Kahoot! A Comprehensive Formative Assessment E-tool in Medical Education: A SWOT Analysis

Yatinesh Kumari[1], Deepa Alex[1]

[1]Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Subang Jaya, Selangor, Malaysia- 47500
Email address: yatinesh.kumari@monash.edu, deepa.alex@monash.edu

Abstract— *Online learning has become the norm for student's world-over, and educationists have to come up with new strategies to maintain student engagement and interest. Gamification of education is a promising approach to address the decline in learners' motivation and engagement. Gamification also facilitates formative assessment while promoting student learning. Among the many virtual educational tools that have emerged over the last decade, Kahoot! has been shown to be a popular choice among learners. It is a game-based student response system that has extensively been used across educational institutions as well as teaching faculty involved in medical education. Evidence suggests that Kahoot! Sessions are more effective than traditional methods to motivate students to study, and it is a promising tool for formative assessment in medical education. But there is a need for a realistic recognition of the Strengths, Weaknesses, Opportunities, and Threats (SWOT analysis) of using Kahoot! as a formative assessment e-tool. This paper describes a SWOT analysis that requires an examination of existing design trends and features with the aim of visualizing future applications, projecting challenges, limits, and expectations, and devise possible ways to increase the potential use of technology in medical education in relation to formative assessment.*

Keywords— *Kahoot!, education, formative assessment, SWOT Analysis.*

I. INTRODUCTION

This write-up focuses on SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis for kahoot! as a formative assessment e-tool. Commonly, SWOT analysis is employed in marketing researches to analyse the components of a project or business activity that may influence the competitive situation in the market, taking into account present and future matters. Strengths indicate the internal capacity and resources of an organisation or entity which help in achieving its targets; Weaknesses are internal limitations of the organisation or entity that could create barriers to achieve the goals; Opportunities are the favourable conditions in the setting that the organisation or entity could perform; and Threats are unfavourable conditions in the environment that could create hindrance in progress and development towards its goals. In general, the aim of a SWOT analysis is to conduct strategic planning by relating strengths with opportunities, identifying weaknesses and minimizing the threats [1].

Assessment refers to the process of finding out the achievement of the learners based on definite weighted set goals [2]. In general, there are two types of evaluations; summative and formative. Summative assessment occurs after teaching or instruction is given to the students and is an evaluation of the sum product of learning that has occurred.

Formative assessment is an ongoing and flexible evaluation designed to provide feedback to improve performance and to accelerate learning. It also helps to enhance students' understanding of the subject and provides actionable feedback to them [3]. Formative assessment is traditionally undertaken through various activities such as student reflection, collaborative learning, visual representation of learning through paper-based methods. Technology is used as an essential element to enhance learning in present-day medical education [4]. This evolving pedagogical approach offers a number of benefits such as learner-centeredness, promotes engagement, improves motivation and enables effective feedback [5]. In this digital era, the current generation is greatly inclined towards gamification behaviour [6]. Due to the innovation of the concept of gamification in education, a number of ideas and frameworks have been introduced [7]. Kahoot! is an example of a game-based student response system, and it has been found to be a valuable tool for formative assessment in medical education [8].

II. STRENGTHS

Kahoot! is a free, real-time, game-based, easy to use, Web 2.0 learning platform. The quizzes can be created even by individuals with minimal technical expertise. The teacher needs to create an account using an email address, while the students do not need to create an account to sign in. Along with developing a quiz, images and YouTube videos can also be embedded, which provides flexibility for teachers to embed relevant resources to use them efficiently in a revision setting to consolidate the facts and encourage active recall. Repetition is key to retention and to reinforcing learning (9). Using histopathological images, clinical conditions, signs, and symptoms to explain a topic help student to correlate, recall, and memorize the facts that make learning experiential. Experiential learning is a well-known and established concept in medical education [10].

Teachers can create four different types of tests/assessments (quizzes, jumbles, surveys, and discussions) using Kahoot, where the students participate and compete. Students can join using nicknames when they play kahoot! Such activities are perceived as fun and thereby lead to higher student engagement and participation. Additionally, it is beneficial for integrating diverse player types without revealing the identity if they get any wrong answer.

Kahoot! has the facility to project the scoreboard, which reflects the lead student based on the accuracy of response and timeliness of response. It creates a kind of competition that

may contribute to improving motivation and engagement. Among the peers who are considered academic equals, some degree of competition is found to enhance engagement and motivation in learning [11, 12].

