



## **The Effect of Two Gamification Formative Assessment tools on the Achievement of Tenth Female Graders in Chemistry**

أثر أدوات تلعب للتقييم التكويني في تحصيل طالبات الصف العاشر في مبحث الكيمياء

By

Leena Mohammad Alja'afreh

Supervisor

Prof. Mohammad Tawalbeh

A dissertation submitted in partial Fulfillment of the Requirements for A  
Master's Degree in instructional technology at the Arab Open University

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## **Authorization**

I, Leena AlJa'afreh, authorize the Arab Open University to provide copies of my dissertation in paper and electronic form to libraries, organizations, or bodies concerned with scientific research and studies upon request.

Name: Leena Alja'afreh

Date: 5<sup>th</sup> August, 2024

Signature: 

## **Dedication**

I dedicate my achievement first to my mother, my inspiration, my role model, my eternal support, and the source of my strength and patience....

Then I dedicate it to my brothers... who provided all kinds of support to me... May God bless their beautiful homes...

Then I dedicate it to my father... who brought me to my current state of success... May God keep me in his blessed prayers.

Then I dedicate it to my children... the joy of my heart, my support, and my pride... who have been very patient with me being busy so that I can grant them this achievement and be a role model for them, God willing...

To my friends and loved ones who wished me well and success and did not forget me in their prayers...

Finally, I dedicate it to myself... because success suits me...

**Leena Alja'afreh**

A handwritten signature in blue ink that reads "Leena".

## **Acknowledgement**

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## **An Acknowledgment of a Commitment to Scientific Honesty in Writing Scientific Theses and Dissertations**

I am the student: Leena Mohammad Alja'afreh,

Student ID: 2210178

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I declare that my thesis/dissertation is not extracted or copied from any published or unpublished source, and does not violate the accepted rules of scientific honesty, whether that was intentional or unintended. Accordingly, I bear full responsibility with regard to granting me the academic degree or withdrawing it after obtaining it if I do not commit to doing so.

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Sincerely,

Name: Leena Alja'afreh

Day and date: Saturday 6<sup>th</sup> July, 2024

Signature: 

Name of the language specialist: Rania Farran

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# The Effect of Two Gamification Formative Assessment tools on the Achievement of Tenth Female Graders in Chemistry

By

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Prof. Mohammad Tawalbeh

## **Abstract**

This study aimed to investigate the effect of utilizing two Gamification applications called Quizizz and Kahoot! as formative assessment tools in improving the achievement of tenth grade female students in chemistry subject in Amman. To achieve this, the quasi-experimental method was used, and an achievement test was developed; its validity and reliability were confirmed. The subjects of the study consisted of (65) students from the tenth grade of the American programme in a school in Amman which was randomly divided into three groups: a first experimental group consisted of 22 students that used Quizizz as a gamification application, and a second experimental group consisted of 23 students that used Kahoot! as a gamification application, and a third group consisted of 20 students as a control group that did not use any gamification application. The results revealed that there were statistically significant differences at ( $\alpha \leq 0.05$ ) between the control group from one side and between each of Quizizz and Kahoot! experimental groups from the other side in favor of each experimental group. However, the findings showed that there were no statistically significant differences between the Quizizz and Kahoot! assessment tools, suggesting that both digital tools are equally effective in enhancing student performance.

The study recommended to: integrate digital formative assessment tools such as Quizizz and Kahoot! into the curriculum to enhance student engagement and performance, and propose a professional development programme to train teachers to employ digital assessment tools effectively.

*Key words:* Gamification, chemistry, Quizizz, Kahoot!, formative assessment, achievement.

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### ملخص

هدفت هذه الدراسة إلى معرفة أثر استخدام تطبيقي التلعيب Quizizz و Kahoot! كأداتي تلعب للتعقيم التكويني في تحصيل طالبات الصف العاشر في البرنامج الأمريكي في مقرّر الكيمياء في إحدى مدارس عمان. ولتحقيق ذلك تمّ استخدام المنهج شبه التجريبي. تم بناء اختبار تحصيلي يتكوّن من 20 فقرة كأداة للدراسة، وتم التأكد من صدقه وثباته. تتكوّن أفراد الدراسة من (65) طالبة من طالبات الصف العاشر ، تم توزيعهم عشوائياً إلى ثلاث مجموعات: مجموعة تجريبية أولى (22) طالبة دُرست باستخدام تطبيق التلعيب Quizizz. ومجموعة تجريبية ثانية (23) طالبة استخدمت تطبيق التلعيب Kahoot!، ومجموعة ثالثة ضابطة تكوّنت من (20) طالبة طُبّق عليها الطريقة المعتادة في التعقيم من خلال أسئلة موجودة في العرض التقديمي لسؤال جميع الطالبات. وأظهرت النتائج وجود فروق ذات دلالة إحصائية عند مستوى الدلالة ( $\alpha \leq 0.05$ ) بين المجموعة الضابطة من جهة وبين كل من المجموعتين التجريبيتين Quizizz و Kahoot! من جهة أخرى لصالح كل مجموعة تجريبية. كما أظهرت النتائج أنه لا توجد فروق ذات دلالة إحصائية بين أداتي التعقيم Quizizz و Kahoot! ، مما يشير إلى أنّ كلتا الأدوات الرقمتين لهما التأثير نفسه في تحسين أداء الطالبات. وبناءً على نتائج الدراسة، كانت أهم التوصيات: دمج أدوات التعقيم التكويني الرقمية مثل Quizizz و Kahoot! في المناهج الدراسية لتعزيز مشاركة الطالبات و تحصيلهنّ، واقترحت الدراسة إنشاء برامج تطوير مهني لتدريب المعلمين على استخدام أدوات التعقيم الرقمي بشكل فعّال.

الكلمات المفتاحية: التلعيب، الكيمياء، تطبيق Quizizz، تطبيق Kahoot!، التعقيم التكويني، التحصيل





# **Chapter One**

## **Background of the Study**

### **Introduction**

Talking about the importance of integrating gamification into the educational process has become one of the most discussed and presented topics in teacher training courses. The role of gamification in increasing students' motivation towards learning and breaking boredom in classroom is no secret, especially for subjects that are predominantly narrative in nature, or subjects that adds a lot of information all at once. Moreover, Gamification increases students' achievement, as it introduces a spirit of competition into the classroom, which encourages them to study more and increases their concentration during lesson with the aim of excelling in these gamified tests.

The large production of such applications that rely on gamification has helped teachers diversify their teaching methods and diversify the use of these applications, which differ in their design and in the avatars that the student can choose from. They can also control the time available for each question and display a countdown to the student, Which increases tension of the task, focus and motivates them to answer quickly. All this with a progress bar to inform the student what stage he has reached in the gamification and how much time he has left. This idea, despite its simplicity, has a great impact in encouraging the student to complete the test, as the mind hates unfinished things. There are also rewards, leaderboards, and collection points to take all aspects of the games they play (Abu Musa, 2020).

All of this makes their use very suitable for a generation that is accustomed to such applications in their daily lives, so there is no harm in making the learning process include this part of their reality as well.

## **Statement of the Problem**

Studies like Alotaibi's (2023) indicate that there are difficulties in studying chemistry accompanied by low achievement in chemistry tests. This is due to the fact that test questions depend on deduction, linking, analysis and generalization, which makes it an unpopular subject for students because it constitutes a burden on them. Chemistry teachers suffer from the fact that the subject is very dense and studying it, as I sensed from students' perspectives, is considered more difficult than studying the rest of the science subjects because it requires both understanding and memorization. In terms of studying it, they encounter topics related to atoms for example along with their properties and how different atoms combine to produce different compounds, to chemical reactions and their need for mathematical skills to master this topic and find different calculations regarding reactions. Students of the American programme also suffer from the necessity to undergo an external test that includes everything related to chemistry that they have studied for two years. Therefore, the required material is very large, which makes studying it challenging. First and foremost, continuous review is necessary in order to achieve excellent results on the American College Test (ACT) that is an international test that they perform to get their equivalency report and apply for universities afterwards. And as noticed while studying the related studies that they recommend and suggest to study the effects of gamification applications on students' performance, therefore, this study seeks to reveal the effect of two gamification formative assessment tools on the achievement of tenth female graders in chemistry

## **Hypothesis**

This study attempted to test the following hypothesis:

H0: There were no statistically significant differences at ( $\alpha \leq 0.05$ ) between the means of tenth female graders achievement in chemistry attributed to type of assessment (Quizizz, Kahoot and normal)

## **Significance of the study**

The significance of the study was demonstrated through:

### ***Theoretical significance***

The theoretical significance of this study is that it will provide theoretical literature for the use of Quizizz and Kahoot! In chemistry classes for the American Programme students. It also provides a model for how to use these two applications and integrate them into chemistry classes in the American Programme. It is also - to the researcher's knowledge – one of the first studies that compares between the effects of the two

applications with this category of students who studies in the American programme in the Arab world.

### ***Practical significance***

The study's practical significance is that it illustrates the importance of using modern technological applications in teaching chemistry in the American programme, which increases knowledge of these applications and how to use them and integrate them into classroom lessons. The results of the study may also draw the attention of supervisors of these materials to include the use of such applications in their training workshops for teachers in addition to adding it in the preparation.

### **Scope and limitations of the study**

The limitations of the current study were as follows:

Human limits: Tenth Grade female Students studying in the American Programme

Time limits: The second semester of the 2023/2024 academic year.

Topic Boundaries: Chapter 7 section 1 Chemical names and formulas from the book McGraw-Hill Modern Chemistry 2017 premium

### ***Study Boundaries:***

The boundary of the study is that the results are generalized only to tenth grade female students studying in the American programme from which the sample was taken and to similar communities.

