

**ONLINE INTERACTIVE GAMES:  
A MODERN APPROACH FOR TEACHING BIOLOGY**

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**1.0 Abstract**

The digital generation of today or the millennials are believed to have shorter attention spans which makes it necessary for teachers to provide a wide array of learning experiences through varying delivery formats that would contribute to increased attention spans. Millennials usually prefer a different kinds of teaching strategies and approaches that can cater to different kinds of intelligences and senses. Hence, it can be safely argued that the most ideal learning environment for the millennials should be less teacher-centred and more student-centred with plenty of emphasis given to collaborative work among students. There are many activities that can be adopted in the classroom that can cater for such demands. However, for content-based lessons, this writer has observed that (in his own context) there is still much emphasis on lecture-based teaching. In this paper the author argues that one approach that teachers can utilize in the contemporary context, is to gamify lessons via online interactive tools such as Kahoot! and Quizizz. Gamification would be feasible for subjects like Biology at pre-university levels where the students have some prior knowledge in biological concepts learnt in secondary school. Thus, rather than repeating the lesson to revise the concepts that they have already learnt, online interactive games can be utilized as a platform to recap certain topics to engage the students and facilitate meaningful learning of Biological concepts. Gamification can also be a suitable approach to conduct formative assessments.

*Keywords: Online games; Kahoot; Quizizz; Biology*

## 2.0 Background and Purpose

One of the greatest challenges faced by many science educators in the 21<sup>st</sup> century is student engagement. This is especially very important as the millennial group of learners are known to be ‘digitally literate’ and ‘tethered to the internet’ (Prensky, M. 2005). Thus, present-day educators need to be ‘adaptors’ who are able to teach the curriculum in more imaginative ways (Iowa Core Curriculum Presentation 2010). The teachers as "digital immigrants" must shift gears in order to keep up with the fast pace of the new generation of students (Prensky, M. 2001). The process of globalization and technological advancement are the key factors that has forced the paradigm shift in education to incorporate digital game-based teaching.

While, studies have shown that the use of technology in education is widespread (Wakil, K 2017), educators are often hard-pressed to incorporate technology into their lessons especially the incorporation of games in content-heavy subjects such as Biology. This paper reports on the writer’s experience of incorporating games in the teaching of Biology lessons to Pre- University students for South Australian Certificate of Education (SACE) International program in Taylor’s College for the past 5 years; since 2014.

Games are used as simple recreational activities most of the time. However, when the games are incorporated within a well thought lesson plan, they can be powerful teaching tools. While participating in games, students have to follow certain rules and procedures and become more competitive in order to win. At the same time, the element of fun that characterizes games provide them an enjoyable learning experience within the classroom. Gamification of lessons also help teachers to create better teaching and learning environments. What is even more advantageous is that these could be presented at different stages of the lessons, at the most appropriate moment to create a positive atmosphere that enhances learning without forcing students to ‘thinking about their learning’. However, teachers should decide carefully when and what kind of games are to be incorporated by analyzing different factors such as the aims of the lesson and students’ prior knowledge. Currently, teachers have been reported to have widely used several online tools that are readily available to customize their teaching for their students such as “Flippity”, “Digital

Jeopardy”, “Kahoot!”, “Quizlet”, “Quizizz”, “Memorize.com”, “Vocabulary.com” & “Dustbin game” to name a few. However, for me, I find Kahoot! & Quizizz the most viable and practical. .

Both Kahoot! and Quizizz use bright colours and fun music to create an energetic, game like atmosphere. Compared to other online teaching tools, Kahoot! and Quizizz are also more user-friendly to be used to gamify a lesson. Kahoot! provides a conducive platform which enables teachers to create a multiple choice quiz game using text, images and video. For Quizizz, the gamification elements such as avatars, live leaderboard and funny memes add to the fun in the learning process. For both the online interactive games, students enter the game code on their devices to play the game.