III. WEAKNESS

Technology is becoming progressively crucial for each generation of learners. Now a student entering medical school have a high level of digital literacy. That's why gamified training platforms have gained popularity among learners and teachers [13]. Kahoot! offers a pause from traditional styles of learning and assessment. However, there are some weaknesses or drawbacks to using the kahoot!. In order to run a smooth session with Kahoot! few technical issues need to be taken into consideration.

Kahoot! questions do not appear on student screens. This has to be overcome by using a projector or smartboard that can be used to project the teacher's version.

All students must have a device, either phone, tablet, laptop, or computer, with robust internet connectivity in order to participate in the Kahoot! activity.

In order to track the student progress, the teacher needs to break down usernames (nicknames) to assign student names and check the number of right answers of each student who played Kahoot! This would add to the workload for the teacher.

In the current digital era, the availability of gadgets and internet connections are essential to achieve set goals, and although most individuals have access to such devices today, it could still be a potential shortcoming in areas where there is limited access to devices as well as the internet.

IV. OPPORTUNITIES

"Technology-enhanced gamification can also provide opportunities for improved engagement, problem-solving and cooperative teamwork. These skills are integral to future health care delivery" [14]. The literature suggests that user feedback is essential in gameplay for the learner as they are in the experiential learning cycle in education [15]. Immediate and frequent feedback has a greater impact on learning engagement and effectiveness [16].

Using Kahoot! there are various opportunities for feedback such as review for the test which can also be used for the discussion.

For example, a simulated case can be presented to students with specific signs and symptoms to challenge the student to choose the treatment option for any medical condition. This is an opportunity to discuss the consequences of each option and to correlate it with the patient's response to the given treatment. It will create an environment to discuss, recollect concepts and to apply to the given scenario. In medical education, these kinds of learning interventions are useful in the context of trauma triage to enhance performance invalidated simulator tests [17].

Another example: The steps of the asthma 'treatment ladder' were projected to students to diagnose the appropriate treatment for the given case. The same concept can be presented as a separate question, from a different angle, such as discussing each drug usage, dose, contraindications, and requirement for monitoring. Doing so will allow students to build a multi-faceted view of the topic, which will further allow them to consolidate the knowledge and improve recall [9].

Kahoot! enables users to maximally utilize its platform in various ways, which can improve engagement, collaborative learning, and better recall.

V. THREATS

Kahoot! has a competitive element, and the level of competition can be increased as the multiple players are connected. Competition in the classroom could increase the level of stress, which could have variable effects on learning. A certain level of stress can be beneficial, but the excessive degree of stress can be detrimental to learning [9]. It is essential to consider the management of stress levels among students when including a competitive element in education. Stress derived from competitive exercise has a more significant undesirable effect than its benefits [18]. Kahoot has background music which makes it enjoyable, but sometimes it can be distracting, which eventually leads to the deviation of the student from its goal.

Selection of the topic and constructing appropriate questions are key to designing an effective quiz. Not all subjects in medicine are suitable to be delivered through a game-based platform such as Kahoot. (For example, demonstrating clinical skills or surgical techniques would not be ideal content for game-based teaching, as they involve teaching skills requiring patient interaction and hands-on experience) Moreover, poor design and a meaningless rewards system can deceive the expectations and lead to unfavourable effects in a learning environment.

TABLE 1. Summarizing important aspects of effectiveness of Kahoot!

S No.	Focal points
1.	Kahoot! is an effective tool that enhances motivation and learning among students, while maintaining engagement in a classroom setting.
2.	Quizzes in Kahoot! can help in the consolidation of actual content and summarizing core concepts, which enables live formative assessment.
3.	Connectivity issues, user interface fatigue, poor choice of subject delivered are a few of the factors which can present challenges to the use of Kahoot!
4.	SWOT analysis highlights strengths, weaknesses, opportunities, and threats in medical curricular adaptations to gamification.

Students have the option to type in any nickname of their choice while participating in kahoot! play. This can sometimes lead to a choice of inappropriate nicknames, which can interfere with the positive discipline of the classroom. Literature suggests that managing students' inadequate behaviour is the primary concern for teachers [19]. There is the option in kahoot! to remove the inappropriate nickname from the game lobby, but again it will create unnecessary interference in the classroom.

VI. DISCUSSION

The quality of learning is generally based on the power of

summative assessment. However, research suggests that formative assessment also plays a crucial role in education. It enhances cognitive, emotional, and motivational profits along with the engagement of the learner [20]. The quizzes can help in the consolidation of actual content and summarising the core concept, which is crucial for learning.