### **Variables of the study**

**First: The independent variable:** assessment method which has three types: Quizizz, Kahoot! and Normal Method

**Second: The dependent variable:** achievement

### **Operational definitions**

**Gamification:** Formative assessments application in the form of a game between students using Quizizz or Kahoot! applications. It contains a leader board for winners, and other

aspects of games as sound effects and animated graphics, to assess tenth grade female students in Chemical names and formulas section.

**Chemistry:** a science topic taught for grade 10 and 11 in the American programme from the book McGraw-Hill Modern Chemistry 2017 premium, which includes atoms and theories regarding them along with compounds, their names and formulas along with chemical reactions and other topics.

**Quizizz:** an application for creating formative assessment that operates in a gamified manner to create an atmosphere of enthusiasm and competition among tenth grade female students during the class session that covers the topic of Chemical names and formulas.

**Kahoot!:** an application based on the concept of gamification, whereby a multiple choice formative assessment test is prepared and then a code sent to the tenth grade female students to access the test and compete answering the questions regarding the topic of Chemical names and formulas.

**Formative assessment:** is a cumulative test performed at the end of the classes that explains the topic of chemical names and formulas in chapter 7 section 1 , by three methods which are: Quizizz, Kahoot!, and the normal.

**Achievement:** is the students' performance in an assessment test consisting of 20 multiple choice questions that tests the students' performance in questions regarding the topic of chemical names and formulas in chapter 7 section 1 from the book McGraw-Hill Modern Chemistry.

## **Chapter Two**

### **Literature Review**

#### **Theoretical framework**

The theoretical literature on the topic of the dissertation is divided into four domains: the domain of formative assessment, the domain of using gamification applications in teaching, the domain of using Quizizz application, and the domain of using Kahoot! Application. Followed by a review of previous studies related to the subject of the study.

#### **First: Theoretical literature**

The first domain: Formative assessment

Assessment is a critical element in the learning process, providing teachers with insights into what students know and can do, and helping identify areas where students need additional support. There are three main types of assessment: diagnostic, formative, and summative, each with its own purpose and unique benefits. These three types of assessment are important components of the learning process. Diagnostic assessment helps identify areas where students need additional support, while summative assessment provides a comprehensive overview of student achievements. The importance of formative assessment lies in ensuring that students can achieve learning objectives, as it provides continuous feedback to both teachers and students using a variety of assessment tools (Slingerland, Weeldenburg & Borghouts, 2024).

#### **The Concept of Formative Assessment in Education**

Formative assessment is systematically and methodologically structured, aimed at improving the educational process by providing feedback to both the teacher and the learner about their progress, as well as identifying strengths and weaknesses. This type of assessment is based on David Ausubel's theory of meaningful learning, which emphasizes linking old information and experiences with new information (Abd Halim, Hamzah & Zulkifli, 2024).

Formative assessment can also be defined as the actions or steps taken by the teacher during the stages of education with the goal of achieving and developing educational objectives, as well as improving student performance, enhancing their academic achievement, and boosting their self-confidence (Slingerland, Weeldenburg & Borghouts, 2024).

As well, formative assessment is defined as a set of diverse methods used by teachers to conduct practical evaluations of student understanding, as well as to assess learning needs and academic progress during lessons or training courses. This assessment helps teachers identify the skills that students find difficult to acquire and the concepts that are challenging for students to understand, in order to make necessary adjustments to lessons and instructional methods (Parmigiani et al., 2024).

Moreover, formative assessment is a process used by teachers to gather evidence about student learning following the instructional process. The purpose of formative assessment is to provide teachers and students with the opportunity to adjust teaching and learning strategies to better achieve learning objectives. Teachers use formative assessment to check understanding, identify knowledge gaps, and adjust teaching methods to help students achieve their educational goals (Asamoah, Shahrill & Abdul Latif, 2022).

Formative assessment can take various forms, including quizzes, games, class discussions, surveys, and peer assessments. One of the key features of formative assessment is its continuity and the provision of regular feedback to both teachers and students. This feedback is used to identify areas where students may be struggling and to develop strategies to help them improve their performance (Sudakova et al, 2022).

## The Importance of Formative Assessment in Schools

The importance of formative assessment in schools lies in the following points (Slingerland, Weeldenburg & Borghouts, 2024):

- Helps teachers identify students' strengths and weaknesses

Formative assessment provides teachers with valuable information about students' performance and understanding. This information helps teachers identify areas where

students may be struggling and adjust their instruction accordingly. For example, if a teacher notices that a student is having difficulty with a particular concept, they can provide additional support and guidance to help the student master the material.

-Guiding teaching methods and improves student learning

Formative assessment allows teachers to adjust their teaching methods based on students' performance and understanding by identifying areas where students are struggling. Teachers can develop targeted interventions to help students improve. This can lead to better learning outcomes for students, as well as increased engagement and motivation.

-Encouraging student self-reflection and learning

Formative assessment can help students take responsibility for their learning by encouraging self-reflection and self-assessment. When students receive regular feedback on their performance, they are more likely to take ownership of their learning and set goals to improve their performance. This can deepen their understanding and motivate them to learn.

-Providing opportunities for feedback and collaboration

Formative assessment provides opportunities for both teachers and students to give and receive feedback. This feedback can be used to improve teaching and learning strategies and build a collaborative classroom culture. When students receive feedback from their peers, they are more likely to develop critical thinking skills and become more engaged in the learning process.

The goal of formative assessment is to gather detailed information that helps teachers modify and improve teaching, as well as to help them identify learning needs and problems. Formative assessment also aims to identify students' strengths and weaknesses to address areas of weakness and enhance areas of strength. When students know what they are doing well and what they need to work harder on, it can help them take greater responsibility for their learning and academic progress (Parmigiani et al ., 2024).

## Effective use of formative assessment in schools

As stated by Abd Halim, Hamzah & Zulkifli (2024), in order to use formative assessment effectively in schools, teachers need to:

-Set clear learning objectives

Clear learning objectives are essential for effective formative assessment. Moreover, teachers need to clearly identify what they want students to learn and understand how to measure students' progress toward these objectives.

-Utilizing a variety of assessment strategies

Teachers should use a variety of assessment strategies to gather evidence about student learning. This includes quizzes, class discussions, surveys, and peer assessments. Using a range of strategies can help teachers form a more comprehensive picture of student understanding.

-Providing timely and actionable feedback

Feedback should be provided in a timely manner and be actionable. This means that teachers should give feedback that students can use to improve their understanding and performance. Feedback should be specific and focused on areas where students need to improve.

## The second domain: Using gamification applications in teaching

Gamification is one of the most prominent innovations in the educational process that has become increasingly evident in recent times, due to the widespread use of various technological devices such as computers, mobile phones, and tablets. It is an effective educational environment that uses various methods to achieve educational goals in the shortest time and with the least effort.

## Concept of Gamification

Al-Hafnawi (2017) defined gamification as a concept derived from the word "game", which initially began with advertising campaigns and brand promotion but later expanded to include other areas such as education, training, and media. Al-Sulaiman (2018)



defined it as using the patterns found in traditional games but with modern digital tools, using electronic devices like computers, phones, and iPads. The primary purpose of gamification is to support students in gaining knowledge and information and helping them solve problems in an exciting and engaging environment. Furthermore, Al-Majid (2020) referred to gamification as an educational strategy based on the principles of traditional play, which can be used to provide students with various forms of knowledge through digital games in an environment full of excitement, enthusiasm, and engagement. This makes students more interactive and receptive to information than they would be through direct instruction. The interaction and challenge mixed with benefit and enjoyment are among the most important characteristics of gamification.

Gamification involves applying basic game elements to a range of activities and different fields such as commerce, marketing, and education, with the aim of creating a challenging environment among students to facilitate the educational process (Anak & Hua, 2021).

Gamification is a new educational approach aimed at motivating students and stimulating their drive by integrating game elements into learning environments. It contributes significantly to student enjoyment and engagement in the educational process (Kalogiannakis, Papadakis & Zourmpakis, 2021). In the same context, Orhan (2019) pointed out that gamification is an educational and training approach to motivate students to continue educational tasks by using game elements in learning and training environments, with the goal of maximizing enjoyment and participation.

Gamification, as defined by Mousa (2020), is the use of game design elements and rewards to introduce an element of fun and enjoyment into education to stimulate learners' engagement in the teaching and learning processes and increase learners' motivation for teaching and learning. One of the benefits of gamification in education is that it increases student participation in learning, increases the level of motivation among students, and increases their loyalty to the educational process.

## Advantages of Gamification

Gamification is a strategy that encompasses multiple advantages, which is why many educational institutions strive to integrate it into their curricula (Zainuddin & Shujahat, 2020). Anak and Hua (2021) highlighted the benefits of gamification in education, noting that it allows students to practice how the game works and how they can play it. This alone is enough to make them eager to play and compete with their peers, fostering a spirit of competition and participation among them. It also encourages and motivates them to learn in an engaging and different way, increasing their productivity. Additionally, gamification provides students with immediate feedback on their responses, offers necessary support, corrects their answers, and clarifies and explains key points faster than other school activities.

Al-Majid (2021) mentioned other advantages of gamification, stating that it gives students the opportunity to notice real-world applications. It is a highly effective way to enhance skills through practical scenarios, allowing learners to see the real-world benefits and applications of the subject matter. As well, they can directly observe how their choices within the game lead to consequences or rewards.

Another advantage of gamification is that it provides real-time or synchronous feedback. The gamification approach allows students to work towards real, measurable, and meaningful goals, receiving high-level feedback as they achieve these goals. This synchronous feedback helps correct the students' learning process (Pham, Nguyen & Van, 2021).