Additionally, Kahoot! & Quizizz also provide a great platform for formative assessments because students get immediate feedback for their responses. Besides that, both these online tools can also be used to review topics before summative examinations. My students have found Kahoot! & Quizizz particularly very useful when they need to review what they have learnt for an upcoming test. Although Kahoot! seems to be more popular among many teachers for formative assessment, many might not realize that there is more to Kahoot! than what meets the eye. For instance, there is another application known as Blind Kahoot! which is useful for the introduction of new concepts to theories being taught. Blind Kahoot!ing allows students to build knowledge gradually – one step at a time. In essence, rather than teaching the content and then using Kahoot! to recap, the teacher will be asking the toughest review question first, before beginning to teach the content. This switches learners into a very active ‘questioning’ mode, the perfect mindset for learning something new!

From the student’s perspective, the use of online interactive games have various meanings: learning, having fun & excitement, accepting a challenge and achieving a better score!!! From the teacher’s perspective, the use of online interactive games allows the teacher to engage a ‘millennial’ using a familiar medium. When Biology questions are asked using online interactive games such as Kahoot! & Quizizz, it increases the interest of students for Biology and they are driven to find the answers. It has a tremendous impact on student motivation to learn more. It is also a wonderful way of interacting and communicating with students.

### 3.0 Details of Content

There are many ways for a teacher to incorporate the use of free online interactive games like Kahoot! and Quizizz in a Biology lesson, in order to make the lesson interesting and to increase student engagement. Firstly, the teacher needs to connect to Kahoot! & Quizizz. using the following links.

#### Kahoot!

Teachers sign in using this link in order to create questions: <https://getkahoot.com/>

Students join in by entering the game pin: <https://kahoot.it/#/>

#### Quizizz

Teachers sign in using the link in order to create questions: <http://quizizz.com/admin>

Students join in by entering the game pin: <http://quizizz.com/join/>

For my lessons, I usually use both the online interactive games as a pedagogical tool to review, revise and reinforce the Biology concepts that the student has learnt. The traditional way of conducting a quiz using pencil and paper is less appealing to digitally literate students who are familiar with the wide array of digital technology available today. For many students digital game-based learning is much more fun because of the interactive feature. It indirectly creates positive competitive vibes among students and also ‘spices up the world’ of formative assessment!

Besides that, online interactive games like Kahoot! also allows me to teach particular topics that the students are already familiar with. For example, Pre-U students have already learnt about the structure and function of Cell Organelles in secondary school. So, to teach the same topics in a traditional way can be boring for the students. To make it more interesting, I incorporated Kahoot! to teach this topic. Students were informed prior to the lesson about the quiz. This “flipped classroom method” allow sufficient time for students to refresh their knowledge on the structure and function of Cell Organelles using the information posted on a Moodle ®, a Learning Management System. Rather than teaching about each cell organelle one at a time in class, questions were created to assess what students know about Cell Organelles. After each question is

posed, I usually take approximately 3 minutes to review the answers. Among items assessed are the students' ability to grasp the concept and also to check if students have used the correct biological term.

For example, I created a Kahoot! question with a picture of a mitochondrion, to direct students attention to a question on the term for the folds of the inner membrane of the mitochondrion. Once the student has answered the question, a statistic will appear to show how many students have answered the question correctly. Based on this, I can gauge how many students really know about the structure of a mitochondrion. I will also go through the question and answer with the students emphasizing the importance of using correct terminology e.g.: *cristae* and also provide additional information on the structure of the organelle e.g.: the importance of having a folded inner membrane. Since the students are in a competitive mode during such lessons, they will pay extra attention in class since their ultimate goal is to win the game.

To reinforce the competitive mode, I usually praise the top five scorers whose names appear after each question. The 'leader board' appears after students answer each question; this constantly changes based on two factors, which are, i) *getting the answers correct* and ii) *the time taken to answer the questions*. To make it more interesting, sometimes, small rewards are given to the winners and also extra tasks are assigned to the student whose name appears last in the leader board. The extra task I usually provide is to get students who appear last in the leader board to do a short oral presentation on a selected biology topic on another day.

