Implementation of a Game-Based Student Response System in Engaging, Motivating, Concentrating, and Apprehending Students' Interest in Learning "The Environment and Sustainable Development"

Hassan Aliyu
Department of Science Education, Faculty of Education, Sokoto State University, Nigeria
nagoronyo@gmail.com
(corresponding author)

Corrienna Abdul Talib
Department of Science, Mathematics and Creative Multimedia Education, School of Education, Faculty of Social Science and Humanities, Universiti Teknologi Malaysia
corrienna@utm.my

Abstract

There is a wide variety of learning software and platforms developed to assist classroom teachers in delivering effective instruction and to create sustainable environments for teaching and learning. But in most learning environments, motivation is a key factor in student performance. As such, earlier student response systems like "Clikers" were developed in the 1960s and later advanced to game-based student response systems like "Kahoot!" in the 1970s. Game-Based Student Response Systems is a game-based version that focuses more on student engagement and motivation by engaging them with graphics, animation, and audio as well as the use of scores to drive for self-improvement or competition against other students. This study investigated the effect of game-based student response systems on students' engagement, motivation, concentration, and interest in learning about "the environment and sustainable development". This quantitative study adopted an experimental and survey research design. The study's sample consisted of 541 undergraduate level students enrolled in Microbiology, Computer Science, Economics, and Physics. While the standard deviations of the data indicated a fair spread of data, the mean-value

showed a significant increase in students' engagement, concentration, motivation, and interest. Moreover, the p-values of Spearman's rho correlation coefficient reveal that there are no significant relationships between students' engagement & concentration and motivation & interest in instruction supplemented by the Kahoot! online game. As technology occupies every aspect of our lives, educational contexts need to be sensitive to the changes and adapt according to the current needs of learners and their learning strategies and preferences. The conclusion is that the interactive features offered by Kahoot! enhance students' engagement, concentration, motivation, and interest.

Keywords: Game-based student response system, Kahoot!, Engagement, Motivation, Interest.

Introduction

While increasing the learning opportunities for students, integrating technology into classroom activities exposes teachers to a variety of instructional approaches. According to Baszuk & Heath (2020), researchers argued that successful integration of technology for classroom instructions necessitates knowledge of not only content, technology, and pedagogy, but also process and procedures of science as well as students' interpersonal relationship. Not only that, but modern technology has produced a variety of software and hardware that will maximize students' engagement in their learning.

There are a wide variety of learning software and platforms developed to assist classroom teachers in delivering effective instruction and to create sustainable environments for teaching and learning. Research (Kaur & Naderajan, 2019) shown that the use of gamified software improved learning outcomes, fostered a supportive learning environment, and increased motivation for and within learning. According to Bicen & Kocakoyun (2018), in most learning environments, motivation is a key factor in student performance. Researchers developed prototypes of Student Response Systems (SRS) in the 1960s and fully implemented them in instructional processes in the 1970s. Since then, game-based learning has become more common in the learning environment along with the introduction of Game-

Based Student Response Systems (GSRS). According to Wang & Lieberoth (2016) GSRS is a game-based version that focuses more on student engagement and motivation by engaging them with graphics, animation, and audio as well as the use of scores to drive for self-improvement or competition against other students. Similarly, Chiang (2020) believe that in order to become more engaged in their study habits and achieve deeper learning, GSRSs require students to experiment, analyse, assess, and apply their past knowledge to relevant information that they have chosen.

Studies (Astuti et al., 2021; Baszuk & Heath, 2020; Hadijah et al., 2020; Kaur & Naderajan, 2019; Neureiter et al., 2020; Wang & Tahir, 2020a) revealed that technology tools including computers, tablets, the web, and software effectively increase and improve students' engagement and active participation in the classroom. Some of these software and online resources assist teachers in using game features to compel, provide feedback on, and organise students' engagement. Gamified web technologies can be used to create adaptive learning environments with the best results because of their responsiveness and interactiveness.

Theoretical Framework

Indicated in Figure 1, Tom Malone's (1981) theory of intrinsically motivating instructions listed three categories that make things fun to learn: *Challenge* (goals with uncertain outcomes), *Fantasy* (captivate through intrinsic or extrinsic fantasy), and *Curiosity* (sensor curiosity through graphics and audio, and cognitive curiosity). The result was to develop a game concept where the *fantasy* is that the classroom temporarily is changed into a game show where the teacher is the game host and the students are the competitors. The *challenge* is to answer questions and compete against other players, and *curiosity* is provided through inspiring graphics and audio, as well as solving a cognitive puzzle.

