

Kahoot! in a dental hygiene class: Motivating or stressful for students?

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ABSTRACT

Introduction: Kahoot! is an online quiz game that has become popular in education, including health professional education. Despite the known benefits of Kahoot!, application of this game in dental hygiene education is rare. **Description of case:** Kahoot! was incorporated into a dental hygiene course at the University of Alberta, Canada. A pilot study was conducted to describe students' experiences with and perspectives on Kahoot! gaming. Nineteen percent (19%) of the students in the course participated in a voluntary, anonymous survey. The results indicated

positive impacts of Kahoot! on student components of motivation: attention, relevance, confidence, and satisfaction. Seventy-five percent (75%) of the survey respondents reported in-class competition in Kahoot! as a source of motivation; 24% found the live leaderboard stressful.

Discussion: Despite some stressful experiences reported by students, this study suggests that Kahoot! is an excellent tool for promoting student engagement. **Conclusion:** Further studies are needed in this area to explore the impact of Kahoot! on the academic performance and learning outcomes of dental hygiene students.

RÉSUMÉ

Introduction : Kahoot! est un jeu de questions en ligne qui est devenu populaire dans l'enseignement, y compris dans la formation des professionnels de la santé. Malgré les avantages connus de Kahoot!, il est rare que ce jeu soit appliqué dans l'enseignement de l'hygiène dentaire.

Description du cas : Kahoot! a été intégré à un cours d'hygiène dentaire à l'Université de l'Alberta, au Canada. Une étude pilote a été menée pour décrire les expériences et les perspectives des étudiants relatives au jeu Kahoot! Dix-neuf pour cent (19 %) des étudiants du cours ont participé à un sondage volontaire et anonyme. Les résultats ont révélé que le jeu Kahoot! a un impact positif sur les composantes de la motivation des étudiants : l'attention, la pertinence, la confiance et la satisfaction. Soixante-quinze pour cent (75 %) des répondants du sondage ont signalé que la compétition en classe lorsqu'il s'agit de Kahoot! était une source de motivation; 24 % ont trouvé le tableau de classement en direct stressant. **Discussion :** Bien que les étudiants aient signalé quelques expériences stressantes, cette étude suggère que Kahoot! est un excellent outil pour promouvoir la participation des étudiants. **Conclusion :** Il faut d'autres études dans ce domaine pour explorer l'impact de Kahoot sur la performance scolaire et les résultats d'apprentissage des étudiants en hygiène dentaire.

Keywords: dental hygiene; education; educational activities; gamification; Kahoot!; learning

CDHA Research Agenda category: capacity building of the profession

PRACTICAL IMPLICATIONS OF THIS RESEARCH

- A growing number of educational institutions are embracing gamification and game-based learning to improve student engagement. Kahoot! is one such popular educational quiz game.
- This study showed that, despite some stressful experiences reported by students, Kahoot! is an excellent educational tool to promote student engagement in class.

INTRODUCTION

Engaging and motivating learners in a didactic classroom are much-explored yet poorly understood aspects of educational research. While students' attention can be captured, keeping them attentive, motivated, and engaged during class time can be challenging, which is the key to achieving the expected learning outcomes.¹ Conventionally, student engagement refers to the students' active participation in educational activities.^{2,3} According to Trowler,⁴ student engagement involves investing time, effort, and other relevant resources to enhance learning outcomes.⁴ Although the power of games in education was recognized decades ago, the term "gamification" has become popular only recently.^{5,6} Many higher educational

institutions around the world are embracing games and gaming mechanics to engage students in class; health professional schools are among them.^{7,8} Games have been shown to have positive impacts on knowledge acquisition, motivation, and satisfaction.^{9,10}

Kahoot!, a game-based student response system, has recently become quite popular in higher education for its ability to engage students both in person and online.¹¹ During the COVID-19 pandemic, when in-person classes were restricted, Kahoot! reported a 5-fold increase in its use.¹² Kahoot! allows instructors to create and host live quiz games for the class. Traditionally, in an in-person setting, the class is presented with a question on a projector.

