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Research Article

Implementation and assessment of students' perception on effectiveness of kahoot game-based educational tool in learning microbiology

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ABSTRACT:

Introduction: Game-based learning exercises are highly effective in promoting students learning compared to conventional didactic lectures. Kahoot is one of the e-learning tools highly appreciated by many educators and found that its incorporation in classroom lectures promotes students' learning process and motivates them to learn better. Also, it provides an opportunity for students to correct their mistakes in the subject matters and thereby enhance their knowledge and improve their examination performance. The present study was undertaken to assess the students' perception about the usefulness of Kahoot e-learning tool in Medical education.

Methodology: A cross-sectional study was conducted among 5th-year medical students at Oman Medical College during the academic session 2017-18. The study was intended to assess the perception of students regarding usefulness and effectiveness of Kahoot online tool in learning Microbiology and Immunology. The students' perception on Kahoot was assessed through 5 points Likert Scale questionnaire. The data were collected and statistically analyzed using SPSS 22.

Results: A total of 110 fifth year medical students voluntarily participated in the study. Majority of the students (≈88%) perceived Kahoot as a very effective and fun-filled learning tool. Students also highly rated the activity in terms of effectiveness in motivation, correcting mistakes, knowledge retention, and improving exam grades.

Conclusion: Kahoot is an excellent e-learning tool that is feasible and practical to use for promoting and encouraging students to learn better. It provides a positive environment in the classroom, improves their concentration and knowledge retention. It motivates the students to learn in a fun-filled, enjoyable, and friendly competitive environment. It is also a good game based e-learning tool for formative assessment.

Keywords: Assessment, e-learning**,** Immunology**,** Kahoot, Microbiology

INTRODUCTION

Learning medicine is a complex process, which involves study of many integrated subjects by medical students in their course of 5-7 years duration. Recent advances in information technology have resulted in rapid changes in the medical education through incorporation of several web based teaching programs which encourage students to learn more effectively

(1, 2). Medical Microbiology, one of the integrated subjects in medical course deals with various aspects of disease causing microorganisms; organisms and their characteristics, concepts related to pathogenic mechanisms, clinical signs and symptoms, diagnostic tests, treatment, and preventive aspects of the disease **(3).** Students are overwhelmed by the bulk of material that they need to study, understand, and memorize in Microbiology and Immunology. It is a challenge for a medical educator to develop and use a teaching method that motivate and enhance learning process of the students**.** Scientific literature has shown that traditional teaching methods such as didactic lectures are less effective in promoting students' learning process, as they are teacher centered and the students are passive learners **(4).** In the last two decades, medical educators across the globe have incorporated many active classroom learning methods in their teaching either in conjunction with regular didactic lecture or as a separate activity. These active learning exercises such as problem based learning (PBL), Patient Oriented Problem Solving (POPS), online quizzes, group discussions, games and crossword puzzles, and many more are found to be quiet effective in promoting students' learning compared to traditional didactic lectures **(5-9).**

Kahoot, an emerging online education tool was appreciated by many educators worldwide and they have found that its incorporation in the classroom activity is quite effective in attracting the students' attention, motivating them to participate in classroom actively, helps in promoting their learning process and thereby enriching their knowledge and memory **(10, 11).** Kahoot is a freely available online resource, easy to use, and simply requires multimedia tool such as cellphone, laptops, and chrome books to participate **(12).** Educators can create quizzes using MCQs and is presented in game based formats to students **(10, 12).** Multiple choice questions (MCQs) can be developed to align with the learning objectives of the lecture topic such as basic principles, terminologies, diagnostic tests, clinical features, treatment and many other aspects. Furthermore, Kahoot quiz questions may also include multimedia visuals such as images and audio-visuals to evoke students' interest and promote their engagement in learning **(13).** Apart from this, teachers can also develop surveys, discussions, jumbles, and other modes in which students participate actively and compete with each other in a healthy environment **(10, 14).** Kahoot MCQ based formative assessment has many advantages; teacher can set time to respond to each question by the students, students can use their personal password to log in to the activity to conceal their identity, each topic will have unique game pin, and questions can be reviewed as many times as required. Furthermore, students get to earn points by answering questions correctly and quickly and the topper of each session will be displayed at the end of the session which will motivate them to participate, learn and do better. Also descriptive analysis data can be saved by the educator for further reference **(10).**

Kahoot is a relatively new e-learning education tool and the research data on its effectiveness in classroom teaching in medical education is scarce and limited. Hence the current research was aimed at incorporating Kahoot in classroom activity in Microbiology and Immunology and to assess the students' perception on the effectiveness of Kahoot in the learning process.

