

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter opens a discussion on the issues related to the sustainability elements in game design and its implication towards the teaching and learning process. In the initial section, a brief overview and advantages of the educational game in the education context are presented, followed by the emerging issues identified by the researcher. Then, based on the experience and readings, a review of the literature that discusses sustainability elements in game-based learning is elaborated. Finally, it paves the way for a discussion on the body of literature pertaining to design and development research (DDR) to show the need to develop a sustainable game paralleled with the emerging trend of technological advancement in instructional strategy. This led to a discussion on the related theory, game development framework and game design life cycle. The chapter then proceeds with the formulation of the theoretical framework.

2.2 Educational Games in Education System

Teaching and learning play a vital role in education. The outburst of technological advancements intensifies the opportunities to participate and engage in technological applications that encourage access to information, content production, knowledge exchange, and sharing ideas (McLoughlin & Lee, 2008). In this section, educational games in the education system will be discussed in detail. It covers how games have been embedded in an educational context.

2.2.1 Teaching and Learning in the Industry Revolution (IR 4.0)

Teaching and learning have become more challenging in the Industrial Revolution (IR 4.0) era, which has also changed many aspects of human life (Juhary, 2019). Industry Revolution 4.0 (IR 4.0) is a term used in the new Malaysian education system to describe the fourth industrial revolution, which is addressed in the Malaysia Education Blueprint for Higher Education 2015-2025. The education system is most affected, whereas academics and educators need to prepare themselves to implement educational technology in their teaching and learning process. Even if educational technologies are powered as adaptable aids, if they are unable to encourage learners to engage in long-term engagement, they will lose their efficacy and purpose (Laine & Lindberg, 2020). Thus, motivation elements are very important to be implemented in educational technology.

Nowadays, students are more interested in gadgets and computers. This is an excellent chance for teachers to use these tools to achieve educational and instructional purposes (Sayan, 2015). One of the most rapidly developing sectors in the educational environment is game-based learning. Its market is anticipated to expand from 3.2 billion US dollars in 2017 to 8.1 billion in 2022 (Statista, 2018), and it has moved from a conventional technique to a technology-based technique. This situation leads to multiple uses of technology such as computer games. The great potential effort required to produce high-quality learning games is best justified by the opportunities for learners who struggle in conventional educational settings or with a specific curriculum topic (Greipl et al., 2020). Consequently, educators need to be creative in implementing the available technology in their teaching process to motivate students to learn the subject.

In addition, IR 4.0 is a new trend that promotes technology-based tools to sustain the use of technology, especially in the education context. Nonetheless, there is still

debate over characterising sustainability in game design. Moreover, there is a scarcity of a consistent understanding of sustainability in general, as well as how it pertains to software systems research and practice (Becker et al., 2015). Therefore, research that focuses on how to produce sustainable products in a systematic process is needed. In the existing literature, several descriptions of sustainable products are presented. Still, they are often limited because they focus on the product's environmental impact rather than the process involved (Amri & Saoud, 2014). As a result, research into the educational game's effectiveness as a learning tool is a promising method known for its ability to encourage learners. At the same time, the game can develop students' knowledge and cognitive skills in creating possible challenges and fulfilling the expected outcomes.

On the other hand, for students to learn and respond to these challenges, they need to be equipped with the right knowledge and technology. Therefore, educators and developers need to create fun learning activities that implement any teaching tools in their teaching process. Under the concept of IR 4.0, production processes objectively become increasingly interconnected, tools, and restructured manufacturing products that participants gain the first experience of how these technologies affect. One of the fun activities that can increase student motivation is game-based learning. The goal of game-based learning is to improve learning activities by incorporating games into the educational process (Trajkovic et al., 2018).

In the context of this research, the game development process typically involves a creative process, as the user, which is primary school students, needs to be provided for. According to (Kasurinen et al., 2017), there are certain parallels between software developers' and game developers' practices, for instance, the necessity to plan, create, and execute high-quality work during the design and development phase. Therefore,

this research aims to develop products that are interactive games based on sustainability elements. The game is deliberately designed to motivate students in learning Tajweed with the intended characteristics and the required quality.

During the evolution of the educational paradigm, the roles of educators and learners have also evolved. Educators' expertise expands, become more creative, and are no longer restricted to the program's subject area. Educators must understand how learners are assimilating this knowledge, which is aided via student-based learning portals. Learners' roles have also changed significantly, moving from passive in education 1.0 to more autonomous in education 4.0 (Almeida & Simoes, 2019). Moreover, Puncreobutr (2016) claims that while the economic paradigm has evolved, new educational paradigms have emerged as well. According to Xing and Marwala (2017), the rise of Industry 4.0 will contribute to more transdisciplinary education, exploration, and knowledge (Almeida & Simoes, 2019).

Ultimately, these activities suggest that game design and development should follow a systematic approach and utilise particular instructional design models. This research creates a long-term game that employs instructional frameworks and learning theory to better understand how game developers work. This implies that a well-designed educational computer game focused on sustainability elements might aid learners in increasing their enthusiasm and, as a result, their accomplishment. Thus, it is convinced that with correct planning and support from both students and academics, it must be prepared for a change to equip students with relevant skills to become increasingly great. Collaborative skill means cognitive skill integrates with technical skill or communicative skills. The education system has gone through great change over the past few decades.

2.2.2 The Advantages of Games in Education

Game development is a generic process that aims to give advantages to end-users. There are some advantages to the use of the game in the education context. For starters, serious games have been shown to increase learner motivation to research in experimental investigations (Yedri et al., 2017). Therefore, educators need to create a better educational tool to provide more options and opportunities for students to develop their motivation and performance. Two key supplementary elements must be incorporated into this cognitive model of multimedia learning to adequately explain game-based learning: motivation and metacognition (Mayer, 2019). As a result, this research is required to ascertain the cognitive, motivational, and effectiveness factors that influence educational computer games in learning Tajweed.

Secondly, games assist learners in reducing cognitive strain. The major issue with multimedia learning materials appears to be that the working memory of learners is frequently taxed as a result of ineffective delivery techniques (Kiili, 2005). Furthermore, since educational games typically feature multiple multimedia elements, the risk of overloading a player's working memory is considerable. Mayer (2001) proposed a cognitive theory of multimedia learning that implies working memory covers restricted channels for visual and auditory (verbal) processing in order to resolve the challenge of constrained capabilities. The restricted capacity assumption is based on cognitive load theory, which states that working memory capacity restricts the quantity of data that can be analysed within every channel at any certain moment (Tindall-ford et al., 1997).

Designers of educational multimedia or games may consider using rapid feedback in game design to avoid excessive cognitive strain. However, it is crucial to note that graphics and sounds have an impact on the player's attractiveness and retention. As a

result, the most difficult challenge in educational game design is to discover an element that can strike a balance between appealing elements and educational aims in order to maximise the likelihood of players feeling flow and learning the skills and knowledge supplied. They can also employ immersive settings to allow experienced players to practise their skills and knowledge while also utilising multimedia engagement (Bellotti et al., 2010).

Third, games have long been recognised as a valuable tool for teaching since they may effectively stimulate students. The intent of translating academic information to game language should not detract from the games' pleasure. Computer learning games appear to offer strong and always obvious types of evaluation, allowing all activities, interactions, accomplishments, and failures to be traced and documented in real-time. In regards to game-based learning, the researchers concluded that the treatment group outperformed the control group in regards to academic performance and motivation (Partovi & Razavi, 2019). This circumstance demonstrates that game-based learning has a purely beneficial influence on learners' performance and motivation.

Likewise, serious games offer developers steps to reduce the costs regarding game technology and content development. In addition, serious games provide an opportunity to experiment with new styles of play, as well as new types of educational technologies. The serious play has been used in areas of expertise, for instance, politics, city planning, defence, education, engineering, and health care (Katsaliaki & Mustafee, 2015). The priority in game development is assessing customer experiences and leveraging input to drive design iterations.

Furthermore, numerous academics have performed research on the utilisation of educational computer games to improve learners' learning, performance, and cognitive skills. As a result, it gives instances of how learning science may be implemented in

teaching (Mayer, 2011). To set the stage, the researcher first looked at the literature on the usefulness of various kinds of games and simulations in terms of learning outcomes. In recent years, the adoption of games for learning about themes such as history, culture, and identity has grown in popularity (Alsawaier, 2018).

The computer game enhances the respondents' spatial vision and subjective abstract skills (Squick, 2006). According to the findings of research conducted by Eow et al., (2010) learners who participated in computer games enhanced their imagination, awareness, self-esteem, and creativity. Educational games, as per Franklin et al. (2003), can aid learner learning and encourage active involvement in the classroom. Learners would be more interested in their learning if they had access to game-based learning in the classroom (Partovi & Razavi, 2019) and encouraged them to learn continuously (Boyle et al., 2016).

According to Zirawaga et al. (2017) a well-designed computer educational game may deliver a rich-resource learning environment with difficult learning quests to help learners develop higher-order knowledge and abilities. In addition, some researchers have suggested that by carefully integrating learning material and methods into a game-based learning environment, learners' learning performance may be enhanced while the games remain entertaining (Gros, 2007; Wang & Chen, 2010).

Finally, a game is a tool in enhancing students' motivation and achievement. People's creativity does not suffer when they are organically driven by their personal interest, enjoyment, or challenge, and they often display more inventiveness (Amabile, 1985, 1997). As a result, instead of rewarding the finished creative output, it is preferable to employ incentives or awards that honour the creative process itself, as well as the desire to explore, discover, and innovate (Erbaş & Bas, 2015). Thus, an educational game that implements sustainability elements in game design has been

developed to promote students' motivation and achievement in this research. It is believed that learners would be encouraged to learn Tajweed while also improving their achievement by participating in the game.

2.2.3 The Comparison of Games Evolution

The history of video and computer games and their evolution is fascinating. However, it involves a very long time period and is quite complicated. Any breakthrough in gaming technology is predicated on previous successes and inventions (Saulter, 2007). Educational technology includes everything from motion images in the early 1900s to radio in the 1930s, educational television in the 1950s, and programmed teaching in the 1960s (Cuba, 1986; Saettler, 2004).

The significance of rules is something that almost all game definitions concur on. Their specific purpose, though, is imagined in a variety of ways. For example, a game might be an activity constrained by rules and relevant players' opinions and judgments always originate from the play experience. Regardless of specific game contents, while playing a game, the player interacts with a virtual universe, which receives player's inputs and responds by changing its status (Perrotta, 2014) created by rules (Suits, 1978), or a sphere of manufactured contingency (Malaby, 2007). Some even claim that a game is defined by its rules (Perrotta, 2014).

Meanwhile, in the era of Prophet Muhammad (Pbuh), most games were purposely to encourage physical development and mental strengths. Kurniawan and Abulyatama, (2017) mentioned that sport in Islam is a recommendation from Rasulullah. Each sport has its benefits for those who do it. Games recommended in Islam are camel racing, horse racing, archery, hunt, wrestling, and running competition that promotes a specific skill and efficacy of the gamers.

In addition, these sports games usually promote physical awareness, friendship among gamers and the element of courage. It also provides an activity of exploration and emotional training. Table 2.1 shows the comparison of the evolution of the game, which starts from the era of Prophet Muhammad Pbuh, moves to the traditional game, and currently, digital game.