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Instructors can set questions as multiple choice, true/false, images as answers, or puzzles, where students have to arrange the answers in the right order. The student who answers the most questions correctly in the shortest time wins the game. Kahoot! has both individual and team-based modes. During the game, the question, without the answer options, is presented to the students for a short period, usually 30 seconds, allowing students to read and think of possible answers. A leaderboard is automatically generated after the game session, showing the ranking of students in the game.¹²

The impact of Kahoot! on student performance is ambiguous. Some studies show that incorporating Kahoot! in class positively impacts student performance, classroom dynamics, and student satisfaction,^{13,14} while other studies report little or no impact of Kahoot!^{15,16}. Wang and Tahir,¹⁷ in a review of the effects of Kahoot!, identified some key challenges reported by students while playing the game in class, which include not being able to change their answer after submission, stressful time pressure, fear of losing, and difficulty in catching up after an incorrect answer.

Kahoot! is a reward-based game; the rank on the leaderboard acts as a reward and source of motivation for students, improving their learning experience.⁸ However, one major drawback of reward-based games is that the player's motivation stops when the reward stops. In Kahoot!, this occurs when players cannot rank on the leaderboard.¹⁸ Leaderboards can even cause stress and discouragement in students who are ranked lower.^{19,20}

Although Kahoot! gaming surged during and after COVID-19, reports of using this game in dental hygiene classes are scarce. A behavioural sciences course (D HYG 370) for third-year students in the Dental Hygiene Program at the University of Alberta, Canada, introduced in-class quiz gaming using Kahoot! in the winter 2023 semester. D HYG 370 explores the social determinants of health, principles of public health, epidemiology, and other concepts specific to public dental health. Kahoot! was selected as the game-based platform to allow students to receive real-time feedback on their answers to promote active learning and to test their understanding of the material. The Kahoot! platform is especially suited for this type of class interaction because of its cross-platform compatibility and user-friendly interface which does not require the students to register or download/install any software.

A pilot study was then conducted to explore students' experiences with and perceptions of in-class gaming. The specific research questions of this study were as follows:

- What are the students' perceptions of Kahoot! gaming in a third-year dental hygiene didactic course?
- What are the students' perceptions of live leaderboards used in the Kahoot! game?

CASE DESCRIPTION

The descriptive study design guided the methodology of this research. A descriptive study aims to describe a population, situation or phenomenon without exploring the underlying cause.^{21,22} Kahoot! was played twice in class with the third-year dental hygiene students who enrolled in the D HYG 370 course in the winter 2023 semester. This study aimed to describe students' experiences with and perspectives on Kahoot! gaming for learning. Forty-two (42) third-year students in the course were invited to participate in a voluntary, anonymous survey. The students were primarily female (n = 39) emerging adult learners. The survey link was posted in the Learning Management System (LMS); students were invited by the course instructor to participate in the survey after completing the Kahoot! game in class. The survey questionnaire was adapted from the Instructional Materials Motivation Survey (IMMS) instrument which measures students' reactions to instructional material according to the ARCS model of motivation.²³ The IMMS is composed of 36 statements that the students can score between 1 and 5 on a Likert scale, with 1 being strongly disagree and 5 being strongly agree. Descriptive statistics, including mean and standard deviation, were used to analyze the survey data using Microsoft Excel. Students' written comments from the open-ended questions were also explored in detail to understand students' perceptions of the gaming experiences. The University of Alberta Research Ethics Board (REB 2) reviewed and approved this study (Ethics ID is Pro00128637).