MATERIALS AND METHODS:

It is a cross sectional study and was conducted in the Department of Microbiology and Immunology during the academic session 2017-18. The study group includes 5th year medical students (117 students) of the batch 2017-18. The study was approved by the Institutional Research and Ethical Committee

(REC) and conducted after obtaining necessary informed consent from the students.

Study design:

By using Kahoot online resource (https://create.kahoot.it), quizzes in the form multiple choice questions with four choices were prepared on selected lecture topics of Microbiology and Immunology. MCQs included statements, images, audio-visual aids, and clinical cases. The questions were prepared to align with learning outcomes of the topics (such as principles, concepts, diagnostic tests, clinical features, and treatment) that were presented through PowerPoint presentation. Also students' response time for each question was set between 30 seconds to 1 minute.

At the end of selected PowerPoint classroom lectures, students were asked to log in to Kahoot site through their smartphones or laptops. Once they log in to Kahoot site, it will show two columns; game pin and password. They type the same game pin on their electronic devices (cellphone or laptop) as displayed on the screen. They were allowed to use their own password to log into the particular session. One question with four options will be displayed on the classroom projector screen at a time. Only the four (4) options will be shown in the students' smartphones and laptops. They need to look at the projector screen for the question and give their response by choosing one of the options displayed on their smartphones and laptops. After response time for each question closes, students responses were displayed on the projector screen in the form of a bar diagram. Each question was reviewed highlighting different aspect of the question and answers for students' benefits before proceeding to the next question. At the end of the session 3 top students, as displayed on the screen were awarded with pen, chocolates and other small gifts to keep them motivated.

At the end of the course, after completing all the sessions, a pre-designed self-administered questionnaire was distributed to all the 5th year medical students who participated in the activity to assess their perception on various learning aspects of Kahoot. The evaluation was performed on a 5 point Likert scale (5=strongly agree, 4=agree, 3=neutral, 2=disagree, and 1= strongly disagree). A sample of the questionnaire along with the responses asked is given in **Table 1**.

Statistical analysis: The completed response sheets were collected and the data was entered in Microsoft Excel sheet and reentered in SPSS version 22 for statistical analysis. Qualitative data were expressed in the form of percentages and the quantitative data were expressed in the form of mean ± standard deviation.

RESULTS AND ANALYSIS:

Table 1: Results of students' questionnaire on Kahoot effectiveness in learning

	Item	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean (SD)
1	I enjoyed classroom Kahoot activity	**72** (65.45%)	**30** (27.27%)	**5**(4.55%)	**2** (1.82%)	**1** (0.91%)	**1.45 (0.75)**
2	Kahoot held my interest in the classroom	**53 (**48.18%)	**45**(40.91%)	**7**(6.36%)	**4**(3.64%)	**1**(0.91%)	**1.68(0.82)**
3	Kahoot kept me more engaged in the classroom	**50(**45.87%)	**49**(44.95%)	**5**(4.59%)	**4**(3.67%)	**1**(0.92%)	**1.69 (0.8)**

4	Kahoot motivated me to learn more	**53**(48.18%)	**45**(40.91%)	**6(**5.45%)	**5**(4.55%)	**1(**0.91%)	**1.69(0.84)**
5	Learning with Kahoot is a fun	**60**(54.55%)	**41**(37.27%)	**4**(3.64%)	**4**(3.64%)	**1**(0.91%)	**1.59(0.8)**
6	Kahoot helped me to focus on key areas of the topic	**77**(70.0%)	**26**(23.64%)	**5**(4.55%)	**1**(0.91%)	**1**(0.91%)	**1.39(0.71)**
7	Kahoot helped me to understand the subject well	**45**(40.92%)	**46**(41.82%)	**9**(8.18%)	**6**(5.45%)	**4**(3.64%)	**2.07(1.02)**
8	Kahoot helped me to retain knowledge and memory	**42**(38.18%)	**52**(47.27%)	**10**(9.09%)	**5**(4.55%)	**1**(0.91%)	**1.83(0.84)**
9	Kahoot helped me to clear my doubts/ misconception on the topic/concept	**34**(30.91%)	**51**(46.36%)	**17**(15.45%)	**7**(6.36%)	**1**(0.91%)	**2.0(0.9)**
10	Kahoot is effective in reviewing the topic	**60**(55.56%)	**40**(37.04%)	**3**(2.78%)	**3**(2.78%)	**2**(1.85%)	**1.58(0.83)**
11	Kahoot helped me to improve my exam grades	**44**(40.0%)	**34**(30.91%)	**24**(21.82%)	**5**(4.55)	**3**(2.73%)	**1.99(1.03)**
12	I recommend Kahoot for others	**61**(55.45%)	**36**(32.73%)	**9**(1.82%)	**2**(1.82%)	**2**(1.82%)	**1.62(0.86)**