Using appropriate technology can be a great way to engage the students. And motivation is the key to learner engagement. "In other words, students who have high motivation make an effort to be engaged in class" [21].

Kahoot! is built upon Tom Malone's theory (1980) of intrinsically motivating instructions [22]. According to Malone's theory there are three components: Challenge, Fantasy, and Curiosity.
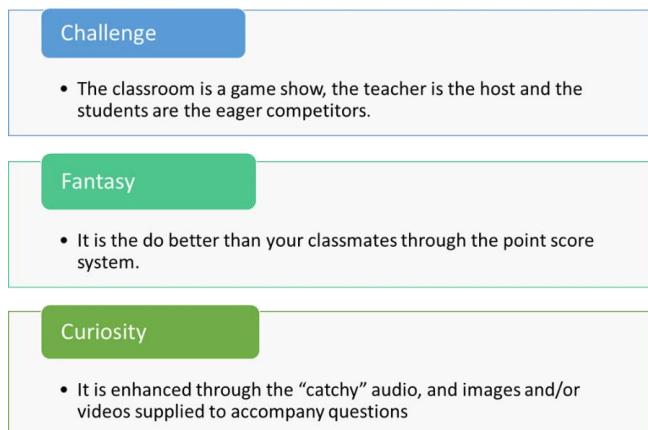

Fig. 1. The 3 components of Tom Malone's theory (adopted from [23])

Technology augmented tools can play a critical role in medical education to achieve learning outcomes. Kahoot! is an innovative formative assessment tool. According to Neureiter D. et al. [24], it is a "simple, direct, and low-cost application in medical teaching improving learning outcomes of pathomorphological topics with high acceptance by students".

To become competent clinicians, medical students need to be encouraged to focus on their academic studies consistently. In general, motivation is of two types; extrinsic motivation and intrinsic motivation. Extrinsic motivation means doing something because it can lead to precise outcomes, and Intrinsic motivation is doing something because it is enjoyable and exciting [25]. It is well documented that "gamification desires to combine intrinsic and extrinsic motivation, in order to increase motivation and engagement" [26].

Another important aspect is repetition to reinforce learning. Medical students require to remember or memorise a huge quantity of factual knowledge, and repetition has been shown to be an effective method to reinforce retention and learning [9]. Kahoot can be used efficiently in a revision setting to consolidate expertise and improve recall.

Kahoot! also provide more opportunities for the students to engage with tutor, peers and the content of the session. Teachers are also able to provide real-time feedback on the basis of students' responses to quizzes. Kahoot! creates 'fun' which helps in creating a positive learning experience, which is important to create classroom engagement dynamics to achieve set goals.

The acceptance of Kahoot by both learners and educators indicates the educational potency of the online quiz in medical education. Active participation during the session by students indicates their interest in making learning a 'fun' process. According to Neureiter D et al. [24], students have accepted that the use of kahoot! had a positive impact on their skill and knowledge during classroom teaching of pathology topics.

As per personal practical experience, using standard kahoot! quiz at the beginning of the session provides a broad overview of students' pre-knowledge of the subject. This will enable the tutor to deliver content based on the students' prior understanding of the topic. Gaps in knowledge can be quickly and efficiently identified, and the relevant information can be provided during the class so that the session will not be overloaded with information.

Using kahoot! at the end of the session can be utilized to assess students' in-class learning, which reflects the overall effectiveness of the session as well as the engagement and attention of students in the classroom environment.

Usually, standard Kahoot! quiz addresses lower-order thinking skills through recall and retention. To accommodate higher-order thinking using Kahoot, students can create their own Kahoot! quiz for a topic that will work as a revision and summing up activity. It will create and synthesise their knowledge as per higher-order thinking (bloom taxonomy [27].

VII. CONCLUSION

In conclusion, with the combination of theoretical frameworks, research, and personal practical experiences, Kahoot! is a promising formative assessment e-tool that allows students to test their knowledge, helps them to assimilate information, and reiterate relevant concepts. It is also beneficial for teachers by providing opportunities for student-to-student interaction and further fruitful class discussion. There are some weaknesses and barriers, but altogether Kahoot! can be utilized as a useful and effective formative assessment tool in medical education, and there are still many possibilities that must be explored in the future to support in particular to diverse medical fields such as anatomy, physiology, pathology, and pharmacology.