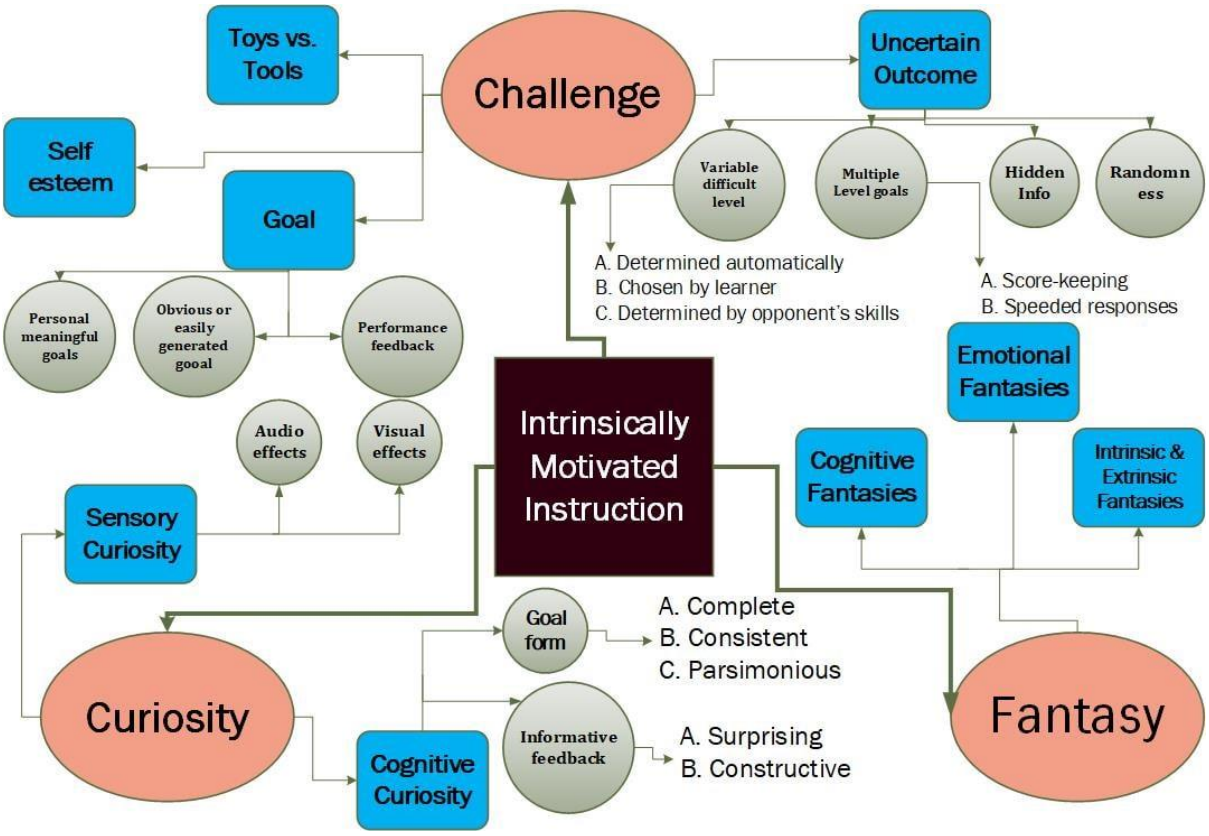

Figure 1: Framework for a Malone's (1981) Theory of Intrinsically Motivating Instruction

i. Challenge (goals with uncertain outcomes)

A goal, an uncertain outcome, toys vs. tools, and self-esteem are all described as components of a challenge. Thus, a game is considered steady (i.e., played consistently throughout the year, like tag) if each player can alter the difficulty level to suit his or her capabilities while maintaining the randomness of each round. It is believed that when the order of players is determined and the results of each round are foreseeable, the game is said to be recurring. A game is sporadic if there is minimal variation in the difficulty level and little challenge at the beginning. And finally, a one-shot game has considerable initial challenge but little hope of improvement beyond an early mastery level, even after several years. Melone (1981) identified five features for making an activity challenging.

i. To precisely match the player's abilities with the demands of action, the activity should be designed such that he can alter the level of challenges he is confronting.

ii. Performance standards should be unambiguous, and individuals should be able to assess their own performance at any moment.
iii. The activity should give the player specific feedback so he may gauge how well he is achieving the performance standards.
iv. For the actor to get more comprehensive knowledge about various elements of himself, the activity should involve a wide range of problems, and possibly several qualitatively different ranges of challenges.