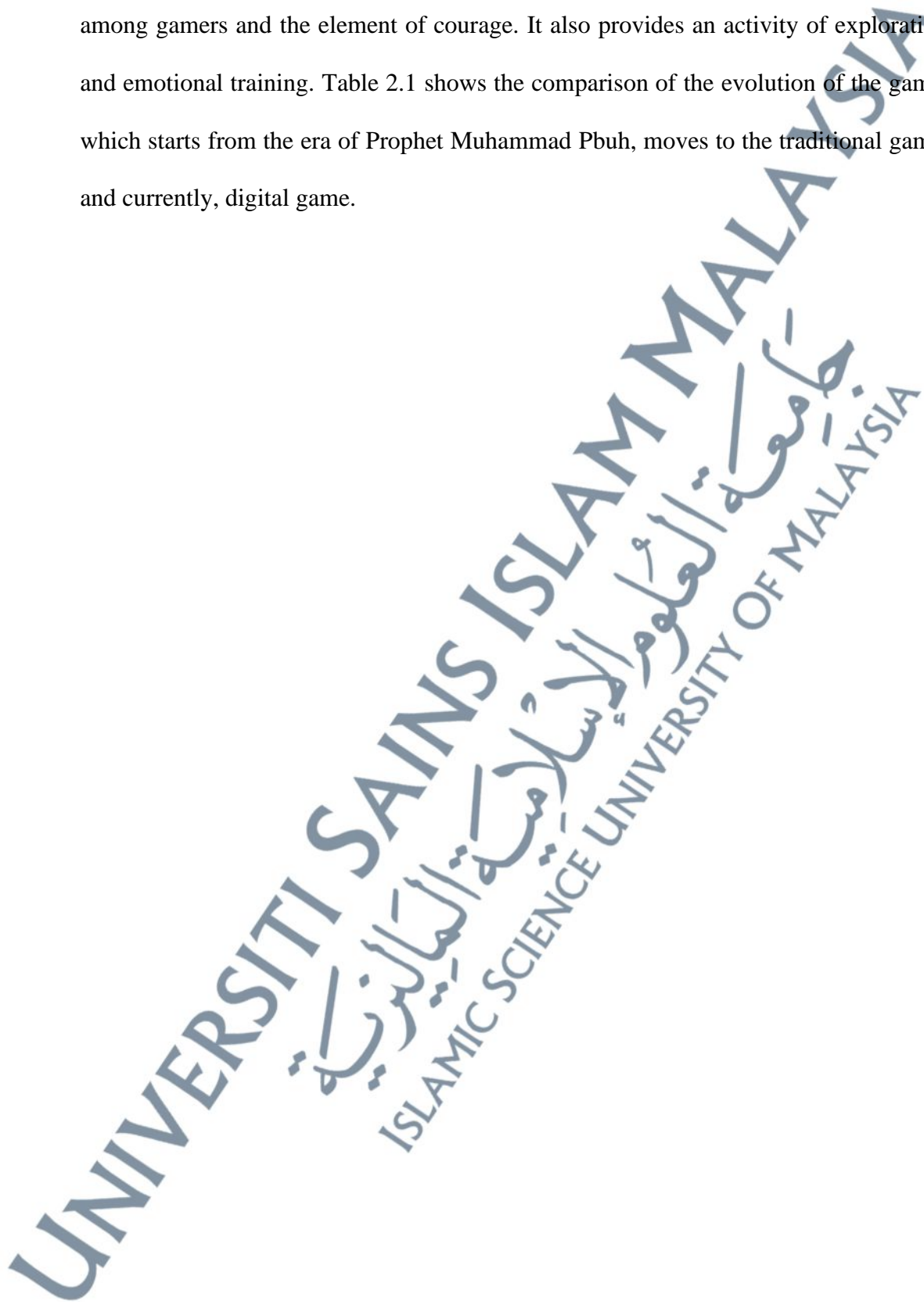
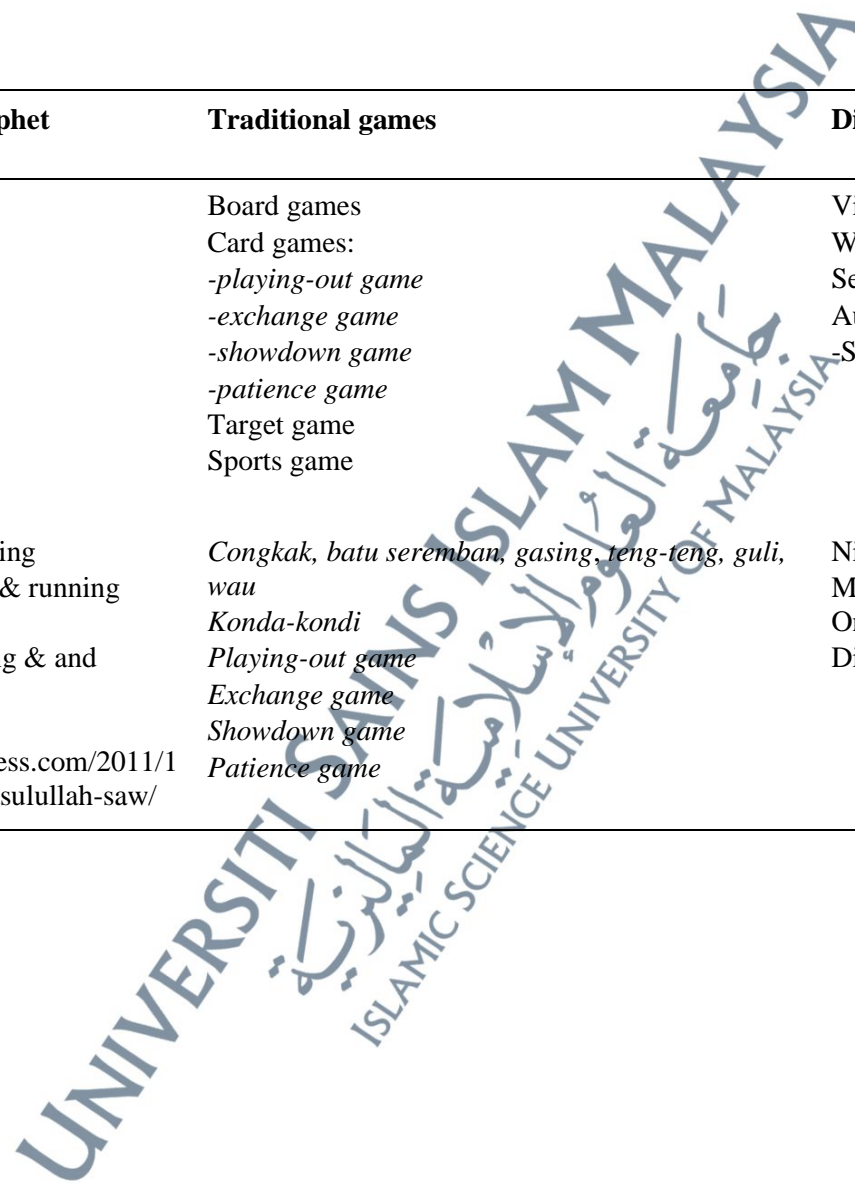


Table 2.1: Comparison of the Evolution of Games

Point/Year	Games in the era of Prophet Muhammad Pbuh	Traditional games	Digital games
Year	The era of Prophet Muhammad Pbuh	1972 (first stimulated colour game). E.g., Magnavox Odyssey 1973-1983: Sectorbeam Graphic (<i>Space war, Lunar Lander</i>) Colour video game (<i>Galaxian</i>) Game with speech (<i>Stratovox</i>) Attract game and high score (<i>Space invaders</i>) Top ten score (<i>Asteroids</i>)	1990 1996 (<i>3D levels</i>) 1997 (<i>Quake 2 & 3</i>) 1998 (<i>UnrealScript</i>) 2002 (<i>Dungeon Master</i>)
Features	Develop a specific skill and efficacy. Promote holistic training to a person physically and mentally. The objective of the games is to promote a healthy lifestyle. Promote the focus aspect of the gamers. Train your emotions and physically to target your target. Source: Kurniawan (2017). Olahraga dalam pandangan Islam.	Provide an element of courage. Provide an activity of exploration. Have emotional training. Promote friendship among members.	Have a combination activity of narrative, entertainment, simulation and interaction. Provide an element of fun and fantasy Use elements of multimedia (video, sound, and others.) Promote deeper learning and motivation. Promote genuine collaboration between users



Point/Year	Games in the era of Prophet Muhammad Pbuh	Traditional games	Digital games
Category	Not specific	Board games Card games: <i>-playing-out game</i> <i>-exchange game</i> <i>-showdown game</i> <i>-patience game</i> Target game Sports game	Virtual online worlds Wireless game Serious game Augmented-reality game -Sport (Hadzinsky (2014)
Example	Camel racing & horse racing Archery, hunt, wrestling, & running competition Swimming, riding, running & and others.). Source: https://shafiqolbu.wordpress.com/2011/11/23/riadah-sukan-cara-rasulullah-saw/	<i>Congkak, batu seremban, gasing, teng-teng, guli, wau</i> <i>Konda-kondi</i> <i>Playing-out game</i> <i>Exchange game</i> <i>Showdown game</i> <i>Patience game</i>	Nintendo Wii Fit and Nintendo DS MMORPGs (Massive Multiplayer Online Role-Playing Games) Digital game-based learning

Based on Table 2.1, it is explained that before going to the digital game platform, most gamers play traditional games such as board games, card games, and sports games. It can be indicated that there is an increasing combination of entertainment, simulation, and interaction during the digital game era. . Zirawaga et al., (2017)explains that in the initial stages, optical disk storage, also known as CD-ROMs, was used to deliver software, for instance, video games. CD-ROMs had significantly more storage space and were much less expensive than the old cartridges.

2.3 Game-based learning (GBL)

In general, game-based learning (GBL) involves the design of learning activities that are integrated with both game characteristics and game principles. Game-based learning is an innovative strategy that uses computer games to promote educational value using a variety of software applications that aim to enhance the teaching process, assessment, and evaluation of learners (Dimitra et al., 2020). Furthermore, game-based learning (GBL) has been shown to promote soft skills, for instance, teamwork, creative problem solving, and critical thinking, as well as academic success motivated within primary children (Partovi & Razavi, 2019).

Furthermore, an educational game, often known as serious games (SG), can be described as a completely formed production or result derived from game components and other elements. Serious games are described as "any type of interactive computer-based game software for one or more players to be utilised on any platform," according to Ritterfeld et al. (2009). This process involves elements of competition, engagement, and immediate reward (Dimitra et al., 2020). Consequently, these interlink elements have a set of possible and uncertain outcomes that will result from the players'

interaction (Rabin, 2010). Therefore, game design elements are essential to sustain students' motivation and fulfil a specific purpose from the developed games.

GBL is widely regarded as the greatest instrument for learning and skill advancement in a variety of fields, particularly in educational upgrading (Versus, 2020). On the other hand, if any product has its own specific purpose, it can be categorised as a serious game; otherwise, it can be mentioned as an entertainment game (Kasurinen & Knutas, 2018). Furthermore, numerous teachers have recently explored game-based learning (GBL) as an educational technique to help primary school learners improve their academic performance and motivation (Choi et al., 2013). Finally, designing an educational game that maximises motivational impact is a difficult undertaking that may be aided by educational game design principles based on research and experience (Laine & Lindberg, 2020). Thus, researchers believe that sustainability elements in game design combined with learning theory can be one of the best solutions to enhance students' motivation and achievement.

The form of the game and the demonstration of its material are, however, constrained by the requirement to complement curricula or particular learning theories. Moreover, in recent years, a growing number of academics from many professions have expressed an interest in utilising well-designed digital games to aid learning (Shute & Ke, 2012). Users' involvement in the design process allows for the creation of games that are tailored to the students' needs and expectations. These characteristics imply that gaming can be an effective learning tool (Leith et al., 2019). Thus, an educational game should provide active, fun elements, attractive, and motivational forms of learning.

GBL, which incorporates games into the educational process, attempts to improve learning processes (Alsawaier, 2018). According to Zirawaga et al. (2017), the impact of computer games on learning in high school learners had a substantial impact on

learning by instilling enthusiasm and happiness. In addition Tüzün et al. (2009) reported that utilising games to teach students was more successful and resulted in an increased internal drive to research. Aside from that, the majority of academics are interested in using digital games to enhance student motivation and assist learning (Greipl et al., 2020). Thus, available assessment techniques in game design should be employed consistently to determine the technique and, at the same time, provide a better learning experience.

In our country's environment, Malaysia has developed as a centre of information technology for serious games and educational game creation; nevertheless, these advancements are frequently carried out without direction to recognise the game elements embedded in the product. Therefore, the use of instructional design theory in the game enables learners to be more effective and clearly understand the topic learned. To bridge this gap, sustainability elements in game design need to be analysed to identify game elements and supported learning for the development of sustainable educational games (Boughzala & Michel, 2016).

On the other hand, while there is no empirical data to back up the performance of digital game-based learning (DGBL), its advocates believe that there is a possibility and proof if adequate research and assessments are conducted (Plass et al., 2015). Thus, this research is relevant to fulfil this related issue. Additionally, Dos Santos et al. (2018) claimed that the clear development and measuring practice of sustainability for software projects would increase the sustainability of final products, resulting in a possible commercial advantage. In this regard, this research is relevant to be implemented in the educational field to provide a mechanism. Therefore, it can be considered as good computer-assisted instructional tools that combined and implemented sustainability elements in game development.

It is important to create a high-quality game-based learning environment that encourages learners to research to achieve these objectives. As Giannakos (2013) defined, playing a game is engaging in activities aimed at achieving a certain goal while adhering to strict rules. Games are naturally engaging children to continuously play it without any concern about the time (Boyle et al., 2012). Computer games have a number of qualities that set them apart from other forms of instructional media and technology (Muhammad Sabri et al., 2012). However, not many educational games were provided in Islamic subjects compared to conventional subjects such as Science and Mathematics.

Focusing on the explanation provided, the goal is to construct sustainability game design elements for game-based learning that will help educational administrators, leaders, policymakers, educators, and decision-makers better grasp the difficult issue of educational needs. The objective is for teachers to be able to provide a higher-quality education to non-traditional students (Turner et al., 2018). Educational games, often known as serious games, are gradually being used in classrooms to make school learning more interactive for learners (Anastasiadis et al., 2018).

In conclusion, to address the gap in effective game-based learning, a researcher identifies key elements of sustainability that contribute to enhancing students' motivation and achievement in learning Tajweed. Many studies have claimed that game-based learning (GBL) was successfully developed as a platform for increasing students' motivation, cognitive skills, and social learning. Nevertheless, there is a lack of evidence in the research that illustrates the value of applying the sustainability elements in game development. Therefore, this research forms a framework to support the implementation of game-based learning that encompasses the integration of games and learning, especially in Tajweed.