REFERENCES

[1] Kotler P, Armstrong G. Principles of marketing: Pearson education; 2010.
[2] Sadler DR. Formative assessment: Revisiting the territory. Assessment in education: principles, policy & practice. 5(1):77-84,1998.
[3] Norcini J, Anderson B, Bollela V, Burch V, Costa MJ, Duvivier R, et al. Criteria for good assessment: consensus statement and recommendations from the Ottawa 2010 Conference. Medical teacher.33(3):206-14, 2011.
[4] Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. Medical teacher. 30(5):455-73,2008.
[5] Erhel S, Jamet E. Digital game-based learning: Impact of instructions and feedback on motivation and learning effectiveness. Computers & education. 67:156-67, 2013.

[6] Sung H-Y, Hwang G-J. A collaborative game-based learning approach to improving students' learning performance in science courses. Computers & education. 63:43-51, 2013.

[7] Hamari J, Koivisto J, Sarsa H, editors. Does gamification work?--a literature review of empirical studies on gamification. 2014 47th Hawaii international conference on system sciences; 2014.

[8] Ismail MA-A, Mohammad JA-M. Kahoot: A promising tool for formative assessment in medical education. Education in medicine journal. 9(2), 2017.

[9] Friedlander MJ, Andrews L, Armstrong EG, Aschenbrenner C, Kass JS, Ogden P, et al. What can medical education learn from the neurobiology of learning? Academic Medicine. 86(4):415-20, 2011.

[10] Mann KV. Theoretical perspectives in medical education: past experience and future possibilities. Medical education. 45(1):60-8, 2011.

[11] Malone TW. Making learning fun: A taxonomic model of intrinsic motivations for learning. Conative and affective process analysis. 1987.

[12] Janssen A, Shaw T, Goodyear P, Kerfoot BP, Bryce D. A little healthy competition: using mixed methods to pilot a team-based digital game for boosting medical student engagement with anatomy and histology content. BMC medical education.15(1):1-10, 2015.

[13] McCoy L, Lewis JH, Dalton D. Gamification and multimedia for medical education: a landscape review. J Am Osteopath Assoc. 116(1):22-34, 2016.

[14] Singhal S, Hough J, Cripps D. Twelve tips for incorporating gamification into medical education. MedEdPublish. 8, 2019.

[15] Manolis C, Burns DJ, Assudani R, Chinta R. Assessing experiential learning styles: A methodological reconstruction and validation of the Kolb Learning Style Inventory. Learning and individual differences. 23:44-52, 2013.

[16] Kapp KM. Games, gamification, and the quest for learner engagement. T+ D. 66(6):64-8, 2012.

[17] Mohan D, Fischhoff B, Angus DC, Rosengart MR, Wallace DJ, Yealy DM, et al. Serious games may improve physician heuristics in trauma triage. Proceedings of the National Academy of Sciences. 115(37):9204-9, 2018.

[18] Cantador I, Conde JM. Effects of competition in education: A case study in an e-learning environment. 2010.

[19] Kizlik R. Classroom management, management of student conduct, effective praise guidelines, and a few things to know about esol thrown in for good measure. Online) Retrieved on. 1, 2010.

[20] Jamil Z, Fatima SS, Saeed AA. Preclinical medical students' perspective on technology enhanced assessment for learning. JPMA. 68(898), 2018.

[21] Nayir F. The relationship between student motivation and class engagement levels. Eurasian Journal of Educational Research. 17(71):59-78, 2017.

[22] Malone TW, editor What makes things fun to learn? Heuristics for designing instructional computer games. Proceedings of the 3rd ACM SIGSMALL symposium and the first SIGPC symposium on Small systems; 1980.

[23] Johns K. Engaging and assessing students with technology: a review of Kahoot! Delta Kappa Gamma Bulletin. 81(4):89, 2015.

[24] Neureiter D, Klieser E, Neumayer B, Winkelmann P, Urbas R, Kiesslich T. Feasibility of Kahoot! as a Real-Time Assessment Tool in (Histo-) pathology Classroom Teaching. Advances in Medical Education and Practice. 11:695, 2020.

[25] Ryan RM, Deci EL. Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary educational psychology.25(1):54-67, 2000.

[26] Muntean CI, editor Raising engagement in e-learning through gamification. Proc 6th international conference on virtual learning ICVL; 2011.

[27] Krathwohl DR. A revision of Bloom's taxonomy: An overview. Theory into practice. 41(4):212-8, 2002.