Malone (1981), by analysing earlier theories of intrinsic motivation and learning, attempted to answer two problems. These questions are (i) why are computer games so captivating? And (ii) how can the features that make computer games captivating be used to make learning-especially learning with computers interesting and enjoyable? It is thought that students will learn more quickly and with greater effort if they are intrinsically motivated to do so. They will also feel better about what they have learned and be more likely to apply it in the future.

ii. Fantasy (captivate through intrinsic or extrinsic fantasy)

Another motivational aspect of environments has to do with the themes or fantasies which they embody or encourage. According to Malone (1981), Piaget (1951) explained fantasy in children's play as an effort to "assimilate" experience into the child's pre-existing mental structures with little need to "accommodate" to the demands of external reality. Children's self-invented symbolic games are explained by Freud (1950) as an attempt by the ego to actively reproduce painful events that have been passively experienced. Repetition enables a type of emotional belated mastery over the incident. Thus, Malone (1981) categorised fantasy into intrinsic and extrinsic fantasies, cognitive aspects of fantasies, and emotional aspects of fantasies.

iii. Curiosity (sensor curiosity through graphics and audio, and cognitive curiosity)

The extent to which an environment may continue to pique and then satiate our curiosity is one of its most crucial characteristics. It is important to understand that the kind of complexity or incongruity that motivates is not only an issue of more information in the information theory sense. Instead, it entails exceeding a learner's expectations and prior knowledge. The ideal

degree of informational complexity, which refers to the maximum level of complexity that humans find engaging, has boundaries. Thus, Malone (1981) categorized curiosity into Sensory curiosity and Cognitive curiosity.

Problem Statement

"Environment and Sustainable Development" is a general studies subject taught for undergraduate programmes in Nigeria. As a general course, all students of the same level are offering it in the same semester of a session. This course, together with other general courses, is regulated by the "division of general studies" and not the Department of a Faculty. Due to the large number of registered students, the division had to divide the courses into groups containing more than 500 enrolled students each. As a result of this large number of enrolled students, teachers find it difficult to control their class. Most students lost attention, focus, motivation, and concentration due to the unfavourable conditions of the learning environment. Unlu (2017), states seven common causes for lack of concentration and focus including attention deficit hyperactivity disorder (ADHD), lack of sleep, emotional/psychological problems, stress, learning environment, lesson content, hunger and dehydration. These problems forced course tutors to use multiple approaches for making lectures more interactive, including breaking the class into smaller groups, questioning the audience, using audience responses (systems), introducing cases the students can work on, using written material, organising debates, reaction panels, and guest talks, using simulations and role-plays, using video and audiovisual aids, and using effective presentation skills.

According to Chiang (2020), the use of educational games to supplement teaching and learning has been steadily increasing over the last few years. Many scholars (Gokbulut, 2020; Prieto et al., 2019; Wang & Lieberoth, 2016; Wang & Tahir, 2020b; Yürük, 2019) overcome similar challenges with the aid Kahoot! (a game-based student response systems). Kahoot! represents a new generation of student-response systems that has a main focus on student motivation and engagement through gamification. This was confirmed by Licorish et al. (2018) in a study to examine students' experience using a game-based student response system, Kahoot!. Studies

reveal that GSRSs enhance students' attention, motivation, engagement and enjoyment beyond traditional methods.

A study conducted by Licorish et al. (2018) to examine students' experience using a game-based student response system, Kahoot!!, in an Information Systems Strategy and Governance course at a research-intensive teaching university in New Zealand. The researchers conducted semi-structured interviews with students to learn about the extent to which Kahoot!! influence classroom dynamics, motivation and students' learning process. The results of the study revealed that Kahoot!! enriched the quality of student learning in the classroom, with the highest influence reported on classroom dynamics, engagement, motivation and improved learning experience. Their study suggests the use of educational games in the classroom is likely to minimise distractions, thereby improving the quality of teaching and learning beyond what is provided in conventional classrooms.

Objectives of the Study

It was the nature of the crowded lecture environment and the difficulty of controlling and managing the classroom by the course tutor that necessitated this action research. However, based on the fact that when students are engaged, they commit to the knowledge process, understand the learning objectives and goals, and maintain motivation toward learning, the researchers consider Kahoot! to assess students' engagement, concentration, motivation, and interest during general course (environment and sustainable development) lectures. Thus, the objectives of this study include

i. To assess students' engagement when instruction is supplemented by the Kahoot! online game.
ii. To assess students' concentration when instruction is supplemented by the Kahoot! online game.
iii. To assess students' motivation when instruction is supplemented by the Kahoot! online game.
iv. To assess students' interests when instruction is supplemented by the Kahoot! online game.

v. To evaluate the relationship between students' engagement and concentration in a classroom where instruction is supplemented by the Kahoot! online game.
vi. To evaluate the relationship between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game.