Another benefit of Kahoot! & Quizizz is that both provide real time results that can be downloaded for reference purposes. The score can also be used to identify the weak students who will need personalized consultation for the remedial activities aimed at reinforcing the knowledge on certain biological concepts tested through the game. This contributes to the academic success of each student as it provides an interesting learning experience that is customized.

Here are some topics that I had successfully taught using Kahoot! or Quizizz to teach/ review Biology lessons:

- (a) Stages of Mitosis & Meiosis
- (b) Genetic Engineering
- (c) Cell Membrane
- (d) Transport Mechanisms
- (e) Ecosystem and Community Characteristics
- (f) Mutations
- (g) Organ Systems

However, the use of Kahoot! & Quizizz is not restricted to only those topics. Both the online teaching tools are ideal to be used for any other topics which do not require elaborate explanations of certain biological concepts. Since the teachers are limited to only multiple-choice quiz format, it is easier to use these online tools for topics with simple concepts that does not require complex explanations of the biological mechanism.

Although there are a lot of similarities between both the online teaching tools, there are some differences as shown in the table below:

<b>Kahoot!</b>	<b>Quizizz</b>
Questions are projected on a screen and are visible to the entire class and not visible on individual devices.	Questions and answers are not projected on a screen to the entire class but are visible on each individual device.
The quiz is teacher-paced. The order of the questions cannot be shuffled.	Students progress through the quiz at their own pace and can shuffle the order of questions (So the students can't copy their friend's answer).
Immediate feedback is projected to the class.	Feedback appears on all individual devices. Entertaining memes pop up after each question with immediate feedback (can be turned on or off)
Quizzes are always timed	Timer can be turned on or off
Limits character length for questions	Re-sizes font based on length of question which enables longer questions.

Both these online interactive games, Kahoot! & Quizizz have the following common advantages:

- (a) Are available for free!
- (b) Works on any electronic device which has an internet connection.
- (c) Provides a question bank where teachers can choose from or edit to suit the aim of the lessons.
- (d) Allows teachers to create questions for our students.
- (e) Does not require the student to create an account.
- (f) Fosters social learning and deepens pedagogical impact.

#### **4.0 Implementation of the Teaching Methodology (Online Interactive Games)**

##### **First Phase: Create**

A teacher who intends to use online interactive games such as Kahoot! & Quizizz in a Biology lesson first needs to log in to the website in order to create the questions. The following are the links where a teacher can sign up for free:

Kahoot!: <https://getkahoot.com/>

Quizizz: <http://quizizz.com/admin>

**Or** the teachers can also google “Kahoot!” or “Quizizz” for much easier access. The teacher can make a series of multiple choice questions based on the biological concept or theory that is to be tested. The teacher can even add images and diagrams to the questions to amplify engagement! For a teacher who does not have sufficient time to prepare the questions, both Kahoot! and Quizizz have lots of questions for the teacher to choose from. The questions in the question bank have been deposited by educators around the world to share knowledge. All that is required is, to duplicate the questions and edit to meet the individual teacher’s requirements e.g. syllabus and context. There are also many options that the teacher can explore such as adjustment of time, music when the game is played, shuffling of order of questions and many more.

## **Second Phase: Play**

The students can log in for free without the need to open an account. The following are the links:

Kahoot!: <https://kahoot.it/#/>

Quizizz: <http://quizizz.com/join/>

**Or** the students can join in by simply googling “Kahoot it” for Kahoot! while “Join Quizizz” for Quizizz. These online interactive games are best played in groups. Once the students are on the webpage, the students are required to enter the ‘game pin’ that is provided by the teacher. (It will appear automatically on the screen when the teacher hosts the game). Once the game pins are entered, the students can start to play the game!