Gamification enhances the learning experience by increasing student interaction with the educational content. In e-learning, gamification provides learners with the opportunity to interact with the content in an effective educational environment. And when students are enthusiastic, they are more likely to retain information. Additionally, gamification makes the educational process enjoyable and effective, creating a fun and engaging environment for students. This makes them more likely to participate in lessons, making learning enjoyable rather than tedious (Suh, Wagner, & Liu, 2018).

## Barriers to using gamification in education

Despite the numerous advantages of gamification in the educational process, there are many barriers that hinder its progress. Zainuddin and Shujahat (2020) mentioned some of these challenges, such as parents' lack of trust in gamification strategies and their inexperience with this approach due to their familiarity with traditional teaching methods. Additionally, they mentioned that there is a lack of expertise among teachers in gamification and its applications, as well as their limited participation in specialized training courses on how to implement gamification in education. The financial costs required for gamification applications are also a significant barrier, as many educational institutions do not have the necessary funds. Moreover, teachers often lack confidence in the positive impact of modern technologies, such as gamification, on student achievement and educational progress. There is also a belief that gamification does not accurately measure students' true abilities.

Suh et al. (2018) pointed out that the gamification strategy does not account for individual differences among students. The lack of financial resources is a significant obstacle in many educational institutions, affecting the availability of the necessary equipment for these games. Additionally, the inability of educational institutions to provide regular maintenance for the existing gamification equipment and devices hinders the learning process based on this strategy. The use of gamification can also distract students due to the colors, images, and multimedia files it contains.

Kalogiannakis et al. (2021) noted that while gamification offers many advantages, it also has some drawbacks. Gamification often focuses on creating a competitive environment where students strive to win and achieve victories, which can divert their focus from educational goals. Teachers may face difficulties in designing games that cater to the interests of both male and female students due to fundamental differences in what appeals to each gender. Some electronic games are complex, with many variables that require additional time for the teacher to explain to the students so they can understand and play the gamification.

Furthermore, gamification programmes may produce annoying images and sounds for students when they answer incorrectly, leading to negative reinforcement and becoming

a source of irritation. This can make students less attracted to the application and less willing to play the game again with their peers due to these annoying sound effects.

#### Educational Uses of Gamification

Loganathan, Talib, Thoe and Zawadski (2019) highlighted several educational uses of gamification, considering it an important tool in the educational process and in enhancing students' knowledge. One application is activating student responses during lessons: gamification breaks the classroom routine and motivates students to learn, alleviating the boredom of traditional education. It simplifies complex concepts; if a teacher encounters many complex concepts in a lesson, gamification can simplify and facilitate these concepts for students by progressing from simple to complex, thereby making it easier for students to understand. Additionally, it aids in formative assessment, as at the end of each lesson, the teacher can obtain an evaluation of all students through gamification within the classroom, providing immediate results and feedback.

Al-Hafnawi (2017) stated that gamification increases the efficiency of the educational process and improves learning outcomes by applying active and effective learning principles. Through gamification, students can gain and enjoy educational experiences. The game allows students to build their knowledge base and acquire various facts and concepts. When used, the game enables students to engage in high-level cognitive processes such as synthesis, analysis, and problem-solving, fostering positive attitudes toward using technology in education and preferring smart devices and computers in their learning.

Gamification in education helps reduce student stress levels and significantly aids them in controlling their emotions. Additionally, it provides students with the ability to gauge their progress in educational materials by continuously offering immediate feedback during learning. Moreover, it increases students' intrinsic motivation towards learning due to the spirit of competition and winning in various games. Learning through gamification is more attractive and emotionally engaging for students, thus motivating their behavior towards learning (Al-Sulaiman, 2018).

## Types of gamifications in education

As for the types of gamifications in education, there are several, and gamification in relation to education can be expressed through four methods: cosmetic/visual enhancement, games as an adjunct, curriculum integration, or making the learning process itself a game (Mullins & Sabherwal, 2020):

1- Cosmetic/Visual enhancement: This type of gamification involves using colorful and attractive graphics and images to improve the appeal of educational materials, making them more engaging and interesting for students.

2- Games as an adjunct: This type of gamification includes incorporating games and interactive activities as part of the learning process, using games to enhance students' understanding of concepts and provide opportunities for active interaction and participation.

3- Curriculum integration: This type of gamification means integrating games and entertaining activities with the formal educational curricula, where games are designed to align with educational topics and learning objectives.

4- Making the learning process a game: This type of gamification involves transforming the learning process itself into a game, using game elements such as levels, challenges, and rewards to motivate students and enhance their engagement and persistence in learning.

## Standards for designing gamification in education

Gamification in education is the process of employing game design concepts and integrating them into learning scenarios, such as websites and mobile applications. The aim of gamification in education is to motivate students and increase their engagement and understanding by providing exciting and stimulating learning experiences that use game elements like challenges, rewards, and levels. Successful implementation of gamification requires consistent and well-planned design, where learning objectives and student needs are included in the design process to achieve the desired results effectively. The successful design process should include several features as highlighted by Waterloo (2022):

1. Defining the game's objective: The game should be designed to achieve specific and clear educational goals that align with the knowledge or skills that students need to acquire.
2. Considering student characteristics: The game should be student-centered, prioritizing students' learning needs.
3. Consistency with the curriculum: Gamification should be aligned with approved educational curricula and desired academic standards, balancing between fun and academic achievement.

Mullins & Sabherwal (2020) mentioned additional features:

- Encouragement and motivation: Gamification should provide motivation and encouragement for active and continuous student participation, using rewards, challenges, and positive feedback to enhance engagement and learning.
- Collaboration and interaction: The educational game should include elements that encourage students to collaborate and interact with their peers, as well as tools that enhance teamwork and communication among students.
- Variety and adaptation: The game should be adaptable to different student levels and needs, including challenges and activities suitable for various learning styles and levels.
- Assessment: Gamification should include an assessment system that allows teachers to evaluate student progress and understand the extent to which educational objectives are being met, using various assessment tools such as observations, active participation in activities, and quizzes.

## Gamification patterns

Loganathan et al. (2019) presented several elements of gamification used in education, which are as follows:

### Points System

The principle of the points system is based on the student accumulating a number of points at each stage, which provides feedback to the teacher about the student's performance. The data collected indicates the student's level of understanding of the educational material. As

the student accumulates points by answering questions, they can progress from the current stage to the next stage. Students can review the badges they have earned at any time.

Some of the common elements of the gamification applications are:

#### Badges

This type is somewhat similar to the points system, where a visible badge or mark is awarded, indicating that the player has achieved a certain goal or passed a specific stage. For example, some exercises award badges after completing a hundred steps. The badges system creates a spirit of competition among students to collect as many badges and medals as possible. Students can review the badges they have earned at any time (Bal, 2019).

Pham et al., (2021) added the following to the elements:

#### Leveling Up

Students must answer all the questions and activities in one level to move on to the next level. The initial levels are easy and do not require much effort from the student, unlike the later levels that require higher concentration and skills.

#### Leaderboards

This involves a leaderboard that records the names of the top-performing students. The competition is among those whose names appear most frequently on the leaderboard. Top performers must maintain their status, thereby raising the level of competition among high-scoring students and motivating others to improve their performance.

#### Feedback

Positive feedback is the primary motivator in this type, encouraging students to progress and put in the effort. Immediate feedback guides student behavior; if the performance is good, they receive positive feedback and strive for better results, while negative feedback for poor performance prompts them to improve.

#### Rewards/Gifts

In this type, students receive rewards prepared for the winner at each stage of the game, such as points, badges, necklaces, or shields. When a student answers correctly, they

receive a reward, motivating them to excel and provide correct answers to earn these rewards.

## The third domain: Quizizz application

The Quizizz application is an Indian educational application that was launched in 2015 to produce gamified tests to integrate students into the educational process and increase their motivation. The number of users reached over 50 million. It can be used in classrooms and can be prepared as homework, for group work, or as reinforcement for some students (Hari, 2024).

Quizizz is a free educational tool that allows teachers to conduct formative assessments at the students' pace in a fun and engaging way for students of all ages. Teachers can choose from millions of teacher-created quizzes covering every topic, or they can create their own material. The app's different modes allow students to participate together in class or at home according to their schedules. While students play, teachers receive immediate feedback on their progress, eliminating the need for grading. Quizizz works on any device with a browser, and Quizizz apps are available for Android, IOS, and Chromebook devices (Orhan, 2019).

Quizizz is an assessment tool that enables teachers and students to create and use quizzes for one another. After providing students with an access code, a quiz can be presented live as a timed competition or used as homework with a specified deadline. After completing the quizzes, students can review their answers (Pitoyo & Asib, 2020).

The application is considered one of the educational tools that allows teachers to create their own tests with the option of making them available to everyone, students and teachers, which provides a wide library of tests that include different areas of subjects. All you have to do is write the name of the subject in the search box to get many options of available tests. Which you can review or take some of the questions and add to a test of your own making (Aralipunan, 2021).

It is a game-based educational tool that can be used to engage students in deep and meaningful learning experiences. It allows for the creation of quizzes and lessons at the pace of the teacher and the student. Using the Quizizz editor, custom quizzes can be



designed to include various types of questions (multiple choice, open-ended, polls, fill-in-the-blanks), and media (such as images, videos, audio clips, and voice recordings (Mullins & Sabherwal, 2020).

## Features of Quizizz

One of the features of Quizizz is its blog section, which highlights new features or techniques for using the platform. Quizizz also has a teacher resources section that includes a one-page getting started guide, a training presentation, and a help center. The flexibility of Quizizz is its best feature, as any teacher can use it for any content area they are teaching. Teachers can view student reports and display which questions were answered correctly or incorrectly to inform instruction or address learning gaps. It can be easily added to Google Classroom. Teachers do not have to post questions on a traditional board, as each student has access to their own questions and answers. Quizizz works on any device with a browser, and Quizizz apps are available for Android, iOS, and Chromebook devices (Pitoyo & Asib, 2020).