In order to effectively attain the stated objectives of the study, researchers raised the following questions:

i. Is there any significant relationship between students' engagement and concentration in a classroom where instruction is supplemented by the Kahoot! online game?
ii. Is there any significant between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game?

To answer these questions, we hypothesised that:

i. There is no significant relationship between students' engagement and concentration in a classroom where instruction is supplemented by the Kahoot! online game.
ii. There is no significant relationship between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game.

Methodology

During the 2019/2020 academic session, Group C of the general course, "environment and sustainable development," comprises of 541 students studying microbiology, computer science, economics, and physics. The course was taught in Multipurpose Hall (MPH1), a 500-seat lecture theatre located in the Faculty of Science of Sokoto State University. If all students are to attend class regularly, about 41 of them will not have a place to sit, either to stand throughout the period or to sit on the floor. But hardly 400 students attend class. As such, when the 2020/2021 academic sessions begin, a Kahoot! online test was developed for each concept in the course content, including introduction (General Introduction to Environment and Sustainable Development; Concept of Science; Concept of Technology; Concept of Environment; Man, His Origin and Nature; Man and His Cosmic

Environment; Environmental waste management; Environmental Pollution and Hazards; Natural Resources; Concept of Energy) such that a Kahoot! game is played after every lesson.

Secondly, an online survey was adapted from Bicen & Kocakoyun, 2018; Kaur & Naderajan, 2019; and Wang & Lieberoth, 2016 to assess students' engagement, concentration, motivation, and interest during general course (environment and sustainable development) instructions supplemented by the Kahoot! online game. This instrument, Students' Engagement, Concentration, Motivation, and Interest on Kahoot! Instructional Game Questionnaire (SECMIKIGS), was developed on a four-point Likert scale of agreement. It consists of five sections. Section A seeks demographic information from the respondents. Section B, titled "Students' Engagement Scale," comprises of five test items seeking to gauge the level of engagement of the learners during lectures supplemented with Kahoot! online games. Section C called "Students' Concentration scale" comprises of five items assessing students' level of concentration during lectures supplemented with Kahoot! online game. Section D, otherwise termed as the "students' motivation scale," contains five test items seeking students' level of motivation during lectures supplemented with the Kahoot! online game. Lastly, the section E refer to as "students' interest scale" comprises of five test items seeking for level of interest of the learners during lectures supplemented with Kahoot! online game.

At the end of our twelfth lecture, after playing the last Kahoot! game on the "concept of energy", students were asked to respond to an online survey shared in the Whatsapp group of the class. Initially, the course tutor observed that the students attending lectures were more than actual enrolled members of the course, and as such, the questionnaire retrieved exceeded the total number of the sample. Therefore, all responses retrieved from individuals that do not offer microbiology, computer science, physics, and economics were excluded in the general data; a separate analysis was made.

According to Creswell (2014), the validity and reliability of scores on instruments lead to meaningful interpretations of data. Consequently, Creswell believed that when one modifies an instrument or combines

instruments in a study, the original validity and reliability may not hold for the new instrument, and it becomes important to reestablish validity and reliability during data analysis. Thus, tests for internal consistency become necessary. This test was executed using Cronbach's alpha coefficient of reliability since the instrument was designed on the Likert scale. According to Tavakol & Dennick (2011), the measure of internal consistency of an instrument with more than two alternatives, like the Likert scale, can be determined through Cronbach's alpha. Thus, Cronbach's Alpha coefficient of reliability is found to be appropriate since the data obtained is ordinal. To form a conclusion on whether the test items are measuring the same construct, or whether they are closely related, the interpretation of the value of Cronbach's Alpha is also provided by Tavakol & Dennis (2011), represented in Table 1 below. The closer the value gets to 1.00, the better the reliability.

Table 1: Tavakol & Dennis (2011) Reliability index interpretation for Cronbach's alpha

Chronbach's alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

According to Creswell (2014), reliability refers to whether scores on an instrument are internally consistent (i.e., are the item responses consistent across constructs?) and stable over time (test-retest correlations), as well as whether test administration and scoring were consistent. Table 1 shows the Cronbach's alpha values for the instrument. The higher the Cronbach's alpha coefficient of reliability, the more reliable the scale is (Creswell, 2014). That is to say, the closer to 1.00 the coefficient value, the higher the reliability, the more items measure the same construct.