RESULTS

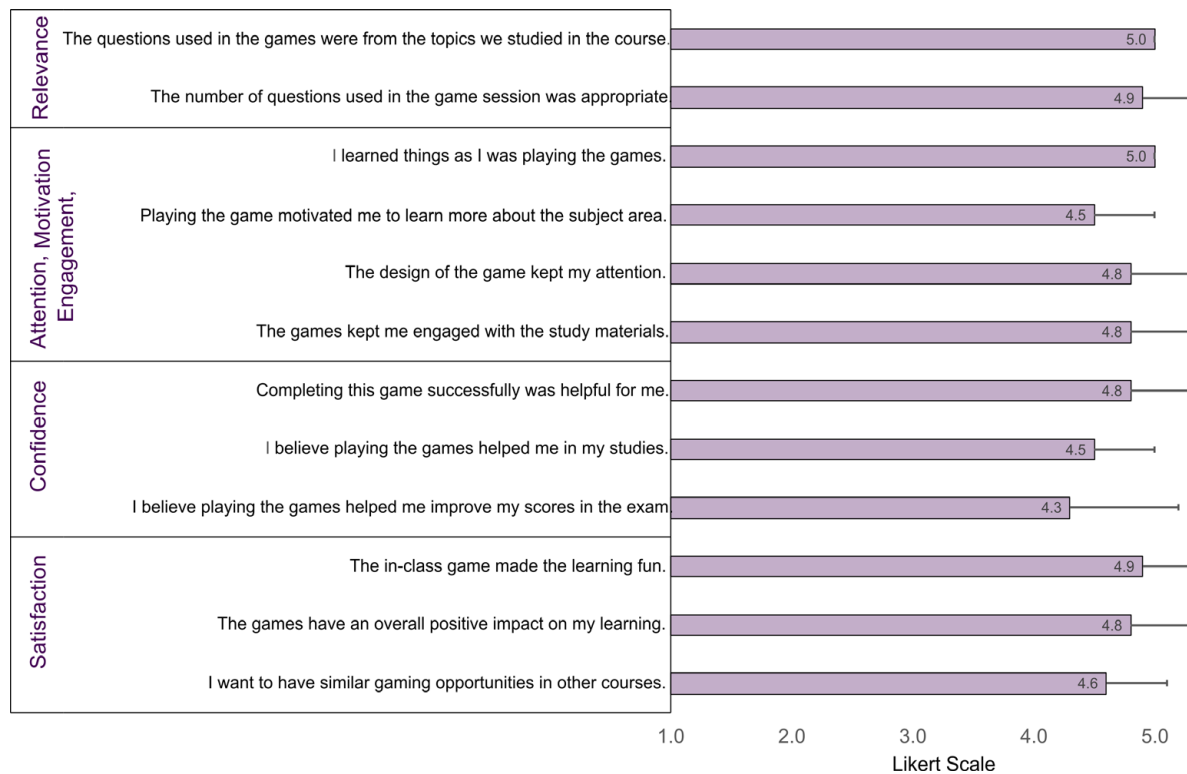
Student perceptions of the benefits of Kahoot!

Nineteen percent (19%) of the class (n = 8) participated in the voluntary survey. The results showed high scores for all questions, indicating a positive impact of Kahoot! on all 4 components of the IMMS: relevance, motivation, confidence, and satisfaction (Figure 1). All study participants either agreed or strongly agreed that playing Kahoot! kept them attentive and engaged in class and motivated them to learn more about the subject area. All study participants (100%) agreed that the game helped them with their studies; 75% perceived that playing Kahoot! had a positive impact on their exam scores. All participants agreed or strongly agreed that playing Kahoot! in class was fun and that they would like similar gaming opportunities in other courses (Figure 1).

Student perceptions of motivation and stress while playing Kahoot!

Students were asked if playing Kahoot! with a leaderboard was motivating or stressful. Seventy-five percent (75%) of the study participants reported in-class competition as a source of motivation for them (Figure 2A). However, when asked about the leaderboard, they expressed mixed opinions. Twenty-four percent (24%) of the participants

Figure 1. Student responses to the voluntary, anonymous survey questions



found the live leaderboard stressful, while 13% remained neutral (Figure 2B). Sixty-two percent (62%) of participants found the time limits set by Kahoot! appropriate (Figure 2C). However, 50% of participants reported that the time limits were stressful for them (Figure 2D). Student comments on the open-ended questions (Table 1) also indicated that the time limits in Kahoot! forced them to make educated guesses to prevent losing points for taking too long to answer a question. Some relevant student comments are as follows:

“Often times, the time limits mean I make educated guesses rather than truthfully answering so that I wouldn’t lose points from taken [sic] too long.”

“Some questions are long and I am still reading them before the options are given potentially decreasing my score.”