## **Third Phase: Reflect**

Although the use of online interactive games can be fun and engaging, the teacher’s ultimate objective to enhance student learning must remain the main focus. Hence, an important component in the implementation of this teaching approach is reflection. Students need to reflect on the answer options that they chose. The teacher should conduct a short debriefing session after each questions to ensure that students understand the answers provided. The teacher should also use this opportunity to reinforce biological concepts when some students have shown a lack of understanding.

For Kahoot!: A short discussion can take place after each question, since the teacher controls the pace of the game. After each question, the teacher can spend about 3 minutes to explain and discuss with the students why a particular answer is required.

For Quizizz: The discussion can take place after all the students have completed all the questions since for Quizizz, students answer the questions at their own pace. A summary or questions with appropriate answers is shown at the end of the game.



## 5.0 Results and Benefits of Implementing the Teaching Methodology (Online Interactive Games)

The benefits of using free online interactive games like Kahoot! and Quizizz in Biology lessons are many and varied. For students to learn, first the students need to be engaged. Thus, these online interactive games provide an excellent platform for student engagement. It is a good way to capture and hold the attention of students. A game allows students to quickly engage and immerse themselves in learning something new. After a long day at College, it can be difficult for some students to sit through another lesson. An engaging and energising game may be just what the students need to help them focus on another area of learning.

After using Kahoot! and Quizizz in my Biology lessons for a few months, I conducted a short survey with the cohort of students that I was teaching in 2016. A total of 28 Biology students participated in this survey. Following is the result of the survey:

No	Questions	Mean Score (Percentage)
1	Online interactive games such as Kahoot! & Quizizz makes learning Biology more interesting & enjoyable.	96.4
2	Kahoot! & Quizizz makes me more engaged with the subject taught in the class.	92.1
3	Usage of Kahoot! & Quizizz in teaching Biology enhances my learning experience.	95.0
4	Usage of Kahoot! & Quizizz can be an effective way to do revision on a particular topics in Biology	95.7
5	Kahoot! & Quizizz are better alternative compared to the conventional method of formative assessment (Quiz using test paper)	86.4
6	Kahoot! & Quizizz makes me more competitive to do revision for Biology	86.4
7	Kahoot! & Quizizz is not a waste of time	92.1
8	Usage of Kahoot! & Quizizz are one of the faster and effective ways to gauge my level of understanding in Biology	92.9
9	Usage of Kahoot! & Quizizz makes the learning environment more lively and interesting	97.9
10	I like my biology teacher to incorporate more Kahoot! & Quizizz games into the Biology lesson	95.7

Generally most of the students were satisfied with the usage of Kahoot! & Quizizz as part of my lessons, be it either as formative assessment or to review topics/lessons. The highest score was obtained for question no.9 where the students definitely in agreement that the usage of Kahoot! & Quizizz makes the learning environment more lively and interesting. Over the years, the usage of these online teaching tool to gamify my lesson definitely had improved my teaching & learning feedback scores which indirectly reflects in the improvement in the students' engagement in the classroom.

## **6.0 Conclusion**

The use of technology in the form of online interactive games definitely benefits the students. However, teachers should play a vital role in planning a well thought lesson plan to integrate the online interactive games as part of their teaching tools. There is a sweet spot for learning that lies between what a student can do without help and what they can accomplish with help which is called zone of proximal development (Matthew Lynch 2016). In the zone of proximal development, the quiz created is neither so easy that the student is bored nor so difficult that the students give up. A successful game layout should aim towards this same zone of proximal development so that the learning can take place effectively. Online interactive games such as Kahoot! and Quizizz without a doubt are excellent pedagogical tools in teaching Biology and also other subjects. For teachers who are already very familiar with Kahoot! perhaps this is the time to venture into using Quizizz or other form of Kahoot! such as “Blind Kahoot!” or “Kahoot! for homework”.

## 7.0 References

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