Quizizz is ideal for many aspects of classroom learning. It is easy to use, flexible, and fun for students. For example, it can be used in art class for basic concepts such as elements of art, specific techniques, art history lessons, and art vocabulary. Teachers can add existing questions from other people's Quizizz to their own Quizizz with one click and make modifications. Fun comments are added to questions once they are answered, and these can be customized to suit the classroom community, school environment, or classroom content, providing positive feedback to students (Pitoyo & Asib, 2020).

The platform contains a large number of ready-made quizzes in various fields prepared by other users from around the world. You can search the same platform and benefit from these quizzes as well. Teachers can modify some of these quizzes according to the curriculum or the information they wish to assess with their students and easily resend and direct them to their students. The platform is easy to handle, requires no training, has a user-friendly interface, and offers simple options (Aralipunan, 2021).

The application works on all internet browsers, and the application is also available for Android, IOS, and Chromebook devices. The application provides multiple choice

questions, true and false questions, and also provides open-ended questions, thus enabling the teacher to prepare questions that help students prepare for their exams, as well as formative exams during the lesson or achievement tests to do at home. All of this helps students remember facts and prepare for tests. The application is also distinguished by its simplicity, ease of use, and provision of instructions during use, which has helped in its wide spread (Alodibat, 2020).

### Challenges of Using Quizizz

While Quizizz offers many benefits for both teachers and students, its implementation in the classroom is not without challenges. Understanding these challenges is essential for educators to maximize the platform's potential and mitigate any drawbacks effectively, one significant challenge is the issue of technical accessibility and reliability. Not all students have access to reliable internet connections or the necessary devices to participate in Quizizz activities, particularly in underprivileged areas. This digital divide can create a disparity in learning opportunities, as some students may struggle to access the quizzes and resources available on the platform. Additionally, technical issues such as software glitches, slow internet speeds, or device malfunctions can disrupt the learning process and lead to frustration among students and teachers alike (Orhan, 2019).

Student engagement and motivation also pose a challenge. While Quizizz is designed to make learning fun and interactive, not all students may find the game-based approach appealing. Some students might not be motivated by competitive elements or might find the quizzes too easy or too difficult, which can lead to disengagement. Teachers need to balance the use of Quizizz with other teaching methods to ensure all students remain interested and motivated. Moreover, the novelty of gamified learning can wear off over time, requiring teachers to continuously innovate and vary their use of the platform to maintain student interest (Mullins & Sabherwal, 2020).

Assessment accuracy is another challenge. While Quizizz provides immediate feedback and grading, it may not always accurately reflect a student's true understanding or abilities. For instance, some students might perform well on a quiz due to guessing or familiarity with the quiz format rather than actual knowledge of the subject matter. Conversely, students who struggle with test anxiety or timed assessments might

underperform, despite having a good understanding of the content. Teachers need to consider these factors when using Quizizz as an assessment tool and combine it with other forms of evaluation to get a comprehensive picture of student learning (Pitoyo & Asib, 2020).

Teacher workload can also increase with the use of Quizizz. Although the platform simplifies quiz creation and grading, teachers still need to invest time in creating high-quality, customized quizzes that align with their learning objectives. They must also regularly review student performance data, provide feedback, and make necessary adjustments to their instructional strategies. For educators already burdened with heavy workloads, integrating Quizizz effectively into their teaching practice can be challenging and time-consuming, lastly, privacy and data security concerns cannot be overlooked. As with any online platform, there are risks associated with the collection and storage of student data. Teachers and schools must ensure that they comply with data protection regulations and take appropriate measures to safeguard student information. This includes being vigilant about the platform's privacy policies and educating students about safe online practices (Alodaibat, 2020).

### **The fourth domain: Kahoot!**

The application was launched in 2013 and is a Norwegian application for creating multiple choice questions. The number of users has reached 10 billion, and the application supports 17 languages (Wang & Tahir, 2020).

A game-based educational platform that allows teachers and students to create, explore, and play a wide range of educational games. The application is easy to use and its games can be played on any device. The teacher's Kahoot! application can include various types of questions and answers, and may incorporate media materials such as videos and images (Krath, 2021).

It has been defined as one of the educational programmes that aim to increase students' activity and enthusiasm by relying on a system of play and response in classrooms, shifting them from a traditional environment to one of competition, fun, and excitement (Al-Nimr, 2017).

Abu Seif (2017) defined it in the context of electronic test applications as one of the most important applications used in the gamification system in the learning and teaching process. It serves as an educational trend and a new approach to increasing students' motivation to learn by using games in the educational environment to achieve maximum enjoyment, attracting learners' attention to participate and continue learning.

Lotfy's (2018) study indicated that when gamification is employed in the educational process, it influences students' behavior by motivating them to carry out all assigned educational tasks with high desire and effectiveness, whether inside or outside the classroom, within the framework of competitive play.

## Advantages of Kahoot!

Electronic gamifications possess many features that have made them among the most widely used applications in education. The study by Nadeem & Al Falig (2020) highlighted several advantages of the Kahoot! application, including:

-Integrating technology with reality: Kahoot! makes it possible for teachers to blend technology with the real world by using it within the classroom environment. This means that teachers and students are present in the same place and at the same time during the application of the electronic test.

-Displaying questions on smart screens only: The questions are displayed only on smart screens in the classroom and not on the students' devices. This ensures that students answer the questions through voting only, which enhances student interaction with their teachers and peers.

Additionally, the study by Al-Majid, (2020) mentioned several features of the Kahoot platform, including the following:

-Free of charge: This platform is free for teachers and students, allowing the educational process to be conducted through play and enjoyment. It makes the learning process fun, engaging, and inclusive of various subjects, but it has some new advanced features for the Kahoot!+ that requires fees and it is AI assisted.

- Flexibility: Teachers can create fun educational games through a series of questions with multiple answer choices. They can also add images and videos and select the format and number of questions to increase engagement within a few minutes for all ages.

- Gameplay: Kahoot! allows for multiplayer use in classrooms, enabling learners to answer questions on their devices while the game and results are displayed on a shared screen to unify the lesson. This increases student interaction and enthusiasm. There are also many ready-made game designs available for learners to use online.

- Collaboration: Group learning on Kahoot! enhances the educational process and promotes discussion regardless of the players' locations, whether they are in the same place or different places.

-Reinforcement: With the increasing availability of mobile applications, students can use the games on the Kahoot! platform as homework. This increases review, practice, and reinforcement through intensive practice.

-Simplicity: The platform works on any internet-connected device without needing to log in to join the game.

-Variety: The platform features a variety of elements such as discussion and dialogue to enhance knowledge and encourage teamwork.

- Attractiveness: Kahoot! attracts learners by encouraging group learning and discovering potential.

- Global reach: The platform allows for play and communication with many players from over 180 countries ( Al-Majid, 2020).

The application contains 3 types of questions: Discussion: which poses a question with an open answer without points, or Questionnaire: which is like questions, but without grades as well, and there are tests, which consist of multiple choice questions with points collected and their ranking is shown to the students. And the number of points they collected also is displayed, which creates a kind of competition between them and increases their motivation towards learning. The application supports the Arabic language and is free. Pictures and

video clips can also be added to questions, and it can be shared with students in Google Class and Microsoft Teams (Al Jarad, 2021).

## **Review of Related Studies**

The following are a number of studies that have been reviewed in theoretical literature in the educational field:

Cigdem et al's study (2024) is quasi-experimental study that explores the impact of integrating leaderboards as a gamification element into formative assessment on learner achievement and engagement in an engineering course. Conducted over eight weeks in the Mechatronics Technology Department of a public university in Türkiye, the study involved 159 engineering students. Using a pretest-posttest control group design, the intervention included a pre-test in the first week, six weeks of instruction and formative online assessment, and a post-test in the final week. Analyzing the data using descriptive and inferential statistics, the results of the study show a positive correlation between the incorporation of a leaderboard as a gamification element into formative assessment procedures within an online platform and improved learner achievement and engagement. However, it is noted that gamification may not sustain learners' long-term attention. Therefore, instructors are advised to carefully consider time and retention concerns when designing or adopting gamified learning opportunities.

Alotaibi's study (2023) aimed to identify the effect of applying Gamification in teaching chemistry on the achievement and the development of habits of mind for 11th Grade female students. To achieve that the quasi-experimental approach was used. An achievement test was prepared, and a Habits of Mind scale, and the study sample included (38) female students. The study concluded that using gamification in teaching chemistry improves academic achievement for Female students in the first year of secondary school, especially in High order thinking skills according to Bloom's taxonomy.

Namari's study (2022) aimed to identify the reality of science teachers' use of electronic assessment applications in evaluating the cognitive learning outcomes of middle school students in the Sabya Education Department in Saudi Arabia. The study relied on the descriptive survey approach to reach the goal of the study. The tool was a questionnaire,

and the study sample included (128) female teachers from the Sabya district were selected randomly. The study concluded that the degree of teachers' use of these applications is moderate, and the obstacles to use are high, and there are no differences according to the variable of academic qualification and number of years of experience.

Wulandari's study (2021) aimed to know the students' point of view on using the Quizizz application as a means of evaluation in the English language course for ninth grade students in Pekanbaru in Indonesia. The study adopted a descriptive qualitative approach, and the tools were an interview and a questionnaire, and the sample included 10 students for the interview. And 36 students participated in the questionnaire, and the study concluded that Quizizz was an enjoyable application and recommendations for using it more often to increase motivation and English language skills.