2.3.1 Classification of Games

The classification of games that puts up a game taxonomy is known as game classification. There are many distinct ways to categorise games by contrasting them to anything else or alluding to a genre. In the initial example, since both games are accessible on mobile devices, BotFighters and Snake may be compared. Indeed, this comparison is useless since the two games have zero in common. However, since both games include fights and continual avatar improvements in the game environment, competing with BotFighters and online multiplayer role-playing games (MMORPGs), for instance, World of Warcraft, may provide superior outcomes.

One of the most important questions appears to be how to ensure that comparison is descriptive. Another frequent method of describing games is to use one or more genres. Games like Guild Wars and World of Warcraft fall under the "role-playing game" (RPG) category in this way. But are the games genuinely comparable, and does RPG have a similar definition in games like Neverwinter Nights and Diablo—or the classic "pen-and-paper" Dungeons & Dragons. Although Diablo was originally classified as a dark fantasy game, one could wonder if dark fantasy is a subgenre of RPGs. Figure 2.1 shows the flowchart classification of games.

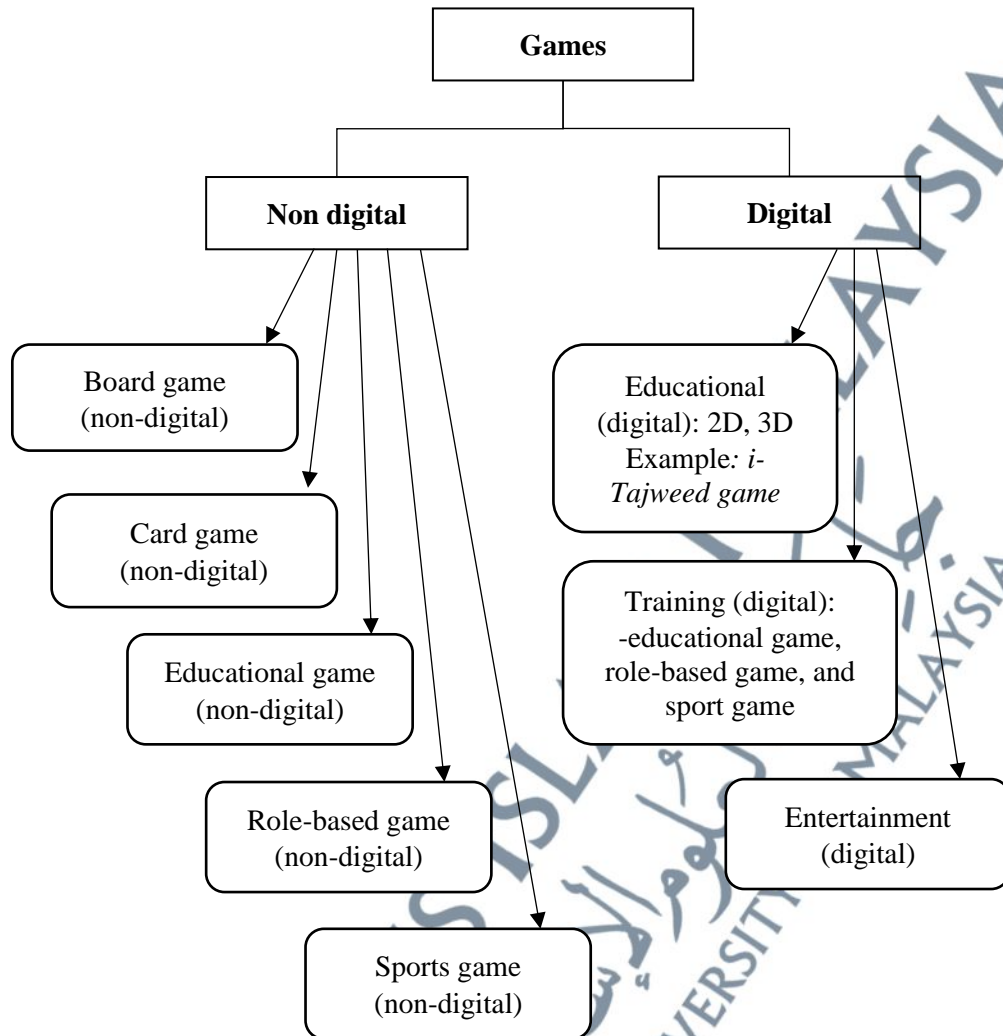


Figure 2.1: Flowchart of Games Classification

Based on Figure 2.1, there are two types of games: non-digital and digital. Under non-digital games, there are board games, card games, educational games, role-based games and sports games. Meanwhile, under digital games, there are educational games, entertainment games, and training.

2.3.2 Genre on a Computer Game for Education

Most computer game genres are educational in some form, and educational computer games are created with an express educational goal in mind. When using educational computer games to enhance learning in the classroom, pedagogical

considerations, for instance, learning style, should be considered. Logic challenges, exploration, logistic, tactical, conceptual, economic, and physical may all be found in games, relying on the genre (Adams, 2009).

Although there are many different forms of games, researchers and teachers lack a standard and precise description of terms, which has resulted in "terminological ambiguity" (Klabbers, 2009). Even yet, when addressing diverse types of games and simulations used in education, the requirement for standard language persists. Despite the fact that scholars and game creators use various taxonomies to describe games, the subsequent seven genres (Gros, 2007) are widely accepted:

1. Action games: video games with a response system.
2. Adventure games: in a virtual world, the player must solve challenges in order to proceed through stages.
3. Fighting games: these games include fighting against computer-controlled or player-controlled characters.
4. Role-playing games: players take on the roles of fictitious characters in this game.
5. Simulations: games that are based on natural or man-made processes or occurrences and require players to fulfil pre-determined objectives.
6. Sports games: these are influenced by various sporting events.
7. Strategy games: these are used to reenact historical events or fictitious settings.

Furthermore, the majority of the educational activities are linked to conceptual and logical concerns. Designing activities like quizzes that need active engagement and participation is the simplest way to introduce game-like challenges. As a result, participants must create a plan to attain the goal. Playing to figure out how to play is a

key component of the gaming experience in certain computer games, for instance, Candy Box (Granic et al., 2014), instead of just a means to avoid having to read instructions or receive explicit direction on how to play. The latter, also referred to as learning analytics, may give specific feedback on players' capabilities and shortcomings as well as misunderstandings, allowing for customisation and personalisation of feedback as well as learning settings (Greipl et al., 2020).

On the other hand, there are compelling reasons to use games in an educational setting. For example, game-based learning, game elements, and technology have all been shown to aid learning and knowledge transfer (Boyle et al., 2016; Liu et al., 2020). In addition, digital game-based learning brings up new possibilities for creating adaptable and secure learning environments, as well as tracking players' activities and interactions with a digital environment in actual time.

On the other side, little research has looked at the link between digital games and non-traditional students' accomplishments (Turner et al., 2018). In reality, the National Research Council recommended that an investigation on games and learning be executed, despite the fact that there is insufficient material to substantiate the adoption of digital games as an aid for accomplishment (Riopel et al., 2019). In addition, there are suggestions on how to effectively use digital games to improve learning performance. Still, a wider knowledge of the potential impact on a variety of students or subject areas is necessary (Chea et al., 2019). Thus, i-Tajweed is implemented under the educational type, which is not for entertainment but learning purposes.

2.3.3 Comparison of GBL in the Marketplace

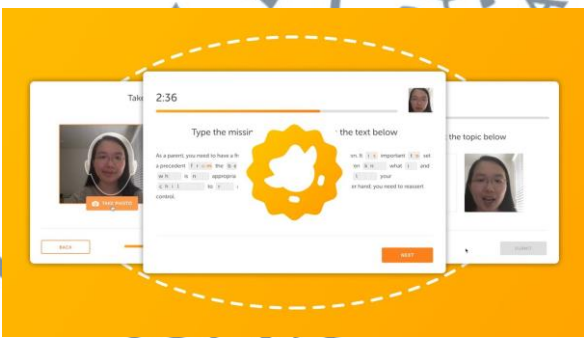
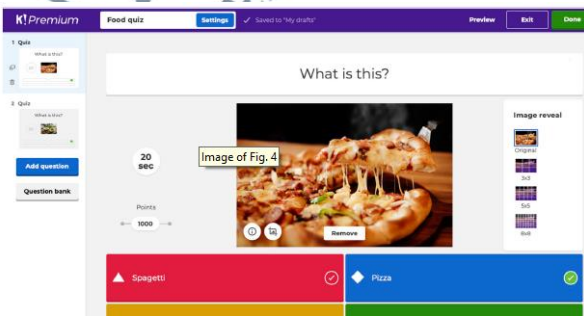
Presently, digital tools, online platforms, web games, and technological applications play a critical part in the teaching-learning process since these

advancements promote information absorption and competence development (Anastasiadis et al., 2018; Salas-Rueda et al., 2020). The usage of digital games in English classes, for instance, enhances pupils' academic achievement (Castillo-cuesta, 2020). Via digital games, educators have the chance to reinvent the educational setting (Zirawaga et al., 2017; Foster & Shah, 2020; Salas-Rueda et al., 2020). Digital games are employed in educational institutions to promote learning, motivation, collaboration, and social interaction (Kordaki & Gousiou, 2017). The example of digital game and its purpose is presented as follow:

1. Duolingo – learners perform drill-and-kill grammar and vocabulary activities while accumulating experience points to advance levels and unlock tougher exercises, gamifying language learning
2. Minecraft – a popular game that has been modified for educational purposes by providing pupils with a sandbox in which to create and develop their personal virtual worlds
3. Second Life – a virtual world in which learners may design their personal avatar and inhabit a 3D area, allowing them to communicate more easily via text and reducing their fear of speaking
4. Brainscape – enhanced flashcards that increase information retention through "confidence-based repetition" and are meant to be more attractive and enjoyable to use to aid with retention
5. Kahoot – a free classroom response system that does not involve student sign-up; simply build a Kahoot game, input questions, and give your pupils the supplied pin, and they will use their laptops or phones to play the game and answer questions



6. OpenBadges – another open-source badge-making programme, similar to Credly, but using Immediate Feedback Assessment Technique (IF-AT) — badge creation is more difficult. The IF-AT gives students quick feedback on multiple-choice questions by making them scratch a card to identify the correct answer.

Table 2.2: The Comparison of Four Types of Game with Example

Type of games	Characteristic	References and Example
Duolingo	The mobile device accessibility, gamification component, and diversity of activities provide users with immediate feedback after each activity.	
Kahoot	A game-based learning platform may be used to evaluate learners' knowledge, provide formative feedback, or provide a respite from typical classroom activities.	

(Munday, 2015)

(Wang & Tahir, 2020)

Type of games	Characteristic	References and Example
Minecraft	<p>The game was originally intended to be a pure sandbox experience, with no sequential storey framework to assist players.</p> <p>Lastowka (2012) claims that <i>Minecraft</i> was founded in the open interchange of creativity and users' inventions. Therefore, it may be used as a creative place for learners to convey their knowledge of literary themes that are persuasive.</p>	
Brainscape	<p>Rather than obstructing investigation with tough tasks, it is more important to let the learner discover freely. This will help refresh the memory of more experienced learners.</p>	

(Cipollone et al., 2014)

(Wilson & Ostergren, 1986)

2.4 Game Development and Design

This section explains the steps involved in game design and development, as well as the components of game design and their characteristics. This is a crucial step in creating a high-quality game. To put it in another way, while a game may look promising in terms of what can be learnt and how it can be learned, the context in which it will be introduced will determine whether or not it is a good fit for the teacher's curricular goals (Foster & Shah, 2020).

In any software development project, the design phase is critical. In the framework of game development, designers must construct a game that caters to the interests and demands of the players. Game development, whether for fun or profit, is a complex process involving game design, programming, content generation, and testing (Westera et al., 2016).

2.4.1 Components of the Game

Learning theories, pedagogical components, gender preferences, as well as game design components are frequently used to create educational games (Mifrah et al., 2014). Higher component quality should be expected, as these components are likely to be used in a variety of games and scenarios, requiring more rigorous testing and stressing of the component's quality than in a single game setting. A game engine normally combines several of these components into one; however, game engines are typically created for a certain game and may not be ideal for your purposes (Salama & Elsayed, 2018).

Furthermore, games are frequently divided down into smaller components. This is done to assist designers in creating it, as well as academics in learning it. Digital educational game production is a difficult process that necessitates knowledge in a variety of fields. This includes digital graphic design, education, gaming, learning sciences, modelling and simulation, psychology, software engineering, as well as visual arts. It can be stated that a game is made up of four key elements: aesthetics, mechanics, story, and technology in the context of game design and development (Leith et al., 2019). Moreover, Katsaliaki and Mustafee (2015) discuss the following component in game design as well as development.

1. The space of the game

This refers to the games' space and everything that fits within it, or a combination of all areas, elements, and states at any given time. The role of the players during the game: The character or role that the player takes on while playing the game; for instance, in the Blood Supply Game, the player performs in the position of a distributor (Katsaliaki & Mustafee, 2015).

2. The goal of the players during the game

Describe the game's key feature and the aim that the player must complete in order to reach the game's goal. For example, it specifies whether the game is a simulation, a board game, a quiz game, a Role-Playing Game (RPG) based on Multi-Agent-Based Simulations (MABS), a pervasive game (a location-based game in which the game progresses based on the players' location using localization technology), whether the game is played online, or is a sandbox game.