Table 2: Cronbach's alpha coefficient of reliability of the instrument

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Students' Engagement Scale	.885	.889	541
Students' Concentration Scale	.872	.878	541
Students' Motivation Scale	.643	.821	541
Students' Interest Scale	.724	.641	541

As observed in Table 2, the p-value of Cronbach's alpha is close to 1.00, and according to Creswell (2014), the higher the p-value of the coefficient, the more reliable the instrument. This means that the test items of the same construct in the instrument are measuring similar traits. Thus, the instrument is highly reliable.

Results and Discussion

The first lecture attracted absentee students and students from other groups. The second lecture became exciting as more than 100 students had no place to sit; class was overcrowded as almost all participants used Kahoot! for the first time during the first lecture. At this time, students abide cautiously by the rules and regulations given by the course tutor. The students' concentration was optimum because all of them wanted to emerge as the winners of that lecture game. Although some students faced challenges with internet connectivity from their respective service providers, the course tutor encouraged pairing of students without good internet connection. The delivery of the instruction was sustained in this format until the last lecture, during which an online survey was shared for data collection. Table 1 presents an analysis of the demographic information of the participants.

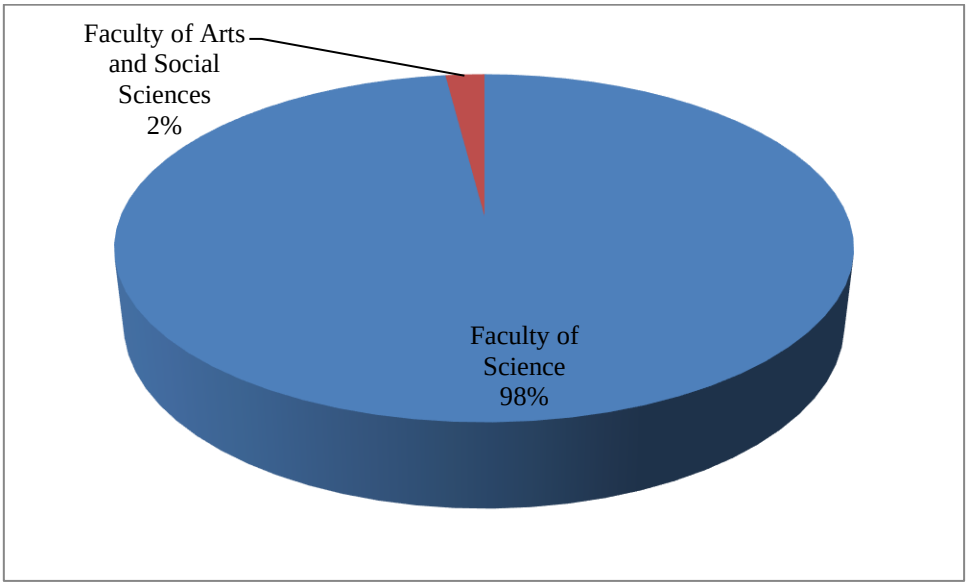

Figure 1: Faculties of the respondents

It can be observed from Table 1 that about 97.97% of the respondents are students from the Faculty of Science, while 2.03% were students from the Faculty of Arts and Social Sciences. This indicates that most of the participants are science-oriented individuals.