Al-Abadi's study (2020) aimed to identify the effectiveness of using the Kahoot application in increasing motivation and academic achievement among eighth-grade female students in the subject of history in Naour District. The study relied on the quasi-experimental approach and the study sample consisted of (60) female students who were selected by a purposive method. They were placed in two groups, one experimental and the other control, and a measure of motivation and an academic achievement test were used. The study found that there were statistically significant differences in favor of the experimental group.

AbdulRahman's (2020) study aimed to determine the impact of the Kahoot! On academic achievement and attitude towards the subject of Hadith. To achieve the goal of the study, the quasi-experimental approach was adopted on a sample of (65) students who were divided into two groups, one experimental (33) and the other a control group (32). The research tool consisted of an achievement test and an attitude scale. The study found that there were statistically significant differences between the averages. Academic achievement and attitude towards the subject.

Pitoyo & Sumardi (2020) explored the impact of gamified feedback using Quizizz platform on students' learning in Indonesia. The study used qualitative approach. To investigate the topic, the researcher used a questionnaire, observation, and in-depth interviews. The study sample consisted of 18 male and female students. The results of the

study showed that students were motivated and wanted to learn more deeply after taking several tests using Quizizz. They were interested in game elements such as Leaderboard, Meme, Time Limit, and Test Report.

Huang, Ritzhaupt, & Albert (2020) a meta-analysis sought to investigate the impact of gamification in educational settings on student learning outcomes in Florida. The study relied on a quasi-experimental approach, and the study relied on an observation tool, as 3083 male and female school students participated in the study. The results of the study showed that each element of gamification leads to different effects on student learning outcomes.

Pitoyo & Asib (2020) aimed to explore the washback effect of Quizizz assessment platform on students' learning. To investigate the issue, the researcher used questionnaire, observation and in-depth interviews. The data obtained would be analyzed qualitatively. The result of the study shows that students were motivated and they wanted to learn more deeply after doing several gamified tests with Quizizz. They were interested in elements of game such as Leaderboard, Meme, Time restriction, and Test report.

Nadeem & Al Falig, (2020) study mainly investigated the students' ratings of Kahoot! Quizzes (KQs) as a Formative Assessment (FA) tool that facilitates the development of self-regulatory learning (SRL) skills. The study uses the seven principles of effective feedback to design a FA model that promotes students' self-regulatory skills by defining the teacher's role and students' responsibilities while administering KQs. The study is classroom action research that was done during a summer course and involved (n =70) female students in two linguistics courses. The researchers used a questionnaire and a focus group discussion to get students' feedback on the effectiveness of KQs in enhancing their self-regulated learning. The results consistently showed positive evaluation of KQs along three dimensions: effective feedback, classroom environment and developing students' meta-cognitive skills, the three essential ingredients of self-regulated learning. The model proved to be extremely effective in designing effective KQs that enhance students' self-regulatory skills.

Che Hassan & Yusof (2019) investigate the effect of gamified assessment on students' achievement, motivation and engagement. Thus, this study used non-equivalent



quasi-experimental mixed method (QUAN-Qual) design. Two approaches were implemented on two groups of students, which is the Gamified Assessment (GA) group using Quizizz and the Non-Gamified Assessment (NGA) group using the multimedia application. The sample size employed in this study is 80 students in Politeknik Balik Pulau. Students were divided into two groups, 40 students in GA group and other 40 students in NGA group. The analysis of Covariate (ANCOVA) revealed that there is a significant difference in students' achievement between gamified assessment using Quizizz and non-gamified assessment using multimedia application. In addition, the ANOVA analysis also reported that there is a significant difference in student's motivation and engagement between GA group and NGA group. Lastly, gamified assessment has proven to have a positive effect on students' achievement, motivation and engagement. These findings lead educators to implement gamification in the classroom and create enjoyment in learning

Sanchez, Langer & Kaur (2019) study revealed the effect of using gamification as a method aimed at improving educational test results in electronic educational environments. The researcher used a quasi-experimental approach. The study sample included 473 university students, and used traditional tests and short online tests. As for the results of the study, it concluded that gamification may be a viable option for short-term tests. It also proved the effect of education using gamification on students' electronic test results. It also indicated that gamification may not be suitable for targeting low-achieving students because its enjoyment and usefulness declines with use which makes it a short-time impulse rather than an effective tool for sustainable changes in pedagogical environments.

## **Critique of Related Studies**

Similarities and differences between the study and previous studies:

### **In terms of the objectives of the study**

The current study aimed to know The Effect of Two Gamification Formative Assessment tools on the Achievement of Tenth Female Graders in Chemistry. Thus, the current study differed from some of the previous studies in terms of the

objective, as Cigdem et al 's study (2024) aimed to identify the impact of integrating leaderboards as a gamification element into formative assessment on learner achievement and engagement in an engineering course, Namari's study (2022) that aimed to identify the reality of science teachers' use of electronic assessment applications in evaluating the cognitive learning outcomes of middle school students in the Sabya Education Department, Wulandari's study (2021) that aimed to know the students' point of view on using the Quizizz application as a means of evaluation in the English language course for ninth grade students in Pekanbaru.

The current study was similar to Alotaibi's study (2023) in investigating achievement and in the subject which was also chemistry for 10<sup>th</sup> grade female students but the study also aimed to identify the effect of applying Gamification on the development of habits of mind as well. The study was similar to Al-Abadi's study (2020) in that it studied the impact of the Kahoot application on students' achievement, but it differed from it in the subject area, which was history and its study of motivation. Abdul Rahman's (2020) study aimed to determine the impact of the Kahoot! On academic achievement and attitude towards the subject of Hadith, so it was similar to the current study in studying achievement but differed in the subject matter which was Hadith and it differed in its study of the trend as well.

Pitoyo & Sumardi (2020) explored the impact of gamified feedback using Quizizz platform on students' learning in Indonesia which was different from the current study's objectives. Huang, Ritzhaupt, & Albert (2020) sought to investigate the impact of gamification in educational settings on student learning outcomes in Florida which differed from the objectives of this study. Nadeem & Al Falig (2020) study mainly investigates the students' ratings of Kahoot! Quizzes (KQs) as a FA tool that facilitates the development of self-regulatory learning (SRL) skills, which differed from this study's objective. Che Hassan & Yusof (2019) investigated the effect of gamified assessment on students' achievement, motivation and engagement, so it was similar in studying achievement but differed in studying motivation and engagement as well. Sanchez, Langer, & Kaur (2019) study

revealed the effect of using gamification as a method aimed at improving educational test results in electronic educational environments, which was similar in studying achievement.

### In terms of the methodology used

The current study differs from the study of Namari (2020), Nadeem & Al Falig, (2022), Pitoyo & Asib (2020), Pitoyo & Sumardi (2020) which adopted the descriptive survey method, and from the study of Wulandri (2021) which adopted the descriptive qualitative method. But it is similar to the rest of the studies as they adopted the quasi-experimental method.

### In terms of the study tool

The current study is similar to the study of Al-Abbadi (2020), the study of Abdul Rahman (2020), and the study of Al-Otaibi (2023) in using the achievement test as a tool, but it differs from Wallendry (2021) in its use of interview and questionnaire tools, and with the study of Namari (2020), which also relied on the questionnaire.

### In terms of sample

The study was similar to Abdel-Rahman (2020), Al-Abadi (2020), Wallandari (2021), Pitoyo and Sumardi (2020), Huang, Ritzhaupt & Albert (2020), Pitoyo & Asib (2020), Nadeem & Al Falig (2020), Che Hassan & Yusof (2019) and the study of Al-otaibi (2023) in that the sample was made up of students, but it differed in numbers and age group of students, and it differed with Namari's sample, which was limited to female teachers. It also differed from Cegdem et al's study (2024) where the sample was engineering students. It also differed from Sanchez, Langer, & Kaur (2019) where the sample composed of university students

The researcher benefited from previous studies to determine the sample, study tool, and study methodology. The current study is distinguished from previous studies in that it studies the effect of using two applications in increasing achievement: Quizizz and Kahoot! to compare between them, it is also the first study, to my knowledge, that deals with the tenth grade American programme students and the chemistry subject in Amman.

## **Chapter Three**

### **Methodology and Procedures**

This chapter includes an explanation of the study methodology used, the study subjects, a description of the achievement assessment test used and how to measure its validity and reliability, its procedures, and the statistical treatment that will be used to analyze the results.

#### **Methodology**

To achieve the aim of the study, the quasi-experimental approach was used.

#### **Subjects of the study**

The subjects of the study was (65) female students from the tenth grade/American programme in schools affiliated with the Directorate of Amman District for the academic year 2023/2024. The school was chosen purposefully due to the researcher's work at this school which facilitated the study's procedures. The subjects were randomly divided into three groups: a first experimental group (22) used the Quizizz as a gamification application, and a second experimental group (23) used Kahoot! as a gamification application, and a third control group (20) that did not use any gamification application.

#### **Design of instructional material**

##### **PowerPoint presentations**

Two PowerPoint presentations were designed for the lesson of chemical names and formulas.

##### **Formative assessment gamified quizzes**

A formative assessment gamified quiz was constructed with the same questions once using Quizizz application and was only used with the group specified for this application and once using Kahoot! as a gamification application, and was only used with the group specified for this application.

## **Instrument of the study**

An assessment test consisting of 20 multiple-choice items.

### ***Test Validity:***

An assessment test to measure the achievement, consisting of 15 multiple-choice items was prepared, you can find in appendix A, and it was sent to arbitrators to check its content validity. Some of the arbitrators were PhD holders in education, in educational technology, methods of teaching sciences and Measurement and evaluation, the others were master's degree holders in general chemistry, some of them teaching the same curriculum as the study sample. The test was modified by adding 5 more questions that covers lower order thinking skills according to the recommendations of the arbitrators and some of the questions were also modified. **The result was an assessment test consisting of 20 multiple-choice items** prepared to cover the section of chemical names and formulas, you can find in appendix C, and was used before the start of the explanation process as a pretest. Then it was used during the following week for all study groups (Control, Quizizz and Kahoot) as a post test, after shuffling the questions and their choices.