3. The graphics of the game

Determine the visual aspects of gameplay (2D or 3D). Availability of games: Reports on the game's accessibility (e.g., online usage download, CD installation), as well as whether the game is free or must be purchased.

4. The number of participants

Determines the maximum players' number who can play the game. Also, the character/role that the player has when playing the game is identified by the player's role during gameplay. During the game, the players' goal is to describe the game's key features, and the aim is that the player must complete to reach the game's goal.

5. The target age group

Identifies the graphics group that game makers are mostly targeting (e.g., pupils, students, or all ages).

6. Verification of the game

Identifies the game creators of the model's portrayal of the real system.

7. Assessment of the game

Reports on the users' and facilitators' principles evaluate the inherent in the games, as well as the techniques used to assess them (e.g., surveys, interviews, comments, and others.) and the results.

8. Characterization in the game

The game is classified as theory learning (knowledge is primarily acquired by watching, listening, and/or reading relevant sources. This is followed by choosing the appropriate action, for example, quiz games), interactive learning (players' actions change the formulation of the game scenarios and/or the actions of other players. Apart from that, knowledge is acquired through the act and react process, for example, simulation games).

2.4.2 Game Characteristics

One of the most crucial components of game development is its game qualities. A number of academics have demonstrated that by correctly incorporating learning content and tactics into a game-based learning environment, students' learning performance can be increased while the game remains entertaining (Gros, 2007; Wang

& Chen, 2010). Therefore, the appropriate content and attributes will have a good impact on student motivation and achievement. However, a quality game does have some characteristics, as explained in the following section.

1. Gameplay

Gameplay is a core notion in games commonly utilized in game-related research literature. However, there is no agreement on what this means. For some, it's all about having fun (Jennett et al., 2008). Several authors limit it to interaction and participation (Adams, 2009). Moreover, the difficulties-actions link - what problems the game has as well as what actions the player is able to face in reaching the goals - is the essence of the gameplay in all circumstances. The earlier definition of gameplay is based on two essential concepts: "interactivity" and "activity." Unfortunately, the instructional designers in the educational profession place far too much emphasis on the research goals and material. As a result, if the tasks and actions aren't intriguing, a good story and stellar graphics won't help (Moyle & Adams, 2000).

2. Achievements

Achievements are a type of objective that usually consists of a mix of obstacles, rewards, and progress. Bonus tasks (mini-games) or time (various gameplay modes – limited time, greater difficulty, multiplayer, and others.) might be supplied based on collected information points. In video games, achievement systems are reward mechanisms that provide extra goals as well as playtime (Sillaots, 2015).

3. Levels

In games, levels can have a variety of meanings (Adams, 2009). Moreover, levels can represent many aspects of the game's challenges or story. In this situation, research units might be used as levels in the educational environment (e.g., lessons). Apart from that, levels also refer to a player's rating depending on the score. Also, in this situation, levels might be viewed as the course's final grade. Besides, the difficulty of the game is likewise tied to the level. Levels can be used to indicate several variations of the same learning task in this scenario.

4. Characters

Avatars are representations of players in the game world, as well as non-player characters (NPCs) or artificial intelligence agents (AI) (Adams, 2009). Moreover, they play a significant role in the game's challenges and story. When implementing NPCs in educational settings necessitates a game-like virtual environment (Duch et al., 2013). Likewise, an avatar can be linked to character development and game storylines, which can drive to a deeper immersion with course activities (Sweeney, 2012).

2.4.3 Game Development Framework (GDF)

In the game creation process, it is critical to prepare all features and traits by choosing a suitable game development framework (GDF). Its purpose is to ensure that the game's goal has a favourable impact on the growth of learners. Games are created with the goal of increasing a particular facet of learning (Derryberry, 2010). Furthermore, criteria for selecting appropriate GDF are regarded as a significant element in the teaching preparation process. The following are the steps that make up this procedure: Finding multiple GDF candidates, analyzing each GDF's attributes,

creating criteria to filter GDF candidates, as well as selecting one or more GDFs that best fit the course content (Wu & Wang, 2012).

In the context of this research, the researcher argues that technological advancements have enhanced GDF. As a result, the purpose of this research is to see how conventional methods might be made more dynamic and appealing to pupils by incorporating current technologies, particularly in Tajweed learning. For starters, it can be used to create games that can be utilized instead of traditional workouts. Second, it may be used to create games that can be integrated into lectures to boost student enthusiasm and performance. Third, students can use a GDF in software development projects to better comprehend the subject of computer science courses (Wu et al., 2009). The GDF in the i-Tajweed game will be detailed in subsection 2.7.4.

2.5 Sustainability Elements in Software Development and Game Development

The importance of sustainability in software development will be highlighted in this section. Also discussed were the important issues of sustainability in game production that must be considered.

2.5.1 Sustainability Elements in Software Development

Several descriptions and measurements of sustainable software exist in the literature, illustrating the three elements of sustainable development: environmental, social, as well as economic (Stanitsas et al., 2019). However, contributions in this area are frequently limited to specific perspectives of sustainability, such as focusing solely on the environmental implications of products (Amri & Saoud, 2014). Furthermore, software development for the games business is rapidly expanding and becoming increasingly sophisticated (O'Hagan et al., 2014). In particular, researchers feel that

long-term development is critical to meeting the demands of future generations. As a result, sustainability aspects in game development are critical in completing the picture of software sustainability from various angles, which is essential to enable software product sustainability.

Sustainable development is described as "development that meets current demands without jeopardizing future generations' ability to meet their own needs" (Hilty & Aebischer, 2015). Moreover, the concept of needs encompasses more than just material requirements. Apart from that, it also encompasses values, relationships, as well as the freedom to think, act, and participate, all of which falls under moral and spiritual sustainability (Shah, 2008). As a result, in order to accomplish sustainable development in the twenty-first century, researchers must establish a uniform definition for what constitutes sustainable activity in their respective fields. Three sustainable dimensions are depicted in Figure 2.2.

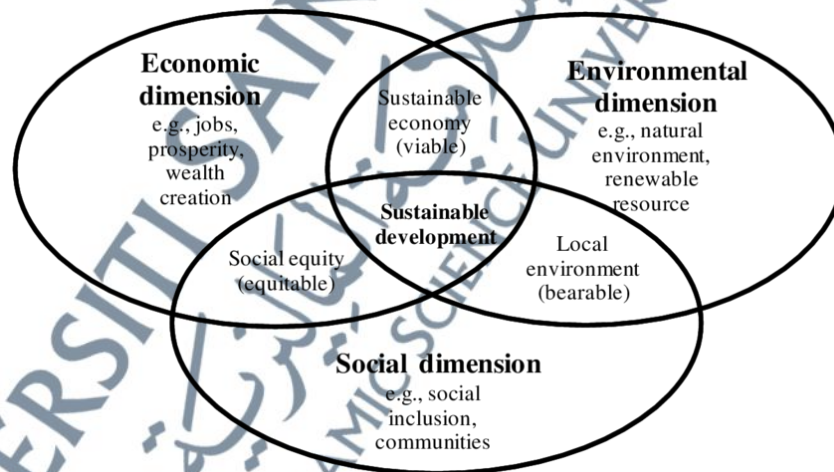


Figure 2.2: Three Dimensions of Sustainability in General

Based on Figure 2.2, there are three main dimensions of sustainability, including economic dimension, social dimension, and environmental dimension. Sustainable

development also involves a sustainable economy, social equity, and the local environment.



Source: (Jnr et al., 2018)

Figure 2.3: Dimensions for Sustainable Software Development

Meanwhile, sustainability in software engineering remains a developing field. Figure 2.3 shows the dimensions for sustainable software development that involve environmental, technical, social, individual, and economical. Sustainable software is defined as software that has minimal direct and indirect environmental, economic and societal effects from its usage. Furthermore, it also has minimal development and deployment costs and/or has a positive impact on long-term development (Jnr et al., 2018). There have been several scholarly contributions to Green IT and Green IS throughout the years; nevertheless, most of the work has been largely focused on environmental sustainability in regards to computer hardware. Hence, only a few studies focusing on challenges are linked to Green sustainable software applications (Jnr et al., 2018).

Meanwhile, the United Nations Sustainable Development Goals (UN, 2019) grant a mechanism for evaluating the comprehensiveness of sustainability conceptions in transition consequences. The SDGs have been criticized for their perceived top-down approach to governance (Aarseth et al., 2017; Eskelinen, 2021). This includes the difficulty in translating goals into measurable actions (Hauff, 2016) and the lack of capacity of developing countries and non-state actors to address the SDGs (Andreoni & Miola, 2016), in which the SDGs have also been praised (Department of Statistics Malaysia, 2018). In the suggested evaluation system, the SDGs examine the direction and comprehensiveness of development path change (Williams & Robinson, 2020).

Software game development differs from typical software development because of the multidisciplinary character of the processes that incorporate sound, art, control systems, artificial intelligence (AI), as well as human elements (Aleem et al., 2016). In any event, there are significant distinctions between game and software development. At the very least, the following aspects are identified in their research: 1) a lack of clear functional requirements, 2) a short design phase based on experience, skill, and emotions, 3) fewer automated testing processes, 4) delayed module maintenance (for non-cloud games), and 5) highly evolved configuration management approaches (Kasurinen et al., 2017). Meanwhile, this research focuses on the elements of sustainability in the development game. To encourage innovation and concretely implement the skills revolution, significant efforts in the development and validation of the most appropriate educational technology should be made (Perini et al., 2018).

2.5.2 Sustainability Elements in Game Development

Sustainable development is an ideal that can lead to sustainability and can be characterized as a concept of possible futures that includes components of the

environment, public health, social equality, justice, and other human and biosphere situations and choices. The following sections are primarily concerned with environmental sustainability and the relationship between interactive technologies and resource consumption, both in terms of how interactive technologies might encourage more sustainable behaviour. In addition, professional perceptions about sustainability have an impact on how sustainability has been implemented in software development (Oyedeki et al., 2018).

The use of sustainable aspects in the design and development of any game can be an essential part of the process. According to Kasurinen et al. (2017), sustainability has become a contemporary trend in most developed industrial fields to provide full support to game and software developers. For example, the following four sustainability principles could discuss as well as enhancing on common Green IT issues in game development: 1) responsible use of ecological, human, and financial resources, 2) continuous quality and knowledge management, 3) use of Green IT principles and sustainably manufactured hardware components, and 4) having a responsible effect on society, economy, as well as ecology (Kasurinen et al., 2017).

Furthermore, the influence of long-term games demonstrates that students who played instructional computer games had considerably higher academic achievement and a more positive attitude toward science learning than students who were trained using traditional methods (Partovi & Razavi, 2019). Improved self-monitoring, problem awareness and solution, decision-making, improved short-term and long-term memory, and greater social skills like teamwork, negotiation, and shared decision-making are all possible with this game (Mitchell & Savill-Smith, 2004). Finally, they are enjoyable to play (Bellotti et al., 2010), which sets them apart from traditional instructive games

(Liao et al., 2020). As a result of following this guideline, a long-lasting game that meets users' needs and achieves the learning purpose can be created.

There are rules, goals, interaction, substance, and a plot in computer games (Rapeepisarn et al., 2008). There are several reasons students should use computer games as a learning tool to improve their learning experience. However, educators, researchers, game designers, and software developers creating a game in the software method for game-based learning have considerable technical obstacles. Game development is a collection of complicated processes that necessitate multi-faceted expertise in a variety of fields, including digital graphic design, education, gaming, instructional design, modelling and simulation, psychology, software engineering, visual arts, as well as learning topic areas. The research area of sustainability is depicted in Table 2.3.