In this cross sectional study, we assessed the students' perception on usefulness and effectiveness of Kahoot as an e-learning tool in medical education. A total of 110 students of 5th year participated in the study and majority of them were females (90.90%). In terms of satisfaction with Kahoot, 92.72% of the students indicated that learning with Kahoot in the classroom is enjoyable and fun filled. Eighty nine percent (89%) of the students stated that Kahoot classroom learning exercises held their interest and motivated them to learn more. Ninety percent (90%) of the students said that Kahoot kept them more engaged in the classroom and helped them to review the topic effectively. More than 90% of the students opined that Kahoot helped them to focus on key areas of the topic and understand the subject well, while 85.45% of the students stated it helped them to retain knowledge and enhanced their memory. Large number of the students (70.91%) indicated that Kahoot improved their exam grades. They believed that Kahoot exercise helped them for better exam preparation by focusing and understanding key concepts of the topic. Vast majority of the students (88.18%) perceived Kahoot as an effective game based e-learning tool and recommended it to be used more frequently and also by other faculty members.

DISCUSSION:

Kahoot is one of the popular technology assessment tools that were developed to promote learning process of the students **(15)**. Studies have shown Kahoot in line with other game based online learning tools is very effective in motivating students and significantly enhances their learning by better engagement in the classroom **(16-18).** Motivation is an indispensable ingredient in the successful learning process. A meta-analytic study proved students perform better when they are motivated **(19).** Papastergiou M et al showed game based learning is more

effective in motivating the students to learn more compared to traditional approach **(20).** In our study, majority of the students (89.09%) stated that Kahoot has motivated them to learn better and these results were in consistent with many other similar studies **(16-22)**. Plump and LaRosa in their study on Kahoot found high rating of the activity by the students in terms of their classroom engagement and enhancement of learning process. They stated Kahoot has made students' learning easy, enjoyable, and interactive and helped them to understand the subject better **(23).** The present study results were in consistent with similar studies as more than 90% of the students indicated Kahoot made them more engaged in the classroom and it is an enjoyable, interactive, and fun filled activity.

In the present study, majority of the students (> 90%) opined that Kahoot helped them to focus on key areas of the topic and understand the subject well. A possible explanation is due to the fact that it provides to various learning styles. Use of visual images along with the questions evokes students' interest and concentration. Incorporating the music in the game entertains students. Kahoot also tackles kinesthetic of the students by keeping them physically active while answering questions displayed on the classroom projector screen. A previous study has shown students' learning, performance, and achievement significantly increases if they are taught by using techniques and approaches aligned with their learning styles **(24)**. Formative assessments through Kahoot provide an opportunity to the students to correct their mistakes on the subject matter and improve their knowledge retention **(10).** In the present study around 85% of the students opined that Kahoot helped them to correct their mistakes and knowledge retention. Also 70% of the students stated that Kahoot improved their exam grades. However, very little literature evidence was found regarding this aspect and therefore it needs to be further explored to understand the current finding.

Majority of the students **(88.18%)** perceived Kahoot as an effective e-learning tool to promote their learning process and recommended for more frequent use of it for formative assessments. Kahoot has many advantages; freely available online, easy to use, multiple types of Kahoot are available (quizzes, discussions, surveys etc.), is compatible with smartphones, tablets, laptops, and ordinary computers, music and colors add to the students' excitement and concentration, and also the response time for answering each question is adjustable as per the students' needs. In addition instructors can download and save the results for analysis and review of students' performance. No learning tool is without disadvantages. Similarly Kahoot also has some disadvantages; MCQs can be prepared only with maximum four options, length of the stem is limited to 95 letters, it allows for only certain types questions such as single best choice, true or false, and its use always needs internet connection.

CONCLUSION:

Kahoot is an excellent e-learning tool that is feasible and practical for promoting and encouraging students to learn better. It provides a positive environment in the classroom, increases energy, concentration, and knowledge retention. It motivates the students to learn in a fun filled, enjoyable, and friendly competitive environment. Also it is one of the good e-learning tools for formative assessment and to improve students' examination preparation and performance.

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