### ***Test Reliability***

To verify the Test reliability, test-retest method was used by administering the test and re-administering it after two weeks on a pilot sample consisting of (20) students selected from the same population and out of the original sample. Pearson Correlation was calculated between their scores on the test which was (0.90).

Furthermore, Kuder Richardson-20 Coefficient for internal consistency reliabilities was calculated, which was (0.86). It can be noted that these values were appropriate to achieve the objectives of the study, since the value is above (0.70) (Pallant, 2005).

### ***Test Discrimination and difficulty values***

Discrimination and difficulty values of the test items were calculated. As shown in table 1 difficulty values ranged between 0.35 and 0.75, which are acceptable values. The same can be said about discrimination value which is acceptable as long as it is not in negative values and ranges between (0.20 - 1). The next table displays difficulty and discrimination index of 60 students resembling the pilot sample.

Table1

*Questions' Difficulty and Discrimination Values:*

Item	Difficulty	Discrimination
1	0.40	0.63(**)
2	0.45	0.61(**)
3	0.60	0.51(*)
4	0.40	0.50(*)
5	0.65	0.54(*)
6	0.55	0.65(**)
7	0.65	0.67(**)
8	0.65	0.52(*)
9	0.75	0.72(**)
10	0.45	0.49(*)
11	0.60	0.49(*)
12	0.45	0.44(*)
13	0.60	0.55(*)
14	0.65	0.50(*)
15	0.50	0.64(**)
16	0.45	0.61(**)
17	0.35	0.56(**)
18	0.35	0.67(**)
19	0.45	0.69(**)
20	0.45	0.61(**)

\* Correlation is significant at the 0.05 level (2-tailed).

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

## **Procedures of the study**

1. Overview the theoretical literature and previous studies that dealt with the use of gamification applications in classrooms.

2. Choosing the topic that will be used for the study according to the timeline at which the application will be possible.
3. Obtaining the approval from the school to apply the study on the chosen classes.
4. Preparation of the two PowerPoint presentations that were used during the explanation of the section.
5. Developing the gamified quizzes using the two applications.
6. Developing the study tool after referring to theoretical literature and previous studies and presenting it to arbitrators with experience to ensure the validity of the content and the extent to which it measures the objectives of the chosen topic, then editing it according to their recommendations to reach its final form.
7. Verifying the validity and reliability implications of the study tool.
8. Appointing the subjects of the study and which groups uses which application and which group is control randomly by writing the sections names on papers then choosing from them.
9. Applying the study tool to groups. Which is An assessment test made of 20 items constructed and applied to all the groups during the week after finishing the section of chemical names and formulas, which required 3 classes, and after the application of the chosen formative assessment tool (Quizziz, Kahoot!, normal) as a teaching strategy, each group as was assigned to it randomly.
10. Check the assessment test and then analyze the score results statistically using SPSS V.23.
11. Analyze and discuss the results, and draw recommendations.

## **Design**

The study was conducted using pretest-posttest-control group design

G1 O X<sub>1</sub> O

G2 O X<sub>2</sub> O

G3 O --- O

Where:

G1: is the first experimental group

G2: is the second experimental group

G3: is the control group

X1: is Quizizz Application gamified quiz

X2: is Kahoot! Application gamified quiz

O: is the achievement test for all groups

## **Statistical Analysis**

To Test the hypothesis of the study, means and standard deviations and estimated marginal means of tenth female graders achievement in chemistry due to type of assessment (Quizizz, Kahoot! and Normal) were calculated, and to find out whether there are statistical significant differences in these means, one way ANCOVA was conducted after ensuring that the conditions to use ANCOVA were available, then multiple comparisons post hoc test using Bonferroni method was also conducted.



## Chapter Four

### Results of the Study

This chapter displays the results of analyzing the collected data on instrument.

The hypothesis of the study was:

**There were no statistically significant differences at ( $\alpha \leq 0.05$ ) between the means of tenth female graders achievement in chemistry attributed to type of assessment (Quizizz, Kahoot! and Normal).**

In order to test the hypothesis of the study, means and standard deviations and estimated marginal means of tenth female graders achievement in chemistry, due to type of assessment (Quizizz, Kahoot! and Normal) were calculated and are shown in table 2.

Table 2

*Means, standard deviations and estimated marginal means of tenth female graders achievement in chemistry attributed to type of assessment.*

Type of assessment	N	Pre		Post		Estimated Marginal Means	Std. Error
		Mean	Std. Deviation	Mean	Std. Deviation		
Quizizz	22	4.23	2.245	14.27	4.355	14.208	0.700
Kahoot!	23	4.21	2.553	13.96	4.587	14.091	0.684
Normal	20	4.24	2.166	11.19	4.986	11.110	0.716

Table 2 shows a slight variance in the means of the pre and post assessments of tenth female graders achievement in chemistry attributed to type of assessment, to find out whether there are statistical significant differences in these means, one way ANCOVA was conducted and the results are shown in tables 3.

Table 3

*One way ANCOVA for the effect of type of assessment on tenth female graders achievement in chemistry*

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pre test (covariate)	690.992	1	690.992	64.176	0.000	0.509
Type of assessment	132.272	2	66.136	6.142	0.004	0.165
Error	667.566	62	10.767			
Corrected Total	1481.818	65				

Table 3 shows that there are statistically significant differences at ( $\alpha \leq 0.05$ ) in the tenth female graders achievement in chemistry attributed to type of assessment, Pair wise multiple comparisons post hoc test using Bonferroni method was conducted as in table 4:

Table 4

*Pairwise Multiple Comparisons Post Hoc Tests using Bonferroni method for the effect of type of assessment on achievement in chemistry*

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.
Quizizz	Kahoot!	0.117	0.979	1.000
	Control	3.098(*)	1.001	0.009
Kahoot!	Quizizz	-0.117	0.979	1.000
	Control	2.981(*)	0.991	0.011
Normal	Quizizz	-3.098(*)	1.001	0.009
	Kahoot!	-2.981(*)	0.991	0.011

\* The mean difference is significant at the 0.05 levels.

Table 4 showed that there were no statistically significant differences between the Quizizz and Kahoot! assessments tools, suggesting that both digital tools are equally effective in enhancing student performance.

However, table 4 indicated that there were statistically significant differences at ( $\alpha \leq 0.05$ ) between the control group from one side and between each of Quizizz and Kahoot! experimental groups from the other side in favor of each external group.

## Chapter Five

### Discussion of Results

This chapter presents the study's results, where an interpretation of the findings is provided by discussing them and then referring to previous studies that agreed or disagreed with the current study. Based on the results obtained, a set of recommendations is formulated to provide practical guidance and further research directions. The discussion highlights the significance of the findings and situates them within the broader context of existing literature, offering a comprehensive understanding of the study's contributions and implications.

**The Main Hypothesis is: There were no statistically significant differences at ( $\alpha \leq 0.05$ ) between the means of tenth female graders achievement in chemistry attributed to type of assessment (Quizizz, Kahoot! and Normal).**

**The analysis indicates that there are no statistically significant differences between the Quizizz and Kahoot! assessments, suggesting that both digital tools are equally effective in enhancing student performance**, as seen in table 4. This finding can be explained by the fact that both Quizizz and Kahoot! are designed to make learning more engaging and interactive. These tools use gamification elements such as points, leaderboards, and time limits to make quizzes more fun for students. This engagement is crucial because it keeps students motivated and interested in the subject matter. When students are actively engaged, they are more likely to retain information and perform better on assessments. Both tools also provide instant feedback. Once students answer a question, they receive immediate feedback on their performance. This instant feedback loop helps students understand and learn from their mistakes immediately. It also enhances learning by allowing students to see where they went wrong and how they can improve, which is a powerful tool for knowledge retention.

Both tools can be accessed on multiple devices, including smartphones, tablets, and computers. This accessibility allows students to participate in quizzes from anywhere, making them suitable for both in-class and remote learning environments. The flexibility of access ensures that learning and assessment are easily accomplished.

Quizizz and Kahoot! provide detailed analytics and reporting on student performance, and teachers can use these insights to identify areas where students are struggling and adjust their instruction accordingly. Which has happened during the application of the gamified quiz, where lots of the students came during the next class, or texted questions to ask about their mistakes and why the correct answer was this and not that, which in my opinion personalized their learning experience. So the data got from the platform of the gamification application also helped track progress over time, set targeted goals, and personalized the learning experience to meet individual student needs. This analytical ability is a huge benefit that traditional assessment methods, such as worksheets, often lack.

The competitive nature of these tools, with features like leaderboards and time-based challenges, fosters a healthy sense of competition among students. This competition can push students to perform better and stay motivated. Additionally, both tools can be used for collaborative learning activities, where students work together to answer questions, promoting teamwork and peer learning. This combination of competition and collaboration enhances the overall learning experience. Which is what happened during the class where I gave them the code of the assessment games for the groups of the study.

Teachers can easily customize quizzes on Quizizz and Kahoot! to fit their specific curriculum and learning goals. This flexibility allows teachers to create targeted assessments that address the unique needs of their students. Customizable features include question types, difficulty levels, time limits and topics, which can be tailored to suit different contexts and learning goals, turning the gamified nature of Quizizz and Kahoot! into fun and engaging activities. The incorporation of game elements like music, visuals, and animations makes learning fun for students. This fun aspect reduces the anxiety and stress associated with traditional tests, creating a positive learning environment that encourages students to participate willingly and enthusiastically. Both Quizizz and Kahoot! feature user-friendly interfaces that are easy to navigate for both teachers and students. The intuitive design ensures that teachers can quickly create and deploy tests without the need for extensive technical knowledge. Similarly, students can effortlessly join and participate

in tests without facing technical difficulties, ensuring a smooth and effective learning experience.