DISCUSSION

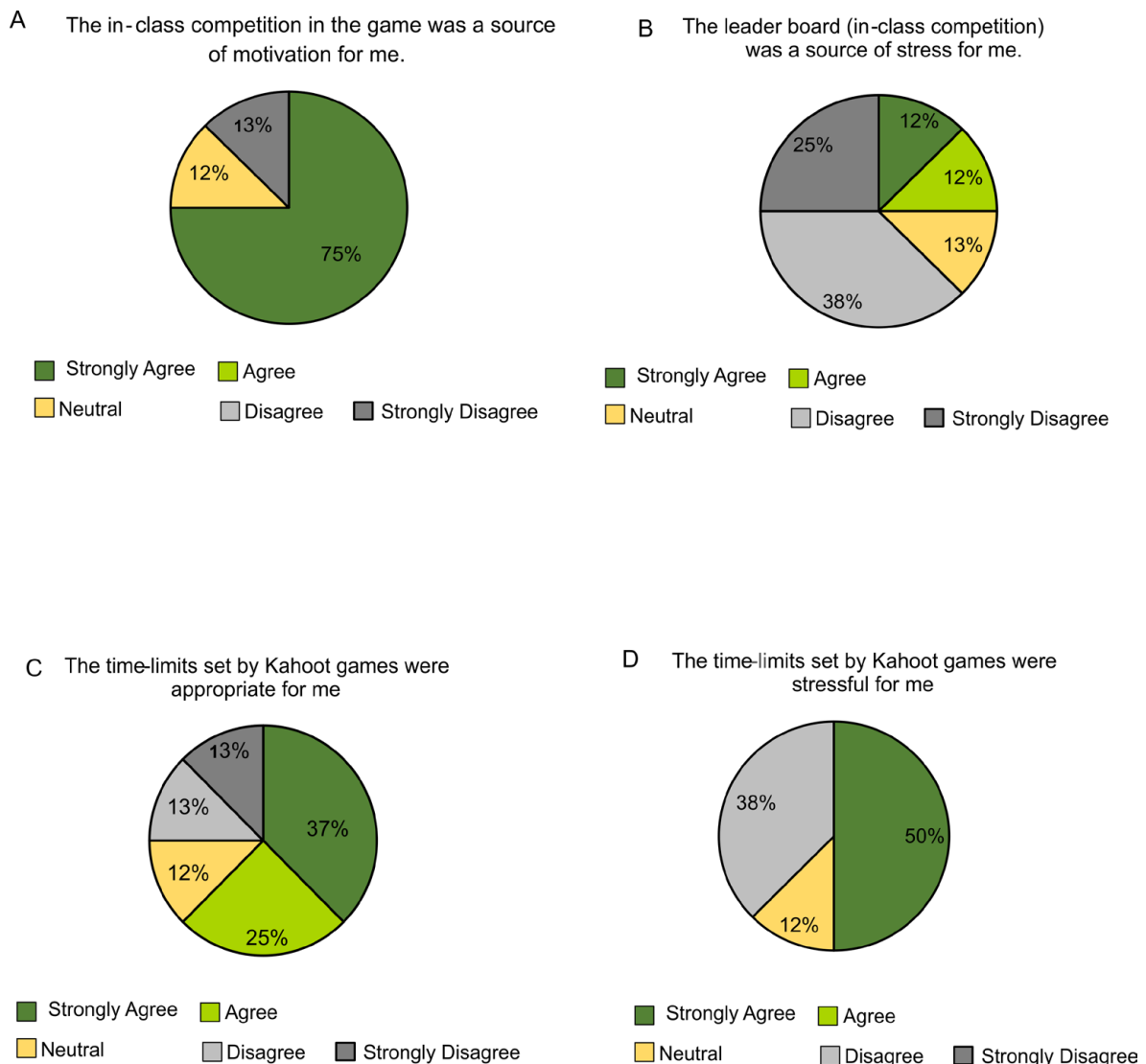
Infusion of technology, such as simulations, interactive models, and game-based learning, has redefined traditional teaching. Game-based learning has been shown to maintain students’ attention and promote motivation and teamwork.²⁴ Although the use of Kahoot! has not been reported in dental hygiene education, its application and benefits are well documented in other health professional

education programs, including medicine, dentistry,¹⁴ nursing,²⁵ and pharmacy.²⁶

Kahoot! was introduced in a third-year dental hygiene course, and a study was conducted to assess student perceptions of the gaming experience. This pilot study revealed positive student perceptions of the overall gaming experience. Most participants agreed they enjoyed Kahoot! and would like such experiences in other courses. This finding is aligned with previous studies that have reported positive impacts of Kahoot! on student performance, classroom dynamics, and student satisfaction.^{13,14}