Table 2.3: The Area of Sustainability Research for the Various Field, Classification, and Game Design

Author and Year of the paper	Sustainability elements	Classification of the field	Game design
Dib et al. (2012)	Serious games are being used to improve and strengthen sustainability education.	<i>Education.</i> Present the design, development, and early evaluation of a serious game for teaching/learning, as well as the concepts and practices of long-term sustainability.	Serious game
Fabricato & Lopez (2012)	Sustainability learning through gaming	<i>Education:</i> Educating for sustainability demands a learning approach and environment.	Digital game
Dib & Adamo-Villani (2014)	Learning sustainable building design principles and practice	<i>Education:</i> Design "sustainability challenge" game to improve building sustainability education using a serious game	Simulation games, Assessment, Serious game

Author and Year of the paper	Sustainability elements	Classification of the field	Game design
Yi-Kai Juen & Tseng Weila (2015)	Sustainability and green buildings.	<i>Environment:</i> Design GB game to deliver knowledge for green buildings	Action, gameplay using cards and tokens.
Mercer et al. (2015)	Education for sustainable development (ESD).	<i>Education:</i> <ul style="list-style-type: none"> ▪ Create education for sustainable development (ESD) to show that gamification can help people develop integrative values and thinking. ▪ Creating a game for this age range was difficult, as was educating them on the basics of sustainability. 	Assessment, gamification
Christoph et al. (2015)	Sustainability design for software-intensive systems.	<i>Education:</i> <ul style="list-style-type: none"> ▪ The sustainability education (SE) curriculum raises awareness and equips software engineers with the ability to think about different fields. ▪ In software and sustainability, there is a global community of research and practice. 	Sustainability software
Kasurinen et al. (2017)	Game industry sustainability (e.g., code reusability, energy-efficient programming, social-awareness impact, and so on) as well as IT green operations.	<i>Industry:</i> <ul style="list-style-type: none"> ▪ Ability to learn while working in the industry. ▪ The ability to produce high-quality containment. ▪ Assist in the development of communication skills. 	Game as software, Game Business Model, Game industry.
Mercer et al. (2017)	The roles of games specifically for	<i>Education:</i> <ul style="list-style-type: none"> ▪ In higher education, the use of instructional 	Game-based learning

Author and Year of the paper	Sustainability elements	Classification of the field	Game design
	learning for sustainability.	game design and play encourages sustainable behaviour. <ul style="list-style-type: none"> Feedback from university students on the invention, development, and operation of instructional games to promote sustainability behaviours. 	
Paravizo et al. (2018)	Sustainability aspects in the transition towards industry 4.0. Sustainability awareness issues.	<i>Industry:</i> The suggested conceptual framework for gamified application development in the field of industry 4.0	Gamified application
Stanitsas et al. (2019).	Serious games that aid in the transition to sustainability	<i>Education:</i> Interested in learning about sustainability through games developed for other than amusement, in this example, sustainability education.	Serious game

The variety of studies on sustainability is shown in Table 2.3. It signifies that in any field, the most crucial factor is sustainability. The cultural element of digital game development, which includes game production, is based on the "meaning" of the gaming experience placed in a cultural context.

2.5.3 Game Development Approach

Additionally, Prensky (2001), taking a more componential approach, claims that a game consists of a number of fundamental elements: rules, goals, objectives, outcomes and feedback (or competition, challenge, opposition), interaction, and representation or tale. Furthermore, using a simulation usually necessitates the representation of some

important traits or behaviours of a real-world phenomenon or system. However, not all games are designed to mimic dynamic systems in real life. Fantasy, for example, could be incorporated into the game's design (Shute & Ke, 2012). Table 2.4 explain the example of the game development approach.

Table 2.4: Game Development Approach

Type of games	Approach	Design purposes
Educational	Contextualization	Define the player (either role or actions)
	Player empowerment	Employ multiple roles with different skills
	Social interaction	Expand the communication outside the game area (e.g., social network)
	Adaptivity	Progressively present mechanics and engagement
Motivational	Players` individuality	Allow players to choose their own objectives. Design different challenges tolerate player failures and tailor content and feedback to the players` characteristics.
	Multiplayer activity	Provide social motivation and inter-group competition, and intra-group cooperation.
Motivational + Educational	Contextualization	Define the player (either role or actions)
	Player empowerment	Employ multiple roles with different skills
	Social interaction	Expand the communication outside the game space (e.g., social network)
	Adaptivity	Present mechanics and interaction progressively
	Players' individuality	Allow players to set their own goals, design different challenges, tolerate player failures, and tailor content and feedback to the players` characteristics.
	Multiplayer activity	Provide social motivation and inter-group competition, and intra-group cooperation.
	Sustainability elements	Provide sustain mechanisms and quality content

Source: Dos Santos et al., (2018)

Table 2.4 shows that this research focuses on motivational + educational type and sustainability elements approach. I-Tajweed include in motivational and educational game.

Table 2.5: Sustainability Guidelines Used in the Research

Sustainability guidelines	Explanation
1) Objectivity and stimulus: Train users` emotions and physical to target their target)	Stated a goal and the objective of the i-Tajweed game may guide users to go to the next level.
2) Fun and focus elements	Encourage user interest and enjoyment, and thus learning.
3) Follow Green IT principles	Protect the sustainability of the end product
4) Well defined advancement system and rewards associated with advancement	Possibilities to create new content (Roussou 2004; Barab et al. 2005); and the ability to progress at the user's own pace (Roussou 2004; Barab et al. 2005). (Shelley, 2006) (Dib & Adamo-Villani, 2014)
5) Assessment: Develop a specific skill and efficacy)	Interactive behaviour can be exploited for assessment purposes. evaluate students` motivation and performance

Source: Dib & Adamo-Villani, (2014)

Meanwhile, Table 2.5 explains the sustainability guidelines used in the research that concern the objectivity, fun, and focus element, follow green IT, and use reward and assessment in game design and development process.

2.5.3.1 Steps in Identifying the Sustainability Elements

Any gaps in information revealed in a review, which is part of a research, should logically lead to the proposed research's aim (Ramdhani & Ramdhani, 2014). Thus, to address the first research objectives to research the sustainability elements in game design, the researcher uses thematic analysis in coding and categorization of the data analysis. It is used to analyse classifications and present themes (patterns) related to the

data. It illustrates the data in great detail and deals with diverse subjects via interpretations (Alhojailan, 2012).

In addition, thematic analysis is a method to identify, analyze, and report the themes (Braun & Clarke, 2006). Using a thematic analysis approach as illustrated in Figure 2.5, the researcher identifies six sustainability elements that can guide research and practice in teacher education for GBL. During the data analysis procedure, the researcher follows four steps to obtain the appropriate themes. The four steps are as follow:

1. Familiarizing with the data: The researcher collects the data and familiarizes it to find an idea of the coding.
2. Generate initial codes: From the raw data collected, the researcher then generates and codes the themes.
3. Searching and reviewing the themes.
4. Defining and naming the themes: After all, the researcher categorizes the themes into six elements, which are relevant content, interface design, gameplay, usability, reward, and motivation.

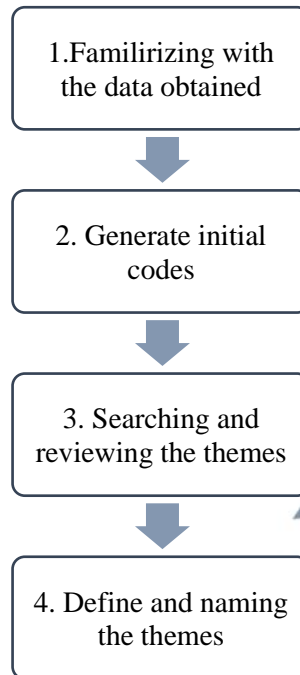


Figure 2.4: Steps in Identifying Sustainability Elements

In the second stage, the search and selection of articles for review were completed (Kennedy & Lee, 2018). Utilizing a combination of keywords such as "game-based learning," "gamification," "computer games," "educational games," "online games," and "mobile games," the initial selection was made by searching databases indexing educational research articles, for instance, ERIC, Science Direct, Scopus, and the search engine Google Scholar. Then, the searching string used in identifying sustainability elements is mentioned in Table 2.6.

Table 2.6: Number of Articles and Searching String

Element	Number of published Articles	Searching String
Relevant content	20	TITLE-ABS-KEY (sustain* AND "GAME BASED LEARNING" AND (student OR pupil OR learner OR tutor OR) AND (content* OR domain OR desire))
Interface design	48	TITLE-ABS-KEY (sustain* AND "GAME BASED LEARNING" AND (student OR pupil OR learner OR

Element	Number of published Articles	Searching String
		tutor OR scholar OR apprentice) AND (interfac* OR OR d8iesign))
Gameplay	27	TITLE-ABS-KEY (sustain* AND "GAME BASED LEARNING" AND (student OR pupil OR learner OR tutor OR scholar OR apprentice) AND (gamepla* OR play))
Usability	35	TITLE-ABS-KEY (sustain* AND "GAME BASED LEARNING" AND (student OR pupil OR learner OR tutor OR scholar OR apprentice) AND (usabilit* OR practice OR purpose OR need OR usage))
Reward	30	TITLE-ABS-KEY (sustain* AND "GAME BASED LEARNING" AND (student OR pupil OR learner OR tutor OR scholar OR apprentice) AND (rewar* OR encouragement OR desire))
Motivation	62	TITLE-ABS-KEY (sustain* AND "GAME BASED LEARNING" AND (student OR pupil OR learner OR tutor OR scholar OR apprentice) AND (motivatio* OR encouragement OR desire))

Table 2.6 shows the searching string for thematic analysis. As previously stated, the purpose is to outline software sustainability techniques from both technical and non-technical perspectives. First, the researcher screened the associated research publications using the approach-oriented classification and snow-balling techniques outlined in earlier sub-sections. Then, based on software design, programming principles, and user feedback, the researcher classified the current technical methods to sustainability.

Table 2.7: Search Results from the Digital Database

Research database	Number of the article found (advance search)	Number of articles selected to review
Google scholars	90	20
Science direct	75	10
Scopus	14	5

Research database	Number of the article found (advance search)	Number of articles selected to review
ERIC	50	10
Total	229	45

Based on Table 2.7, the researcher found 229 articles related to games by searching using the Google Scholar database. After screening, 45 articles were closely related to game-based learning. Finally, 25 articles were chosen based on the suitability of the research theme that is related to the sustainability elements. Researcher should begin by identifying research gaps, such as a lack of diversity in topic fields and game genres, the dominance of the media-comparison experiment, as well as sustainability and scalability concerns (Kennedy & Lee, 2018). To integrate information technology with, for example, psychological and pedagogical knowledge, talents and resources pool is required, all of which must be focused on a specific learning goal to be implemented (Greipl et al., 2020). After all the process, researcher decide to choose six sustainability elements based on the suitability to the research objectives as explain in Figure 2.5.

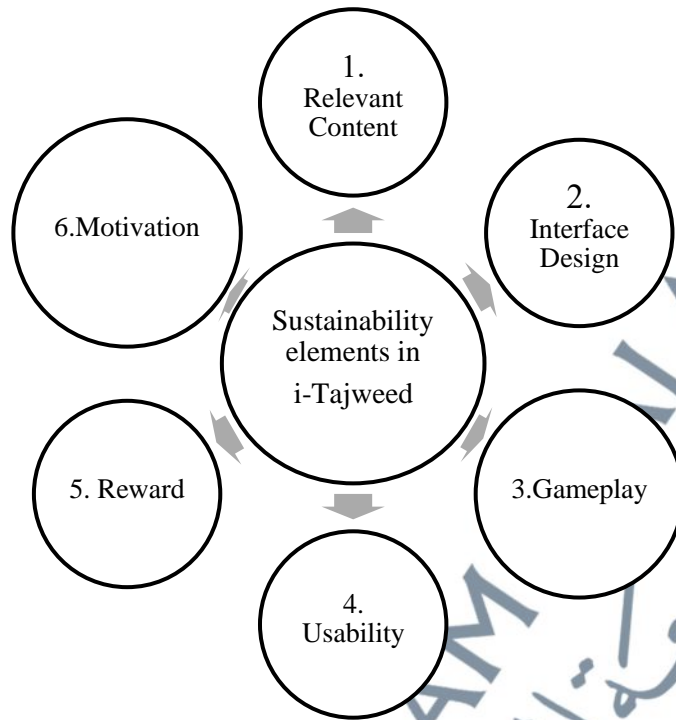


Figure 2.5: Sustainability Elements in Game Development

The final step, the researcher came up with six sustainability elements that will be used in this research in game development, as illustrated in Figure 2.5. Additionally, Tseklevs et al. (2014) contribute insights into the hurdles and advantages of employing serious games in education through their systematic research. The scholars list a number of advantages, including achievement and rewards, interactivity and feedback, incentive and competitiveness, playfulness and problem-based learning, collaborative learning, progression and repetition, as well as realism and immersion. Finally, they offer some recommendations to assist stakeholders in better integrating serious games into education.

Apart from that, the experience of working with theory in a digital game-based business subject was described as engaging and pleasant by postgraduate students (Brady & Devitt, 2016). In the context of this research, motivation is defined as a learner's level of commitment to the learning process and their ability to stay engaged

in a learning activity. Educational game designers can use the proposed game to construct games that have a higher chance of motivating learners and improving their performance. However, choosing and implementing relevant methods and paradigms for creating and evaluating such systems, as well as properly combining the 'fun' element with the information to be transmitted, remains a research topic.

Another important component is enjoyment. Serious games differ from conventional instructional approaches. The student is motivated to research not because the subject matter is intrinsically appealing but rather because the gaming action with which the subject matter is related provides entertainment value. Serious game players are compelled to play the game, and as a result, they stay engaged in the lesson for much longer and pay far more attention than they would if they were learning through standard methods (Leemkuil, 2006). Finally, the explanation of six sustainability elements that will be used in this research in the game development section, are described in Table 2.8.