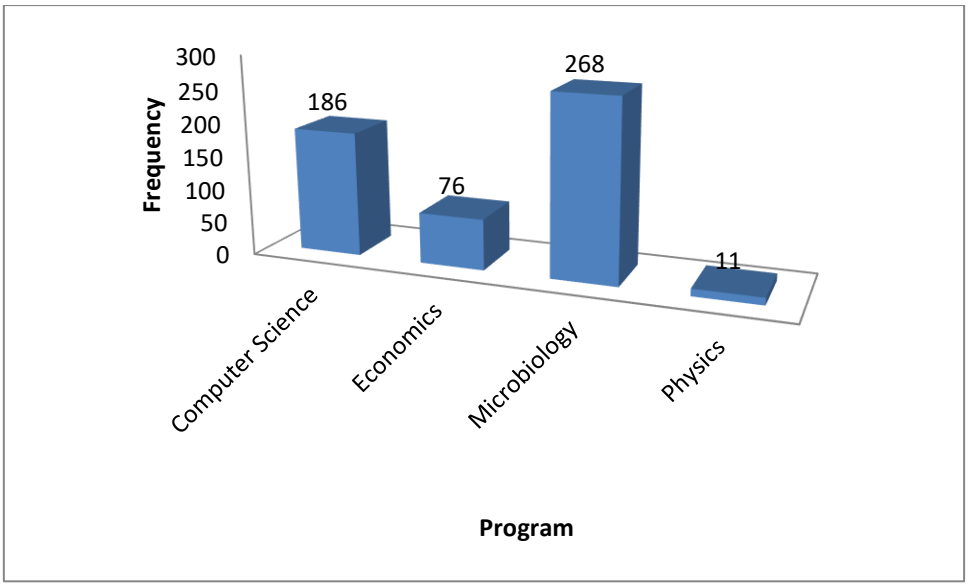

Figure 2: Program of the respondents

As observed from Table 2, computer science has 186 individuals, economics has 76 individuals, microbiology has 268 individuals, and physics has 11 individuals. It can be concluded that microbiology has the highest students, followed by computer science, then economics, while physics has the least participation.

Further analysis of the obtained data is presented such that the stated objectives of the study are addressed. Since the instrument was design in four-point Likert anchor of agreement, a scale of 1 – 4 was assign to the anchor from lower (SD) to higher (SA). Thus, the following presentations involve interpretation of both descriptive and inferential statistics of the data. The descriptive statistical aspect of this study deals with the interpretation of mean and standard deviation of the analysed data. According to Rumsey (2021), the standard deviation measures how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation. While the mean identifies a central value in the distribution, it does not indicate how far the data points fall from the centre. That is, it represents the typical distance between each data point and the mean. Smaller values indicate that the data points cluster closer to the mean—the values in the dataset are relatively consistent. Conversely, higher values signify that the values spread out further from the mean (Jim, 2021). Data values become more dissimilar, and extreme values become more likely.

i. **To assess students' engagement when instruction is supplemented by the Kahoot! online game**

Students' engagement, as one of the crucial factor determining the success of instruction is evaluated via four-point Likert scale of agreement indicated in Table 3.

Table 3: Statistics of students' engagement when instrument is supplement by the Kahoot! online game

SN	Items	SD	D	A	SA	Total	Mean	Std. Dev
1	Initially, I thought playing the Kahoot! would be boring, but it's not	2	21	167	351	541	3.60	0.583
2	The Kahoot! question sets accessible are connected to my lessons	1	0	98	442	541	3.81	0.404
3	Kahoot!! team mode enables me to discuss and collaborate with my teammates	0	1	324	216	541	3.40	0.494
4	Gamification methods help identify areas of deficiency by collecting different data from individuals in group activities	0	1	312	228	541	3.42	0.498
5	I felt an increased pulse when answering questions	0	0	121	420	541	3.78	0.417

As indicated in Table 3, although the standard deviation of.580,.404,.494,.498, and.417 shows the data is spread, the mean values of 3.60, 3.81, 3.40, 3.42, and 3.78, respectively, reveal that the respondents are highly engaged during lectures that are supplemented by the Kahoot! online game. While item 1 has its data furthest away from the mean, item 2 has more concentrated data around the mean. This reveals that students are more engaged in item 2 than the other items on the scale.

A condition of emotional, social, and intellectual readiness to learn, characterised by curiosity, participation, and the drive to learn more. student engagement in education relates to how attentive, curious, interested, upbeat, and passionate students are when learning or being taught, as well as how motivated they are to learn and advance in their education (James, 2017). The idea of "student engagement" is based on the idea that when students are curious, interested, or inspired, learning tends to improve, and when students are bored, disinterested, disgruntled, or otherwise "disengaged," learning often suffers. Thus, one needs to look at the

students' engagement intellectually, emotionally, physically, behaviourally, culturally, and socially.

ii. To assess students' concentration when instruction is supplemented by the Kahoot! online game

Table 4 presents students' concentration when lectures in an overcrowded classroom environment are supplemented by game-based student response like in the Kahoot! online game. Students' concentration was assessed on a four-point Likert scale anchor.