Gamified learning aims to influence players’ motivation.²⁷ Self-determination theory suggests that humans are driven by intrinsic and extrinsic motivation.²⁸ A player is driven by the underlying challenge or “fun” of a game when they are intrinsically motivated.^{28,29} Kahoot! being focused on “fun-based learning” is expected to improve student engagement.²⁴ The rank on the leaderboard of Kahoot! can be an extrinsic motivation for students, whereas the potential to improve learning is an intrinsic motivation. An approach to developing a successful educational game is to promote the internalization of an extrinsic motivation so that an individual experiences the external motivations as internally caused and thus feels self-determined to play the game.²⁹ Surveys and student comments from the present study indicate the success of Kahoot! in promoting self-determination in students who play the game to improve their learning and academic scores.

Figure 2. Student perceptions of motivation and stress while playing Kahoot!



The application of Kahoot! in courses such as this one that explores the social determinants of health can act as the impetus to initiate discussions and debates that would help students to think critically about issues and different viewpoints. Real-world scenario-based questions can also prompt students to apply their knowledge to solve problems in a shared learning experience. This type of formative assessment not only benefits students by allowing them to evaluate their knowledge, but also provides real-time feedback to the instructor who may then clarify and expand on concepts that prove to be challenging or misunderstood by the class.

This pilot study shows that, although many students were motivated by the challenge and the Kahoot! leaderboard, others found the ranks in the leaderboard and the time limits to be stressful (Figure 2, Table 1). This finding is not surprising, as several previous studies identified

leaderboards as a source of stress and discouragement in students who rank low on the leaderboard.^{19,20}

Several participants in the pilot study indicated that the short time given in Kahoot! to read each question was stressful and insufficient for many slow readers. Similar findings were also reported in the review by Wang and Tahir.¹⁷ Instructors can increase the time set for presenting the question, which may reduce the extrinsic challenge and competition of the gameplay.

There are some limitations to this pilot study. The findings are based on perception data and are only from a single cohort of dental hygiene students, which may limit the generalizability of the findings. No demographic data were collected, and students' performance in the game was not compared with their academic performance. Generalizations from this cross-sectional study to more longitudinal implementation of Kahoot! gaming should

Table 1. Students' comments on the open-ended questions

Open-ended questions	Representative quotations
What is the best part of Kahoot! gaming?	<i>It's fun and interactive.</i>
	<i>Being able to test my knowledge while also getting a feel for where I sit in the class in terms of knowing the material.</i>
	<i>Testing your knowledge in a more fun and less stressful way.</i>
	<i>It is engaging and allows me to use active recall to better reinforce my understanding and knowledge of course content.</i>
	<i>I see that I don't study enough.</i>
What is "not so good" about Kahoot! gaming?	<i>If you're not an advanced/quick reader the time limit can be stressful.</i>
	<i>Often times, the time limits mean I make educated guesses rather than truthfully answering so that I wouldn't lose points from taken [sic] too long.</i>
	<i>Having to answer questions quickly, as well as giving an explanation for the right answer after each question would be helpful.</i>
	<i>Some questions are long and I am still reading them before the options are given potentially decreasing my score.</i>
	<i>Stress when not anonymous and names are shown.</i>

also be cautioned against. While students enjoyed playing Kahoot! in this individual session, students may disengage from the activity as the novelty dwindles.

It should also be acknowledged that certain types of students may fare better and/or enjoy gamification more than others. Those who need additional time to absorb, consider, and prepare material may find time-limited active strategies such as Kahoot! to be stressful and ineffective. Other students may perform better and enjoy Kahoot!'s team-based modes better than individual modes. Certain types of material may also be more suitable for Kahoot! gaming than others. For example, simple recall questions may be more appropriate than questions that require deeper analytical thought, given the time constraints of the questions.

Future studies can focus on further exploration of the long-term impact of Kahoot! on the academic performance of dental hygiene students. Faculty and student perceptions of in-class gaming with Kahoot! as well as correlations between student demographics and game participation can also be potential research areas.

CONCLUSION

Apart from some challenges and stressful experiences reported by students, Kahoot! can be an excellent tool for implementing friendly competition in class and thus promoting student engagement. Exploring the impact of Kahoot! on the academic performance and learning outcomes of dental hygiene students may benefit many health professional programs around the world.

CONFLICTS OF INTEREST

The authors of this study have declared no conflicts of interest.

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