Table 2.8: Explanation on Six Sustainability Elements Used in the Research

No	Sustainability elements	Explanation
1	Relevant content	<ul style="list-style-type: none"> ▪ Good content ▪ Clear goals
2	Interface design	<ul style="list-style-type: none"> ▪ Suitable color ▪ Provide users feedback ▪ Consistency ▪ Sound effect
3	Gameplay	<ul style="list-style-type: none"> ▪ Easy to use ▪ Clear instruction ▪ Eco-technology
4	Usability	<ul style="list-style-type: none"> ▪ User friendly ▪ Easy to use ▪ Provide users feedback
5	Reward	<ul style="list-style-type: none"> ▪ Provide user`s excitement

No	Sustainability elements	Explanation
6	Motivation	<ul style="list-style-type: none"> ▪ User`s motivation ▪ User`s satisfaction ▪ User`s understanding

a. Reward

One of the game elements that appeases the player and drives them to accomplish more is the reward (Hsu & Tsai, 2013). The reward is one of the most important factors to incorporate in game design because it can help users focus on their goals. Extrinsic rewards, like points and badges, are available in games, as well as intrinsic rewards, which are actions that are gratifying in and of themselves (Adams, 2009). It is a procedure based on a system of scoring and recording incentives that offer students tools for developing their achievement and becoming more involved in the teaching and learning processes in the educational context. Incorporating rules, goals, engagement, challenge, feedback, fun, interactive, outcome, as well as a rapid reward are all standard features in game development.

The incorporation of design components typical of games, such as reward points (Majchrzak & Malhotra, 2013), facilitates behavioural change by catering to end-users' intrinsic values, according to a recently developed approach for addressing these objectives (Seaborn & Fels, 2015). For example, researchers have developed rewards such as a trophy in the i-Tajweed game design based on literature findings to foster enjoyment and fun.

b. Motivation elements

Moreover, Wouters and Van Oostendorp (2013) investigated the impact of serious games on cognitive as well as motivational characteristics. They discovered that serious

games might be helpful in specific situations, such as (1) when additional teaching approaches were used in conjunction with the game, (2) when many training sessions were implemented, and (3) when players cooperated in groups (Kennedy & Lee, 2018). The incorporation of rules, goals, engagement, challenge, feedback, fun, interactive, consequence and rapid reward are among these factors. Game points, social points, badges, and leader boards are all elements that appear regularly in many situations (Hamari et al., 2014; Seaborn & Fels, 2015) and concept communities (Scheiner et al., 2017). Moreover, Garris et al. (2002), for example, regard fantasy, rules/goals, sensory inputs, challenge, mystery, as well as control as important factors of motivation. Play, exploration, challenges, and involvement are the four motivational components identified by Amory (2007). Immersion, identity, interactivity, agency, challenge, storey, and feedback, according to Blumberg et al. (2013), are traits that attract and retain a player's interest in a game.

2.6 Theories about Games That are Related to Design and Development

This section describes the game development theories applied in this research. As we all know, information and communication technology (ICT) has changed the way individuals engage with one another, regardless of time or location (Olsson et al., 2019). Throughout this paper, it is noted where the suggested framework contributes to existing work and how it aids in the resolution of previous research restrictions (Roungas et al., 2019).

2.6.1 Models of Instructional Design (ID)

The models for instructional design are described in this section. It provides procedural frameworks for producing teaching in a systematic manner. Instructional

Design (ID) is a method for systematically and genuinely constructing an educational or training programme, curricula, or courses (Bajracharya, 2019). The models integrate essential parts of the instructional design process, such as audience analysis and goal and objective determination.

Instructional design is defined as the process of creating appealing learning sessions that stimulate the development of skills connected to the lesson (Lee et al., 2017). The goal of instructional design is to make the learning experience more efficient, enjoyable, and exciting. In a nutshell, instructional design is the process of creating instruction and ensuring that it can be given properly. Unfortunately, designing applications relevant to the educational goal can sometimes be made without fully considering the proven instructional design theory (Bajracharya, 2019).

Furthermore, instructional designers feel that using systematic design techniques while creating and developing multimedia courseware can improve the effectiveness, efficiency, and relevance of education. Therefore, the design system employs a method for its components to communicate with one another and ensure that the entire instructional process is coordinated (Tasks et al., 2000). To put it another way, instructional design is typically defined as a combination of explanations regarding 1) screen design, 2) learner control, 3) navigation, 4) animation, 5) video and audio, and 6) colour. All of the above items will be briefly explained in the next paragraph.

In conclusion, instructional design is a technology for creating learning settings and experiences that encourage more effective and appealing behaviours connected to the instruction. Instructional design is a type of technology that combines learning methodologies with instructional experiences to make people more productive and valuable (Becker, 2005). The following subsection discusses some related IDs in this research.

2.6.1.1 ADDIE Model

The ADDIE model is a well-known instructional design model. It is a very practical, straightforward, and methodical instructional design approach. Analysis, design, development, implementation, and evaluation are the five phases involved (AlKhateeb et al., 2019). Because of its systematic and generic framework, the method can be used in a variety of scenarios. The framework gives multimedia creators a way to determine the demands of their target audience. It encourages them to apply that information in the design and production of any multimedia programme.

As a result, the developer takes corrective action or makes necessary modifications or improvements to ensure that the software is delivered properly. The evaluation step is critical to the success of a programme since it guarantees that the target audiences' needs are met. Moreover, the ADDIE framework, as previously stated, is a cyclical process that grows over time and continues throughout the instructional planning and implementation phase. The framework is divided into five stages, each with its own purpose and function in the advancement of instructional design.

The ADDIE model is employed in the design and development process for this research because it assists instructional designers, content developers, and even teachers in creating an efficient and effective teaching design by implementing the ADDIE model's procedures to any instructional product. Apart from that, in reality, items invented adopting the ADDIE approach can be utilized in any venue, whether online or in-person (Aldoobie, 2015). Many researchers have explored how to ensure that the distribution instructions are successful and that the research objectives are met (Goundar, 2019). As a result, the framework gives multimedia creators a way to identify the demands of their target audience and encourages them to apply that information in the design and creation of any multimedia programme.

2.6.1.2 Hannafin and Peck Design Model

The Hannafin/Peck Design Model is divided into three stages. A requirements assessment is carried out in the first phase. After this, there comes a design process. Instruction is prepared and equipped in the third phase. All of the phases in this paradigm entail a process of evaluation and revision. The learning environments are designed using this concept. The three primary phases of the Hannafin and Peck model are the needs analysis phase, design phase, as well as development-implementation phase. Process assessments and reviews are undertaken on a regular basis for each phase.

The Dick and Carey design approach outline a complete and precise Instructional System Design (ISD) process that begins with the identification of instructional goals and concludes with a summative assessment (Basu, 2018). Furthermore, the instructional development process is divided into nine steps in this paradigm. The following are the sequential steps in this design (Richey & Klein, 2014): (1) identify goals by assessing needs, (2) conduct instructional analysis and analyze learners and context, (3) write performance activities, (4) develop assessment instruments, (5) develop instructional strategy, (6) develop and select instructional materials, (7) design and conduct formative evaluations, (8) revise instruction, and (9) design and conduct a summative evaluation.

2.6.2 Instructional Strategy

The greatest instructional technique enables users to actively establish connections between what they already know and the information they are receiving (Basu, 2018). This activity also pushes students to investigate and comprehend the new knowledge thoroughly. For the sake of this research, the researcher also uses recall

tactics when creating the screen's interface. After the instructional tactics have been designed, the researcher should consider how they wish to communicate the material in a more effective manner. This will assist the student in achieving the goals.

While learning theories have been applied to traditional learning, they have not yet been applied to serious gaming (Tuan Sarifah Aini et al., 2019). Educational serious games qualities are the attributes generated from a review of learning theories, and the initial research objective is to identify these serious games attributes. Review educational and learning theories and select ones that are acceptable for serious games as an approach for answering this question. The theories and their components can be summed up as follows:

a. Theories of learning

Learning theories are descriptive in nature and explain how the learning process works. Understanding and appreciating the ideas that underpin how people learn should lead to more successful multimedia design in the future (Reigeluth, 2014). As technological advancements provide new learning opportunities, it is critical to consider a variety of theoretical viewpoints in order to maximize the usage of new technologies in teaching and learning.

b. ID theories

ID theories, in contrast to learning theories, identify particular external events that facilitate learning rather than what happens inside a learner's head when learning takes place. Simply defined, an ID theory is a set of rules for designers to follow to understand better how and under what situations an increase in comprehension and performance may be achieved. An ID theory, unlike other theories, states learning goals and provides

viable techniques or strategies for achieving them, helped by knowledge of diverse situations that should or should not be employed (Reigeluth, 2011).

c. ID process

An ID process is also known as an ID model or a process for developing instructional systems. It is focused on learning, improving, and implementing teaching methods (Reigeluth, 2011). An ID process is a method of planning and preparing for instruction that a designer should utilize. The ADDIE acronym stands for analysis, design, development, implementation, as well as evaluation, and it is used to describe a typical ID process. As will be discussed later in this paper, each phase has its own set of needs.

d. Principles of design

Preliminary plans for developing multimedia products are created using design principles. They include content design, interactivity, audio-visual design, and screen design, among other things.

e. Content creation

The appropriateness and structure of the content, the suitability of chosen instructional means and methods in delivering the content, consideration of the learners' cognitive and motivational competencies, and the ability to enhance learner competencies through the use of media are all aspects of content design.

f. Screen design

Another important aspect of multimedia creation is screen design; high-quality screen design can contribute to enhanced performance and sustained viewer attention (Faiola & DeBloois, 1988). Good screen designs are expected to meet a number of criteria, including the ability to maintain learner attention, develop and maintain interest, promote information processing, increase learner engagement with lesson content, assist learners in finding and organizing information, and facilitate lesson delivery.

g. Designing for interactivity

In multimedia design, meaningful interaction between learners and content is essential. Interface design, easy navigation and management, control over learning events and experiences, among other things, all play a role in interactivity. Effective interaction can improve both the learning experience and achievement (Kamaruddin, 2010).

h. Audio and visual effects

The design of multimedia aspects such as colour, music, video, graphics, and animation are referred to as audio and visual design. If maximum learning performance is to be obtained, each factor must be carefully addressed. For example, throughout the presentation, a consistent colour scheme should be employed, with appropriate colours used for cueing and highlighting specific content (Merrill, 1983). On the other hand, a combination of text, images, audio, and video could be employed to adapt to various learning styles.

i. Principles and tools for authoring

Using software to mix text, images, sound, animation, and digital video to create a multimedia production is referred to as authoring principles. Multimedia authoring tools are divided into five categories by Roblyer and Doering (2010); presentation software, video production and editing systems, multimedia development software, virtual environments and immersion tools, and web authoring tools.

j. Supporting software

Graphics, planning, and content-specific tools make up software support tools (Roblyer & Doering, 2010). Such tools boost efficiency and productivity, improve product look, improve information accuracy and timeliness, and make it easier for people to communicate and share information.

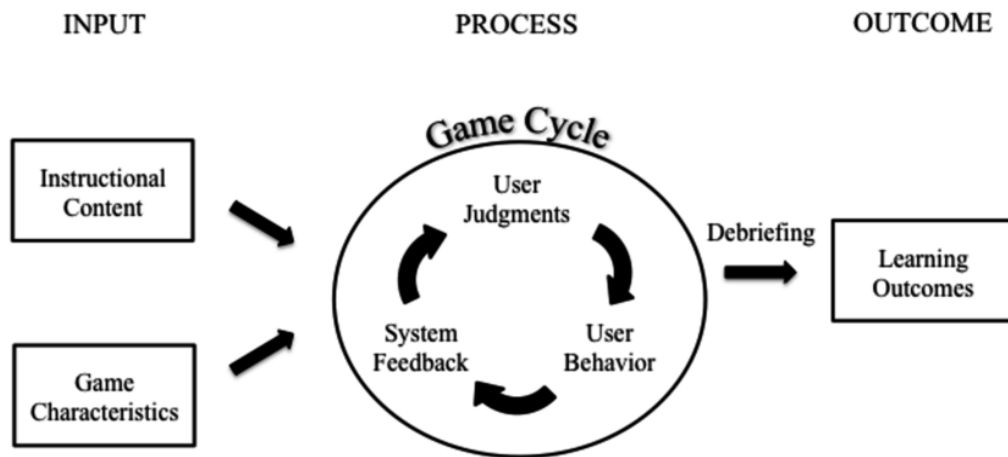
2.6.3 Games Development Model

The following subsection discusses the model used for game development in this research.

2.6.3.1 Game Model of Input-Process-Outcome

First and foremost, the goal of this research is to create an instructional programme that integrates particular game qualities or characteristics. Second, these qualities set off a chain reaction that involves user judgements or responses like enjoyment or interest, user behaviours like increased persistence or time on task, as well as more system input. Third, this cycle results in recurring and self-motivated gameplay to the point that we are effectively coupling instructional content with relevant game elements. Finally, this game-playing involvement leads to the accomplishment of

training goals and particular learning outcomes. Hence, Figure 2.6 illustrates this educational model.



Source: Garris et al. (2002)

Figure 2.6: Input-Process-Outcome Game Model

Figure 2.6 shows the input-process-outcome model of instructional games that summarises several significant components of earlier research and defines the learning process of a person using an educational game. The instructional material and six-game qualities of an effective instructional game (fantasy, rules/goals, sensory stimulation, challenge, mystery, and control) are used to feed the model. The educational game's incorporation of instructional content results in a user judgments game cycle, user behaviour, as well as system feedback that repeats.