Table 4: Statistics of students' concentration when instrument is supplement by the Kahoot! online game

SN	Items	SD	D	A	SA	Total	Mean	Std. Dev
1	I study more to become more successful via gamification methods	0	4	111	426	541	3.78	0.432
2	The gamification method allows me to see my achievement status and improve myself in the areas that I am weak in	0	0	124	417	541	3.77	0.421
3	Use of a learning method blended with a gamification method helped me to understand the lesson better	0	0	525	16	541	3.03	0.172
4	Using videos in Kahoot! application attracts greater student attention	0	0	0	541	541	4.00	0.00
5	The scoring system of Kahoot! increases the ambition of students to be a top-five scorer	0	0	0	541	541	4.00	0.00

As indicated in Table 4, while in items 1 & 2 the standard deviation of.432 &.421 shows data is spread, the mean values of 3.78 & 3.77, respectively, reveal that students' concentration is high during lectures that are supplemented by Kahoot! online games. However, the standard deviation of item 3 is.172, indicating that data is fairly spread but more concentrated around the mean than items 1 and 2. Finally, items 4 and 5 have a universal mean with zero standard deviation. This means that the data from items 4

and 5 is solely centred on the mean. Thus, students' concentration is optimum when instruction is supplemented by the Kahoot! online game.

A state of thought known as concentration can be triggered by physical sensations (Sari et al., 2021). A continuous flow of mental energy directed by learners at what they're learning, is crucial in any lesson. A pleasant feeling is needed to activate the sensation that can sharpen the concentration. The core of the concentration is to train students ' attention because the more often somebody pays attention to something in detail and carefully, the better their concentration is. Unlu (2017) stated strategies for enhancing students' concentration during instructions including

a) The learning activities can be made more bearable by taking frequent, brief breaks throughout the class.
b) Tasks can be divided into smaller, more manageable portions by assigning them to pairs or groups of students, and then asking them to share their responses, which promotes cooperation and peer support.
c) Get physical – ask students to change seats during the lesson, this will also mean that they get the opportunity to work with different people in class.
d) Keep the classroom neat and orderly. Wall notifications and posters that aren't necessary should be taken down because they will simply serve to distract.
e) Include activities that are aural, visual, and kinesthetic.
f) Give the students opportunity to collaborate in pairs, groups, and individually to vary the interaction patterns.
g) Watch over students who have special needs. Some students, especially those who are still developing their skills, require extra supervision while you work with them to create techniques that will allow them to function with less.
h) Students can learn to focus better and for longer periods of time by playing memory and concentration games.
i) Always have a backup activity ready that you can assign to students who finish their work ahead of schedule.

iii. Students' motivation when instruction is supplemented by the Kahoot! online game

Students' motivation is also assess via four-point Likert scale of agreement. Table 5 represent statistics of students' motivation during lectures supplemented by the Kahoot! online game.

Table 5: Statistics of students' motivation when instrument is supplement by the Kahoot! online game

SN	Items	SD	D	A	SA	Total	Mean	Std. Dev
1	It was important to do well on the quiz	0	0	46	495	541	3.91	0.279
2	Playing the quiz could be of some value to me	0	1	193	347	541	3.64	0.484
3	I feel motivated when I compete with my friends to get higher scores in Kahoot!! game.	0	0	21	520	541	3.96	0.193
4	I feel positive towards my learning when I participate in Kahoot!! games.	0	13	167	361	541	3.64	0.527
5	I study more to become more successful via gamification methods	0	6	133	402	541	3.73	0.468

It can be observed from Table 5 that while the standard deviation of.279,.484,.193,.527, and.468 show that the data is spread, the mean value of 3.91, 3.64, 3.96, 3.64, and 3.73 reveals that students are motivated when instruction is supplemented by Kahoot! online games. Consequently, while item 3 have the least standard deviation, item 4 has the highest. Meaning, data for item 3 is more concentrated around the mean than data for item 4. Generally, the mean value of all items measuring students' motivation during lectures is supplemented by the Kahoot! online game indicates higher level of motivation.

According to the social cognitive perspective, students' motivation is relatively situation or context specific. Motivation stimulates, guides, and sustains learning. It is an important building block of self-regulated learning—the set of attitudes and mental processes that allow a person to steer their own learning. According to Hansbury (1962), student motivation may be oriented internally or externally. Intrinsic motivation is internally

focused and fuelled by the inherent satisfaction one feels from completing a task or mastering a skill. Extrinsic motivation is often driven by external rewards and consequences. These two forms of motivation are not mutually exclusive. Thus, generally, motivation is the state that can maintain students' attention and behaviour as well as provides with more energy to needed to lead tasks to completion. Silva (2020), lists factors that influence students' motivation in teaching and learning including:

a) Class and curriculum structure
b) Teacher behaviour and personality
c) Teaching methods
d) Parental habits and involvement
e) Family issues and instability
f) Peer relationships
g) Learning environment
h) Assessment

In order to maintain their highest levels of motivation, students need to feel proud of the things they have learned and accomplished. Satisfaction can come from a sense of achievement, value, or inherent joy in the act of learning; from external reward systems or praise; or from the belief in a sense of fairness.

iv. Students' interest when instruction is supplemented by the Kahoot! online game

Students' interest is also among the crucial factor determining the success of instruction is evaluated via four-point Likert scale of agreement indicated in Table 6.

