapas, N., & Wu, Y. (2020). Applying Kahoot in Thai Language and Culture Curriculum: Analysis of the Relationship among Online Cognitive Failure, Flow Experience, Gameplay Anxiety and Learning Performance. *International Journal of Information and Education Technology*, 10(8), 563-572. <https://doi.org/10.18178/ijiet.2020.10.8.1425>

- Youhasan, P., & Raheem, S. (2019). Technology Enabled Formative Assessment in Medical Education: A Pilot Study through Kahoot. *Education in Medicine Journal*, 11(3), 23-29.
<https://doi.org/10.21315/eimj2019.11.3.3>
- Yunus, M., & Azman, M. (2019). Memory stay or stray? Irregular verbs learning using Kahoot! *Arab World English Journal*, 5, 206-219.
<https://doi.org/10.21315/eimj2019.11.3.3>
- Yunus, M., Hashim, H., Hashim, H.U., Yahya, Z., Sabri, F., & Nazeri, A. (2019). Kahoot!: Engaging and active learning environment in ESL writing classrooms. *International Journal of Innovation, Creativity, and Change*, 5(6), 141-152.
- Yürük, N. (2019). Edutainment: Using Kahoot! As A Review Activity in Foreign Language Classrooms. *Journal of Educational Technology and Online Learning*, 2(2), 89-101.
<https://doi.org/10.31681/jetol.557518>
- Yürük, N. (2020). Using Kahoot as a skill improvement technique in pronunciation. *Journal of Language and Linguistic Studies*, 16(1), 137-153.
<https://doi.org/10.17263/jlls.712669>
- Zakaria, N.Y., & Hashim, H. (2020). Game-Based Assessment in Academic Writing Course for Pre-Service Teachers. *TESOL International Journal*, 15(1), 65-73.
- Zhumasheva, T., Alimbekova, A.A., Saira, Z., Ussenova, A., Nurgaliyeva, D., & Hamiti, M. (2022). Evaluation of University Students' Views on the Gamified Classroom Model. *Int. J. Emerg. Technol. Learn.*, 17(16), 21-32.
<https://doi.org/10.3991/ijet.v17i16.32189>

Suggested citation:

Ciesielska, Kucirkova, Campbell & Schewe (2024). Integrative Review and Meta-Analysis of the Effects of Kahoot! Quiz Games. Final report for Kahoot! on behalf of WiKIT AS.



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