This viewpoint comes with a number of advantages. For starters, the standard input-process-output learning paradigm emphasizes single-trial learning, in which a learner completes a task in a single trial. Although the present model uses an input-process-output structure, the game cycle, which is triggered by specific game elements, is the most important component. Gameplay can drive user judgments or reactions such as increased interest, enjoyment, involvement, or confidence. These reactions lead to

increased persistence or intensity of effort, where these behaviours lead to system feedback on performance in the game context (Garris et al., 2002). As a result, the game cycle is a distinguishing feature of computer gameplay in which participants participate in recurrent play and return to the game action over time.

2.6.3.2 Game Design Life Cycle Model (GDLC)

The suggested GDLC is merely one step in the process of making a game. Moreover, the guidelines are established to guide the GDLC application in order to construct and deploy the game properly. It includes game development introduction, role management, initiation, pre-production, production testing, beta testing, and release. In addition, the rules include a brainstorming aid section in the form of questions to assist in game ideation. Finally, the pre-production chapter covers game description, characters, storyline, control, features, concept art, as well as documentation in the form of a game design document (GDD), prototyping, and the pre-production phase delivery checklist. Hence, the procedures given in the guidelines are used to evaluate the prototypes created.

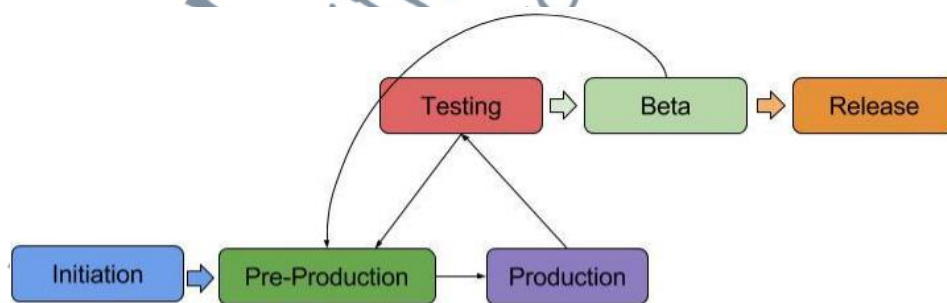


Figure 2.7: GDLC

The game development life cycle (GDLC) as illustrated in Figure 2.7 is a framework for describing the entire game development process (Hendrick, 2009). From conception until retirement, this life cycle serves as a foundation for organizing the

procedures, work products, quality assurance activities, as well as project management activities demanded to create, utilize, maintain, and enhance a gaming software application. The suggested life cycle is designed to be adaptable to any digital educational game of any size. This paper conducts extensive research into the evaluation of digital educational game software.

Quality assessment is the key pillar of any form of software throughout its entire life cycle, affecting its level of success and posing substantial issues for managers, engineers, as well as practitioners. The purpose of the indicator development is to create a collection of reusable indicators for assessing the quality of gaming software.

1. Arnold Hendrick's GDLC contains 5 phases

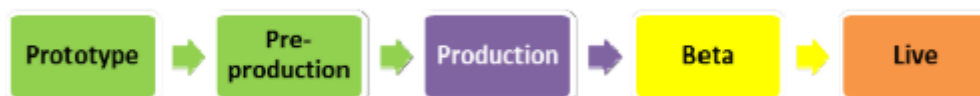


Figure 2.8: Arnold Hendrick's GDLC

In the prototype (1) phase, the first step in designing a game is to generate the first design, concept art, and many prototypes. Pre-production (2) involves creating documentation in the form of a game design document. Next, Production (3) is concerned with the creation of assets, source code, and their integration. When the build is complete, beta (4) testing is undertaken to gather input from users. Finally, when a game is marked as live (5), it has already passed testing and is available to play.

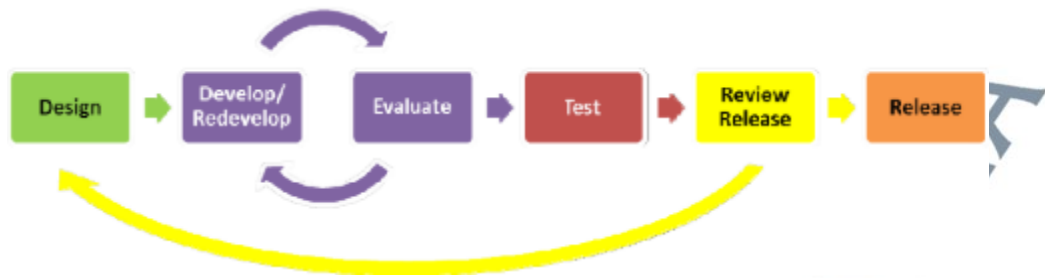


Figure 2.9: Doppler Interactive GDLC

2. Doppler Interactive GDLC

The GDLC paradigm is made up of six continuous phases that use an iterative approach to game development. The following is a quick description of each phase: (1) Create a design. This has to do with the game's construction and the game design document (GDD). After the design is complete, the designer must begin developing a game engine for the currently being developed game, (2) phase, then analyze (3) phase to see how it works. Finally, redevelop (2) to the build if it isn't satisfying. However, if it passes the evaluation, it will move on to the test (4) phase, when the game (not only the engine) will be tested by the internal team and bugs will be fixed. After that, the game is made available for third-party review (5). After that, repeat steps 1 through 5 until the game is available to be released in phase (6).

3. GDLC of Heather Chandler



Figure 2.10: GDLC of Heather Chandler

GDLC of Heather Chandler is employed in the stage of i-Tajweed game development. This research employs the GDLC of Heather Chandler in the process of the development of the game. First, pre-production (1) denotes the game design and project planning, which is the first step in the game creation process. After the design and plan are finalized and authorized, it is time to move on to production (2), which involves both technical and creative components of creation. Then, test (3) the game and correct any errors you find. Finally, when a build is considered complete for a single cycle, post-production (4) is carried out to distribute current documentation and execute post-mortem operations.

2.6.4 Multimedia and Learning Theory

This section discusses the multimedia and learning theory that can be implemented in game-based learning research.

2.6.4.1 Cognitive Learning Theory

The term cognitive refers to perceiving and knowing, and cognitive scientists seek to understand mental processes such as perceiving, thinking, remembering, understanding language and learning (Piattelli-Palmarini & Nadel, 2016). According to this model, stimulations from the environment activate receptors to produce patterns of neural impulses.

Then, this information may be stored in the short-term memory as auditory, articulatory, or visual images, which are subjected to rehearsals (silent mental repetition of the information). Finally, as the input to the long-term memory, the information is semantically encoded and then stored.

2.6.4.2 Cognitive Theory of Multimedia Learning (CTML)

CTML (Figure 2.11) is the result of combining cognitive load theory and constructivist learning theory (Mayer & Moreno, 2002). Referred to dual coding theory, which is represented by the visual model as well as verbal model, the cognitive theory of multimedia learning describes how humans learn from both words and visuals (Mayer, 2010). However, according to cognitive load theory, the human brain's capacity to process information from various mental channels is limited to some extent (Paas et al., 2003; Clark & Mayer, 2008).

Meaningful learning is attained, according to the cognitive theory of multimedia learning, when pupils are able to pick relevant information verbally or visually and begin to rearrange the knowledge in their working memories (Mayer & Moreno, 1998; Watson & Brathwaite, 2013; Jingjit, 2015). Moreover, the use of graphics and text in a multimedia presentation should provide value and assist students in understanding difficult topics. In the end, a new state of knowledge is produced, which will give the

situation a new meaning. Furthermore, learners may be able to keep material in their long-term memory longer if there are good correlations between verbal and visual representation.

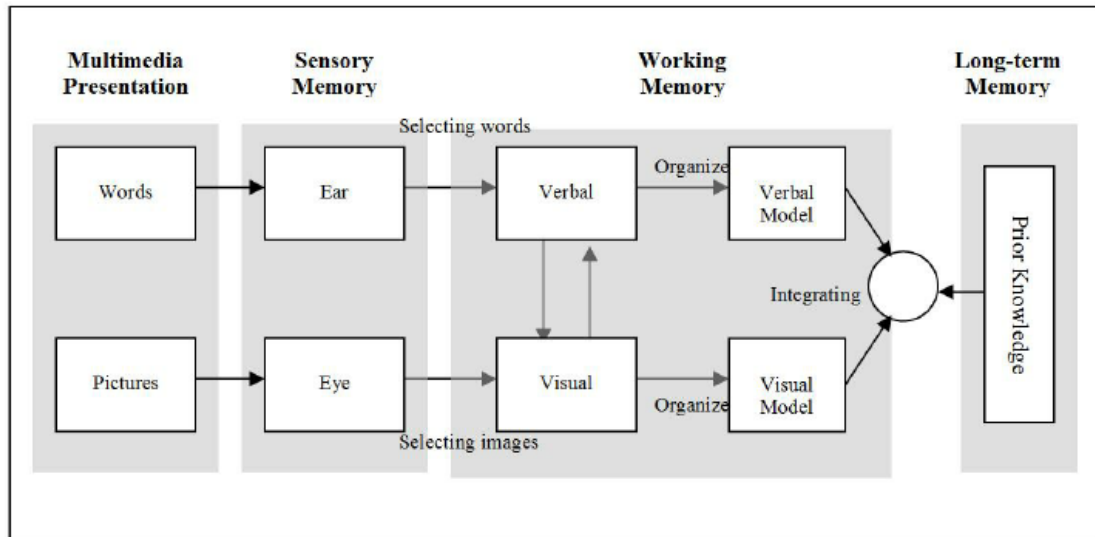


Figure 2.11: Cognitive Theory of Multimedia Learning (CTML)

The next stage is to combine prior information with the visual mental model and the verbal mental model. Students engage in cognitive processes to pick relevant images and sounds, organize them into appropriate visual and verbal mental models, and integrate them with existing knowledge in constructivist learning. This integration of selected data will increase the transfer of skills to problem-solving activities, resulting in cognitive enhancement in students' learning experiences (Mayer & Moreno, 2002).

2.6.4.3 Gagne's 9 Events of Instruction

An instructional design theory is a set of guidelines that helps designers understand how and under what conditions of learning knowledge and performance will improve. Unlike other theories, it describes learning goals and provides the tools or tactics for reaching them, supported by knowing when and when not to employ certain

scenarios (Reigeluth, 2014). For example, an eminent learning psychologist, Robert Gagne (1985), defined nine mental states required for efficient learning and for an individual learner to assimilate what is being taught. A scholar referred to these mental states as "instructional experiences." Later in the design and development part, the application of Gagne (1985) 9 events of instruction to i-Tajweed game will be explained.

2.6.5 Motivation Theories

This section describes the various motivation theories that can be incorporated into the development of any software.

2.6.5.1 ARCS Model

In 1987, John Keller introduced the ARCS (Attention–Relevance–Confidence–Satisfaction) motivation design model, which was separated into four aspects that were important to develop students' learning effectiveness. In order to improve students' learning performance, ARCS emphasizes that learners' motivation has to be matched with the utilization of these four variables. ARCS is based on Keller's methodical research technique, a design pattern the motivation, and merges motivation patterns proposed by motivation theory and related theories to boost students' learning encouragement.

As a result, Keller created the ARCS motivation model, which can help educators understand students' motivational needs, identify instructional tactics, increase learning motivation, and effectively improve students' learning and performance (Chang et al., 2020). Keller proposes four components (Attention, Relevance, Confidence, and Satisfaction) that might assist the instructor in motivating and maintaining the learner's

motivation to learn. The goal of ARCS is to assist in curriculum development and teaching improvement.

2.6.5.2 Maslow Theory of Motivation

This motivation theory is one of the most well-known as well as influential workplace motivation ideas. First, in the 1940s, psychologist Abraham Maslow established his theory of individual growth and motivation. He claimed that man has a hierarchy of needs, in which everyone acts in a certain way to meet their basic requirements before moving on to meet the higher levels needs.

Furthermore, Maslow's motivation demonstrates how critical it is to meet our basic needs before moving up the hierarchy. This is to discuss more complex needs such as the need to meet the physiological needs for water, food, warmth, and the need to focus on safety, which is the need to join the community. Maslow's motivation theory, on the other hand, is usually represented by five steps: self-esteem, physiological, safety, social, and self-actualization requirements (Taormina & Gao, 2013).

Previous research has presented many game motivators and game designing processes, whereby motivation is the reason for the principles to alleviate this. Still, there has yet to be a thorough synthesis (Laine & Lindberg, 2020). Sustainability is a rapidly expanding field in which serious games are used. The objectives of serious games on sustainability can be summarised as follows: (a) raising awareness of the challenges associated with sustainability, (b) providing knowledge and understanding of the issue of sustainability, and (c) encouraging players to take actions and develop solutions that are environmentally and socioeconomically balanced (Ouariachi et al., 2019).

Many studies indicate that computer games have educational benefits (Mayer, 2019). Still, such claims need to be backed up by rigorous scientific research and evidence-based theories about how sustainability elements might assist students in learning from the game. This is beneficial to our teaching and learning efforts. It can be divided into two categories: learning that can be engaged with the introduction of an underlying game and learners who have grown up in a digital world and are accustomed to its operation. Many digital games, likewise, provide an environment in which children may quickly capture greater graphical content, allowing them to think, grasp, and execute successfully (Zirawaga et al., 2017).