The results of this study agreed with the results of Mullins & Sabherwal (2020) and Al-Majid (2020).

**The results also showed that when comparing both Quizizz and Kahoot! with the traditional assessment method, both Quizizz and Kahoot! performed significantly better than those assessed using the traditional forms of assessment like class discussions, surveys, and peer assessment.** This finding can be explained by the fact that digital tools such as Quizizz and Kahoot! are designed to be engaging and motivating. Game elements, such as points, badges, and leaderboards, create a fun and competitive atmosphere that encourages students to actively participate. Where traditional assessments often lack this level of engagement, leading to low motivation and interest among students. The interactive nature of digital tools keeps students more engaged in the learning process, which is essential for effective knowledge retention and improved performance. One of the most important advantages of digital assessment tools is the provision of immediate feedback. Once students answer a question, they receive immediate feedback on their performance unlike the traditional method, for example if a worksheet is used for assessment. This immediate feedback helps students understand and learn from their mistakes in real time, reinforcing correct information. In contrast, traditional in-class assessment methods typically involve a delay in feedback, or it won't be personalized, which can hinder the learning process. Immediate feedback is crucial to enhancing learning and ensuring that students are able to correct their misunderstandings immediately. The interactive nature of digital tools ensures that assessments are more engaging and better suited to diverse learning preferences.

Quizizz and Kahoot! provide detailed analytics and reporting on student performance. Where traditional assessments typically do not provide such detailed analytics, making it difficult for teachers to identify specific areas of weakness. The data-driven insights provided by digital tools enable more personalized and effective teaching strategies, ultimately leading to improved student outcomes.

The fun nature of Quizizz and Kahoot! can help reduce test anxiety among students. The fun and interactive format of these assessments makes them less like traditional tests and more like engaging activities. This reduction in anxiety can lead to better performance, as students are more relaxed and focused during assessment. Traditional assessments often cause high levels of stress and anxiety, which can negatively impact student performance. The stress-free environment provided by digital tools enhances students' ability to showcase their true potential. Digital tools promote active learning by encouraging students to participate in tests, answer questions, and interact with content in a dynamic way. This active engagement is more effective in promoting deep understanding and long-term knowledge retention than the passive learning methods often used in traditional assessments. The active learning strategies facilitated by digital tools ensure that students are not just retaining information, but actively processing and applying it.

The results of the study were consistent with the results of Alotaibi (2023) and Al-Abadi (2020), which showed the positive impact of gamification applications on student achievement.

## **Recommendations**

Based on the results of the study, the researcher recommends the following:

- Integrating digital assessment tools such as Quizizz and Kahoot! into the regular curriculum to enhance student engagement and performance.
- Creating professional development programmes to train teachers to use digital tools effectively for assessment, such as Quizizz and Kahoot! and ensure they are able to maximize the benefits of these technologies.
- Using a variety of question formats available in digital tools to cater to different learning styles and provide a more comprehensive assessment of student understanding.

## **Suggestions**

- Integrating digital literacy skills into national curriculum using digital assessment tools, which is found in the American programme curriculum, to prepare students for future academic and professional environments

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# Appendices

## Appendix A

Initial form of the assessment tool

Assessment test in chemistry for grade 10 in sec.1 of chapter 7 chemical names and formulas

### Q: Choose the correct answer: (15 marks)

1. The name of the compound  $\text{Be}(\text{OH})_2$ 
  - a. Beryllium hydroxide
  - b. Barium hydroxide
  - c. Beryllium oxide
  - d. Beryllium hydroxine
2. The name of the compound  $\text{KBr}$  is
  - a. Potassium bromine
  - b. Potassium bromide
  - c. Kalcium bromide
  - d. Potassium chloride
3. The name of the compound  $\text{Mg}(\text{NO}_3)_2$ 
  - a. Magnesium hydroxide.
  - b. Magnesium (II) nitrate
  - c. Magnesium monoxide
  - d. Magnesium nitrate
4. The name of the compound  $\text{Rb}_2\text{S}$ 
  - a. Rabidium sulfate
  - b. Rabidium sulfide
  - c. Rabidium (II) sulfide
  - d. Rabidium (II) sulfate
5. The name of the compound  $\text{FrH}$  is
  - a. Francium Hydrogen
  - b. Flourine hydride
  - c. Francium hydride
  - d. Hydrogen francide
6. The name of the compound  $\text{SF}_6$ 
  - a. Sulfur hexaflouride
  - b. Sulfur flouride
  - c. Sulfur heptaflouride
  - d. Monosulfur hexafluoride
7. The name of the compound  $\text{SnO}$ 
  - a. Tin oxide
  - b. Tin (III) oxide
  - c. Tin dioxide
  - d. Tin (II) oxide

8. The name of the compound  $\text{PbBr}_2$  is
- a. Lead (II) bromide
  - b. Lead bromide
  - c. Lead (I) bromide
  - d. Monolead dibromide
9. The chemical formula for the compound Tetraiodine nonoxide is
- a.  $\text{I}_3\text{O}_9$
  - b.  $\text{I}_4\text{O}_8$
  - c.  $\text{I}_4\text{O}_9$
  - d.  $\text{I}_3\text{O}_8$
10. The chemical formula for the compound Nitrogen monoxide is
- a.  $\text{NO}_2$
  - b.  $\text{NO}$
  - c.  $\text{No}$
  - d.  $\text{N}_2\text{O}$
11. The chemical formula of the compound Copper (I) Selenide
- a.  $\text{CuSe}$
  - b.  $\text{Cu}_2\text{Se}$
  - c.  $\text{CsS}$
  - d.  $\text{CuSe}_2$
12. The chemical formula of the compound Lithium sulfide is
- a.  $\text{LiS}$
  - b.  $\text{LiS}_2$
  - c.  $\text{Li}_2\text{S}$
  - d.  $\text{Le}_2\text{S}$
13. The chemical formula of the compound iron (II) sulfate is
- a.  $\text{FeS}$
  - b.  $\text{FeSO}_4$
  - c.  $\text{Fe}_2(\text{SO}_4)_3$
  - d.  $\text{Fe}_3(\text{SO}_4)_2$
14. The chemical formula of the compound Aluminum oxide is
- a.  $\text{AlO}$
  - b.  $\text{Al}_3\text{O}$
  - c.  $\text{Al}_2\text{O}_3$
  - d.  $\text{Al}_3\text{O}_2$
15. The chemical formula of the compound Silver iodide
- a.  $\text{AgI}$
  - b.  $\text{Ag}_2\text{I}$
  - c.  $\text{Ag}_2\text{Br}$
  - d.  $\text{AgI}_2$

## Appendix B

### *List of Arbitrators*

No.	Name	Specialty	Workplace	e-mail
1	Basil Abu Fodeh	Ph.D Measurement and evaluation	Arab open university	<a href="mailto:b_abufodeh@aou.edu.jo">b_abufodeh@aou.edu.jo</a>
2	Fadi Bani Ahmad	Ph.D Educational technology	Arab open university	<a href="mailto:f_baniahmad@aou.edu.jo">f_baniahmad@aou.edu.jo</a>
3	Jehad Almomani	Ph.D Methods of teaching sciences	Amman Arab university	<a href="mailto:jmomani@aau.edu.jo">jmomani@aau.edu.jo</a>
4	Anas Hanandeh	Ph.D Educational Technology	Amman Arab university	<a href="mailto:a.hanandeh@aau.edu.jo">a.hanandeh@aau.edu.jo</a>
5	Mofeed Abu-Mosa	Ph.D Methods of teaching Mathmatics	Arab open university	<a href="mailto:m_abumusa@aou.edu.jo">m_abumusa@aou.edu.jo</a>
6	Hadeel Alhayek	Master's in General Chemistry	Islamic educational college	<a href="mailto:Alhayek.hadeel@outlook.com">Alhayek.hadeel@outlook.com</a>
7	Shaza Alhourani	Master's in General Chemistry	Islamic educational college	<a href="mailto:shazaalhourani@gmail.com">shazaalhourani@gmail.com</a>
8	Fayda Salameh	Master's in General Chemistry	AlBalqa Applied university	<a href="mailto:Fayda.salameh@yahoo.com">Fayda.salameh@yahoo.com</a>
9	Asmaa Yousef	Master's in General Chemistry	Jordan university	<a href="mailto:Asmaazead3@gmail.com">Asmaazead3@gmail.com</a>

## Appendix C

### Final format of the assessment tool

Assessment test in chemistry for grade 10 in sec.1 of chapter 7 chemical names and formulas

#### **Q: Choose the correct answer: ( 20 marks)**

1. An ion of bromine with a single negative charge has the symbol and the name
  - a.  $\text{Br}^+$  , bromide ion.
  - b.  $\text{Br}^-$  , bromide ion.
  - c.  $\text{Br}^+$  , bromium ion.
  - d.  $\text{Br}^-$  , bromium ion.
2. The platinum(II) ion and the platinum(IV) ion
  - a. are anions.
  - b. are polyatomic ions.
  - c. have charges of 2+and 4+, respectively.
  - d. have charges of 1+ and 3+, respectively.
3. The name of the compound  $\text{Be}(\text{OH})_2$ 
  - a. Beryllium hydroxide
  - b. Barium hydroxide
  - c. Beryllium oxide
  - d. Berryllium hydroxine
4. The compound  $\text{KBr}$  is given the name
  - a. Potassium bromine
  - b. Potassium bromide
  - c. Kalcium bromide
  - d. Potassium chloride
5. The name of the compound  $\text{Mg}(\text{NO}_3)_2$ 
  - a. Magnesium hydroxide.
  - b. Magnesium (II) nitrate
  - c. Magnesium monoxide
  - d. Magnesium nitrate
6. In words, the compound  $\text{Rb}_2\text{S}$  is pronounced as
  - a. Rabidium sulfate
  - b. Rabidium sulfide
  - c. Rabidium (II) sulfide
  - d. Rabidium (II) sulfate
7. The name of the compound  $\text{FrH}$  is
  - a. Francium Hydrogen
  - b. Flourine hydride
  - c. Francium hydride
  - d. Hydrogen francide
8. The compound that has 1 sulfur atom and 6 flourine , $\text{SF}_6$  , is given the name



- a. Sulfur hexafluoride  
c. Sulfur heptafluoride
- b. Sulfur fluoride  
d. Monosulfur hexafluoride

9. How many atoms are present in one formula unit of barium acetate,  $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$ ?