Table 6: Statistics of students' interest when instrument is supplement by the Kahoot! online game

SN	Items	SD	D	A	SA	Total	Mean	Std. Dev
1	A gamification method increases my interest in the lesson	0	0	6	535	541	3.99	0.105
2	I prefer my teacher to conduct Kahoot!! activity at least twice a week.	0	0	1	540	541	4.00	0.043
3	Using a gamification method through my smartphone makes me feel better	0	0	6	535	541	4.00	0.043
4	I want gamification methods to be used in other lessons as well	0	0	0	541	541	4.00	0.00
5	Winning badges through a gamification method makes me feel important	0	0	0	541	541	4.00	0.00

It can be observed from Table 6 that the standard deviation of all the items measuring students' interest is either zero or very close to zero. This indicates that the data of the items is concentrated around the mean. Furthermore, the mean values of the items reveal that students' interest is enhanced during lectures complemented by the Kahoot! online game.

It has become crucial for teachers to use methods that increase students' motivation for learning. Student interest in education is the predisposition of a student for a certain subject with which he or she is able to relate easily. Learning becomes enjoyable for students when it involves what interest them.

v. **Relationship between students' engagement and concentration in a classroom where instruction is supplemented by the Kahoot! online game**

In order to find out there could be a relationship between students' engagement and concentration in a classroom where instruction is supplemented with game-based students' response like Kahoot!, a Spreaman correlation was employed. The Spearman rank-order correlation coefficient (Spearman's correlation, for short) is a nonparametric measure of the strength and direction of association that exists between two variables measured on at least an ordinal scale. Since the data obtained from the

instrument is ordinal, it is justifiable to use Spearman' rho correlation to assess the relationship between students' engagement and concentration. Table 7 represent Speaman's correlation between engagement and concentration of students.

Table 7: Spearman correlation between engagement and concentration of students during instruction supplemented by Kahoot! game-based students response

			Mean_Engagement	Mean_Concentration
Spearman's rho	Mean_Engagement	Spearman Correlation	1	.760**
		Sig, (2-tailed)		.000
		N	541	541
	Mean_Concentration	Spearman Correlation	.760**	1
		Sig, (2-tailed)	.000	
		N	541	541

** Correlation is significant at the 0.01 level (2-tailed)

It can be observe from Table 7 that Spearman's correlation coefficient, r_s, is 0.837, and that this is statistically significant (p = .000). This indicates that there is no significant relationship. Thus, we failed to reject the null hypothesis that states that "there is no significant relationship between students' engagement and concentration in a classroom where instruction is supplemented by the Kahoot! online game".

vi. Relationship between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game

The relationship between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game was assess using Spearman correlation. Thus, Table 8 represents Spearman's correlation coefficient of students' motivation and interest.

Table 8: Spearman's correlation between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game

			Mean_Motivation	Mean_Interest
Spearman's rho	Mean_Motivation	Spearman Correlation	1	.212**
		Sig, (2-tailed)		.000
		N	541	541
	Mean_Interest	Spearman Correlation	.212**	1
		Sig, (2-tailed)	.000	
		N	541	541

** Correlation is significant at the 0.01 level (2-tailed)

It can be observe from Table 8 that Spearman's correlation coefficient, r_s, is 0.346, and that this is statistically significant (p = .000). This indicates that there is no significant relationship. Therefore, we failed to reject the null hypothesis that states that "there is no significant relationship between students' motivation and interest in a classroom where instruction is supplemented by the Kahoot! online game".

Recommendation

As technology occupies every aspect of our lives, educational contexts need to be sensitive to the changes and adapt according to the current needs of learners and their learning strategies and preferences. Therefore, teachers and educators should try to complement traditional textbooks with learning software in order to enhance students' engagement, concentration, motivation, and interest in learning.

Conclusion

Students do better when the focus of learning activities is on mastering material rather than achieving performance goals. Kahoot! creates unique lessons that are fun and effective, as well as monitors their students' progress through quizzes and surveys. The interactive features offered by Kahoot! enhance students' engagement, concentration, motivation, and interest. Kahoot! is a teaching tool that teachers should try to implement in

their classroom because it can have positive impacts on the classroom for both teachers and students.

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