- a. 4  
b. 8  
c. 15  
d. 16

10. The name of the compound  $\text{SnO}$

- a. Tin oxide  
c. Tin dioxide
- b. Tin (III) oxide  
d. Tin (II) oxide

11. The name of the compound  $\text{PbBr}_2$  is

- a. Lead (II) bromide  
c. Lead (I) bromide
- b. Lead bromide  
d. Monolead dibromide

12. The chemical formula for the compound Tetraiodine nonoxide is

- a.  $\text{I}_3\text{O}_9$   
c.  $\text{I}_4\text{O}_9$
- b.  $\text{I}_4\text{O}_8$   
d.  $\text{I}_3\text{O}_8$

13. The chemical formula for the compound Nitrogen monoxide is

- a.  $\text{NO}_2$   
c.  $\text{No}$
- b.  $\text{NO}$   
d.  $\text{N}_2\text{O}$

14. The chemical formula of the compound Copper (I) Selenide

- a.  $\text{CuSe}$   
c.  $\text{CsS}$
- b.  $\text{Cu}_2\text{Se}$   
d.  $\text{CuSe}_2$

15. The chemical formula of the compound Lithium sulfide is

- a.  $\text{LiS}$   
c.  $\text{Li}_2\text{S}$
- b.  $\text{LiS}_2$   
d.  $\text{Le}_2\text{S}$

16. The chemical formula of the compound iron (II) sulfate is

- a.  $\text{FeS}$   
c.  $\text{Fe}_2(\text{SO}_4)_3$
- b.  $\text{FeSO}_4$   
d.  $\text{Fe}_3(\text{SO}_4)_2$

17. The chemical formula of the compound Aluminum oxide is

- a.  $\text{AlO}$   
c.  $\text{Al}_2\text{O}_3$
- b.  $\text{Al}_3\text{O}$   
d.  $\text{Al}_3\text{O}_2$

18. The chemical formula of the compound Silver iodide

- a. AgI
- b. Ag<sub>2</sub>I
- c. Ag<sub>2</sub>Br
- d. AgI<sub>2</sub>

19. The salt calcium nitrate, Ca(NO<sub>3</sub>)<sub>2</sub>, contains the anion from

- a. calcium.
- b. nitrogen.
- c. nitric acid.
- d. nitrous acid.

20. In a Stock system name such as iron(III) sulfate, the Roman numeral tells us

- a. how many atoms of Fe are in one formula unit.
- b. how many sulfate ions can be attached to the iron atom.
- c. the charge on each Fe ion.
- d. the total positive charge of the formula unit.

Answer Key: 1: b, 2: c, 3: a, 4: b, 5: d, 6: b, 7: c, 8: a, 9: c, 10: d, 11: a,

12: c, 13: b, 14: b, 15: c, 16: b, 17: c, 18: a, 19: c, 20: c

## Appendix D



التاريخ: 2024/5/14

السادة مدارس الكلية العلمية الإسلامية - جبل عمان المحترمين

الموضوع: تسهيل مهمة الطالبة لينه الجعافرة

السلام عليكم ورحمة الله وبركاته،،،

تقوم الطالبة بدراسة بعنوان "أثر أداتي تلعب للتقييم التكويني في التحصيل النهائي لطالبات الصف العاشر في مبحث الكيمياء" وذلك استكمالاً لمتطلبات الحصول على درجة الماجستير في تكنولوجيا التعليم، ويستدعي ذلك تطبيق أداة الدراسة (المرفقة) على مجموعة من طلبة الصف العاشر في المدرسة، علماً بأن مشرف الطالبة هو الأستاذ الدكتور محمد طوالبية.

أرجو التكرم بالاطلاع والموافقة على تسهيل مهمة الطالبة المذكورة أعلاه.

شاكراً ومقدراً لكم تعاونكم مع الجامعة.

وتفضلوا بقبول وافر التقدير والاحترام،،،

المنسق الأكاديمي لبرنامج التربية

الدكتور مفيد أبو موسى



ر.ع.

ص.ب ١٣٣٩ عمان - الرمز البريدي ١١٩٥٣ الأردن - هاتف : ٩٦٢-٦-٥٦٣٠٦٣٠ - فاكس ٩٦٢-٦-٥٦٣٠٦١٠  
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## Appendix E

**1. Multiple Choice** ⌚ 20 seconds 🎯 1 point

The name of  $\text{Ba}(\text{OH})_2$  is

answer choices

Beryllium hydroxide  Barium oxide

Barium hydroxide  Barium hydroxine

---

**2. Multiple Choice** ⌚ 20 seconds 🎯 1 point

The name of  $\text{NaI}$  is

answer choices

Sodium iodine  Nitrogen iodine

Nitrogen iodide  Sodium iodide

---

**3. Multiple Choice** ⌚ 20 seconds 🎯 1 point

The name of  $\text{CO}$

answer choices

Calcium oxide  Carbon dioxide

Monocarbon monoxide  Carbon monoxide

---

**4. Multiple Choice** ⌚ 30 seconds 🎯 1 point

The name of  $\text{SbCl}_5$  is

answer choices

Antimony chloride  Antimony pentachloride

Monoantimony pentachloride  Antimony hexachloride

Figure 1. Sample Questions from Quizizz application

Appendix F

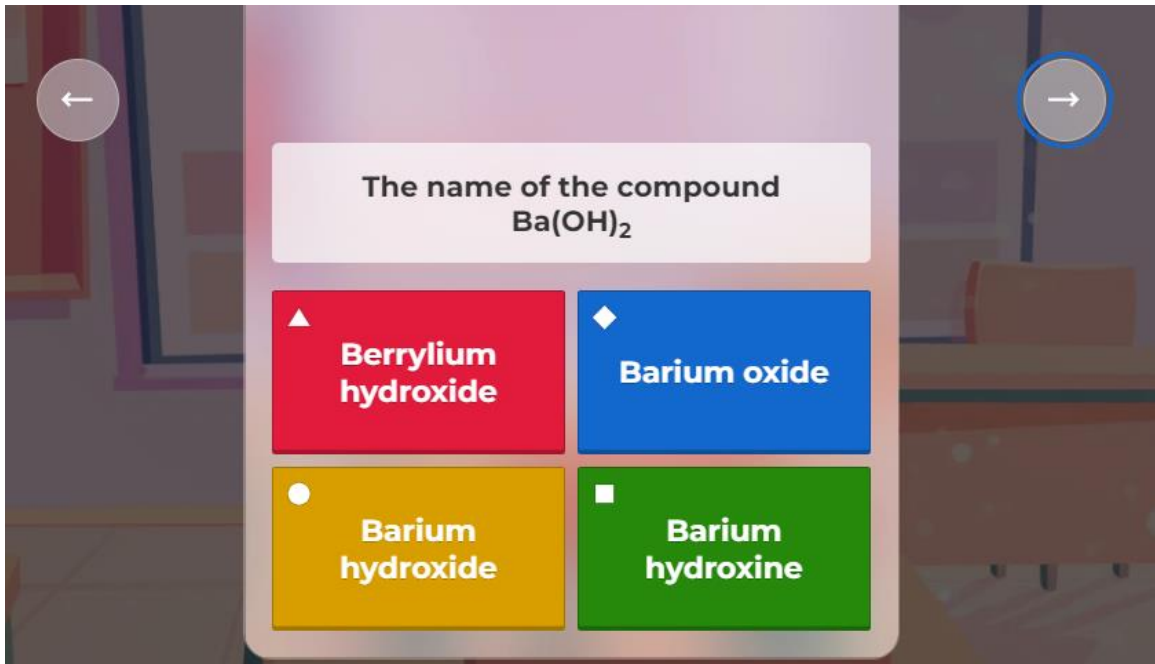


Figure 2. Sample Question from Kahoot! application

## Appendix G

### *Assessment test specifications' table*

Objective	Questions	Marks	Percentage %
<b>Name</b> ions according to their location in the periodic table or the roman numeral	1, 2, 20	3	15
<b>Determine</b> the formula of an ionic compound formed between two given ions.	14, 15, 16, 17, 18	5	25
<b>Name</b> a binary ionic compound given its formula.	3, 4, 5, 6, 7	5	25
<b>Name</b> an <u>ionic</u> compound given its formula using the stock system.	10, 11,	2	10
Using prefixes, <b>name</b> a binary <u>molecular</u> compound from its formula.	8	1	5
<b>Determine</b> the formula of a binary <u>molecular</u> compound given its name.	12, 13	2	10
<b>Determine</b> the number of atoms in compounds, given their formulas.	9	1	5
<b>Predict</b> the origin of the anion and cation in ionic compounds	19	1	5