2.6.5.3 Motivation Technique of Prophet Muhammad pbuh

According to recent research, playing games motivates pupils to learn more (Mahmoud & Tanni, 2014). The findings of this research are consistent with another research that found that one of the reasons students played digital games was to learn new things. In addition, the approaches for motivation emphasize the use of only positive phrases and avoidance of any negative ones.

The researcher will employ the "Technique of providing praise" in this investigation (as explained in Table 2.9). Motivation is defined as the readiness or desire to take part in a task. Motivation is defined as an individual's decision to engage in a particular activity as well as the amount of effort or persistence put forth in that activity (Filgona et al., 2020).

Table 2.9: Prophet Muhammad Pbuh Motivation Techniques

Source from Hadith	Motivation technique used	How can it be applied? / Application
Hadith from The Abridged Collection of	The technique of giving reward	When a task is completed correctly, a reward is offered. When a task is

Source from Hadith	Motivation technique used	How can it be applied? / Application
Imam Muslim Authentic Hadith		<p>completed in front of the public, the reward is also offered in front of the public.</p> <p>It is a social award that is provided. Those that performed the task incorrectly are not held accountable.</p>
Hadith from The Abridged Collection of Imam Muslim Authentic Hadith	The technique of discouraging bad behaviour	<p>Someone who has misbehaved should not be chastised for it. Anyone who has misbehaved should be taught the norms and regulations, as well as what they should not do.</p>
Hadith from The Abridged Collection of Imam Muslim Authentic Hadith	The technique of giving praise	<p>On positive behaviour/effort/outcome, praise is offered. After good behaviour, praise is provided right away.</p> <p>Praise is delivered in front of others, and when possible, in front of VIPs.</p> <p>Actions are praised, not people or personalities.</p> <p>The structure of praise MUST be as follows:</p> <ol style="list-style-type: none"> 1. "I am astounded" or phrases with a similar meaning 2. Describe the positive action, effort, or result. 3. Describe the positive influence of the good deed, effort, or result.
Hadith from The Abridged Collection of Imam Muslim Authentic Hadith	The technique of encouraging good behaviour	<p>Motivation should be given during school assemblies or before a tough course or assignment is completed.</p> <p>The structure of the encouragement script should be as follows:</p> <ol style="list-style-type: none"> 1) Start with an oath. 2) Then issue a cautionary statement. 3) The first criterion is stated. 4) The first criterion is stated. 5) Then, pose a question to pique people's interest in doing good.

Source from Hadith	Motivation technique used	How can it be applied? / Application
		6) Make a final condition, but it should be the simplest one that anyone can do.
Hadith from The Abridged Collection of Imam Muslim Authentic Hadith	Technique to raise self-Confidence	Present four questions to which we are confident that all pupils will raise their hands since they Have completed all of the tasks that have been assigned to them. After you've asked those four questions, say something like, "Those who have done these are certain to succeed."
Hadith from The Abridged Collection of Imam Muslim Authentic Hadith	Hadith from The Abridged Collection of Imam Muslim Authentic Hadith	Hadith from Imam Muslim's Abridged Collection of Authentic Hadith

Motivation is an important factor in human behaviour and has been highlighted as a necessary component of efficient teaching and learning (Tahir & Yucel, 2019). Motivation tactics that emphasize the use of only positive words as well as prevention of negative phrases, such as criticism, reprimand, and punishment, resulted in significant elements in motivating pupils to do better (Yusoff, 2012). The difference between a student's ability and academic performance is commonly used to determine low achievement (Yusoff, 2012). Low achievement is reflected in the Malaysian context by the previous year's school exams. Low achievers are placed together in classes classified as the last classes in Malaysian schools since ability grouping is still prevalent (Aminuddin et al., 2009).

Many learning theories include motivation as an important component. Motivation is a critical aspect in instructional design, according to Katzeff (2000), and for learning to occur, the learner must be driven to learn. However, because this research

is limited to a few fields, there is a void in the literature about a consistent paradigm for use throughout all academic programmes. As a result, the decision to incorporate games as well as simulations into the teaching process is frequently left to the discretion of the instructor. As a result, the goal of this research is to create a framework that will help educators from many disciplines better comprehend the benefits and drawbacks of games and simulations in relation to their instructional objectives (Vlachopoulos & Makri, 2017).

2.6.5.4 Motivational Elements that are Used for This Research

According to Hartmann and Gommer (2021); Westera et al. (2016), a successful educational game design must achieve and balance three aims: (i) providing an entertaining game, (ii) linking game content to learning goals, and (iii) taking into account the context of game use. Referring to this rationale and the existing literature, three factors are presented as potential triggers and sustainers of student gameplay motivation: (i) appeal of the game, (ii) game learning, and (iii) game cooperativeness. Besides, a great majority of academics attribute games' popularity to their qualities. However, there is no consensus on game properties (Garris et al., 2002; Wouters & Van Oostendorp, 2013). Hence there is no consensus on what motivates people to play. In light of the literature and discussion, the researcher would recommend motivational aspects in game design and development. Table 2.10 explains the motivational aspects used in game development and how they might be applied to various situations.

Table 2.10: Motivation Elements and Their Impacts Used in i-Tajweed

Motivation elements	Example	Impact
On positive behaviour/effort/ outcome, praise is offered. After	Congratulations!	Give encouragement

Motivation elements	Example	Impact
displaying positive behaviour, praise is offered right away.		
Use positive words	Focus, be patient, Don't Give Up, You Got This!	Maintain the effort to achieve the goal
Display the good action or effort or outcome	You Are Amazing! Next Level	Keep the momentum

Table 2.10 explains how motivation elements will be applied in the game.

2.7 Game Tajweed Research

This section details the effects of the domain in this research, which is Tajweed learning. Some of the topics that are discussed in this section are:

2.7.1 Teaching and Learning Tajweed

In Islam, the Quran is the first source of knowledge. Whoever holds it and follows its teachings will certainly be on the straight and true path. The verses, as we all know, cannot be changed or remade by anyone. Allah has promised that He will keep the Al-Quran unchanged till the end of time (The Day of Judgment). "We have, without doubt, sent down the message: and we will assuredly guard it (from corruption)" (15:9).

Similarly, many people believe that Islamic Education (IE), such as Tajweed, is taught objectively in order to build an individual with strong moral and civic values such as honesty, caring, justice, and integrity (Nuriman & Fauzan, 2017). Similarly, the goal of Islamic Education curricula in Malaysia is to intentionally nurture and enhance the excellent character of Muslims. j-QAF is one of the programmes that former Prime Minister Tun Abdullah bin Ahmad Badawi was inspired by during his 2003 visit to the Ministry of Education. Since 2005, the programme has been running. However, existing

Al-Quran applications do not meet all Muslims' present demands because most focus solely on the Al-Quran and its translation (Nuril Ham Al Hafizah et al., 2017).

Furthermore, every Muslim understands the significance of the Quran in their life (Mashita, 2005). Science, engineering, social science, law, and management are all included in the Holy Quran (Mohamed Akhiruddin et al., 2016). This truth motivates people to read and comprehend the Quran for religious as well as scientific reasons (Faruqi, 2007). Recitation of the Muslim holy book, the Holy Quran, is a region's responsibility, and it is done with great care to ensure that no errors are made while reading it (Farooq & Kanwal, 2019).

According to Siti Fatimah et al. (2020), Islamic education teachers tend to employ memorization in their lessons, which does not inspire students to think and act creatively. Some children begin reading the Quran before starting primary school. Al-Quran research is usually structured in the subject of Islamic Education in schools (MOE, 2004). This formal education lasts until the student graduates from high school. Non-interactive teaching in traditional classrooms usually leads to pupils abandoning the learning process halfway through (Neo & Neo, 2004; Azham et al., 2014).

Another difficulty related to these concerns is that most students believe they are learning Islamic education solely for the goal of passing an examination rather than living it in order to be a good Muslim (Nik Rosila, 2013). As a result, teaching Tajweed rules in Quranic topics should be more successful and appealing to generate students who are fluent in Tajweed rules and can correctly recite the Al-Qur'an after six years of primary school and five years of secondary school. As a result, this research establishes and constructs a game called i-Tajweed using the presented framework. As a result, it is envisaged that this game will be successfully implemented into educational procedures, particularly in Tajweed learning.

The lack of teaching aids or tools by teachers can be seen in the diverse methods employed by teachers in learning the Quran. This finding was consistent with those of Amal Hayati (2012); Sakri (2012) and Misnan et al. (2012), who found that while the teacher's teaching is outstanding, the utilization of teaching aids as well as curriculum facilities should be made better. Similarly, according to the conclusions of the same research by Hafit Hidayah (2015), teachers prefer to employ Iqra' literature, the Quran, and the blackboard above other teaching resources like multimedia. Furthermore, player enjoyment might lead to an intention to engage in a game (Yang et al., 2017). Furthermore, the research emphasizes the relevance of positive experiences in motivating players to participate in a game (Liao et al., 2020).

Table 2.11: Analysis of students' achievement (Year 6), JQAF in Kuala Langat District (*Model Khatam Quran*) 2017-2019

Year	No. of students	Percentage
2017	1035	34.86%
2018	662	22.83%
2019	1045	35.56%

Source: PPD, Kuala Langat, (2020)

Table 2.11 shows that the percentage of students who can read the Quran is still low (22.83%). As a result, teachers must take the best possible action to excite students and provide them with educational teaching aids such as games. This predicament demonstrates the necessity for instructors to develop new teaching methodologies in order to prepare future generations for the new challenges of the industrial revolution. Implementing game-based learning to improve student performance and encourage them with advanced knowledge is one of the effective techniques that can be implemented.

According to Carolina, Murphy, Zimmermann, and Nagappan (2014) in their research, there are six primary difficulties in game development that are listed below: 1) a lack of clear functional objectives, 2) a short design phase based on experience, skills, and emotions, 3) fewer automated testing processes, 4) delayed module maintenance (for non-cloud games), and 5) highly evolved configuration management techniques (due to a large number of assets). To address the aforementioned concerns, the researcher recommends that all game developers (GD) or software engineers (SE) incorporate sustainability ideas and elements into the game design and development process. This is because Tajweed teachers have been observed to have difficulty recruiting students and assisting them in developing their Tajweed talents (AlKhateeb et al., 2019).

Finally, all Muslims are required to recite the Quran with the exact and proper pronunciation of Tajweed. This is because tajweed norms were applied to the Qur'an when it was revealed. Muslims should give each letter of the Qur'an its rights and dues of features when reciting the Qur'an while also following the rules that apply to those letters in various situations.

2.7.2 Learning Tajweed in a Digital Environment

Earlier research (Billingham et al., 2001; Dunleavy, 2014) examined the use of technological approaches to entice learners to acquire Islamic subjects explicitly (Billingham et al., 2001; Dunleavy, 2014) (Ismail et al., 2011; Sardan & Rias, 2013; Wan Noor Hazlina & Kamaruzaman, 2009). In Tajweed learning, augmented reality and gamification are examples of current technologies. For example, virtual items such as text, animation, sound, and movies can be placed in a real-world setting using augmented reality (Bakar et al., 2018).

Meanwhile, gamification allows non-game aspects such as points, levels, leader boards, and others to be included in the learning process (Sanmugam et al., 2014). In augmented reality and gamification, interactivity, attractiveness, and experiential learning elicit a wide range of emotions and entice learners to participate in a learning process (Erlandsson & Ivarson, 2021). Despite the fact that various studies on technological approaches to Tajweed learning have been published, such as Mssraty (2015); Irfan Naufal and Zabedah (2015); Nurtihah et al., (2019), it is still considered rare in comparison to other learning content (Noor et al., 2018). Furthermore, according to research, there is currently less deployment of augmented reality and gamification in Tajweed learning, notably in Malaysia (Wang & Khambari, 2020). It is feasible to combine both learning methodologies (Noor et al., 2018). However, it needs a very detailed and wholesome design process in order to prevent any cognitive overload while learning.

In conclusion, the findings imply that game design with relation to educational usefulness, when incorporated within rich multimedia-based learning environments, has the potential to provide users with a significantly enhanced learning experience.

2.7.3 Tajweed Games Application Comparisons

Earlier research examined the use of technological approaches to entice learners to acquire Islamic subjects explicitly (Muhammad Talhah et al., 2019). Current technology includes augmented reality and gamification. Virtual items such as text, animation, sound, and movies can be placed in a real-world setting using augmented reality (Taskiran, 2019). Gamification allows non-game components such as points, levels, leader boards, and others to be included in the learning process (Lee et al., 2014; Nurtihah et al., 2019). In augmented reality and gamification, interactivity,

attractiveness, and experiential learning elicit a wide range of emotions and entice learners to participate in a learning process (Kiili, 2005).

Despite the fact that various studies on technological approaches to Tajweed learning have been published, such as Mssraty (2015) and Nurtihah et al. (2018), it is still considered rare in comparison to other learning content (Noor et al., 2018). Furthermore, according to research, there is currently no deployment less augmented reality and gamification in Tajweed learning, notably in Malaysia (Noor et al., 2018). It is feasible to combine both learning methodologies (Chyan & Syariffanor, 2014; Noor et al., 2018). To avoid cognitive overload throughout the learning process, however, a thorough design procedure is required.

2.7.4 GDF for i-Tajweed

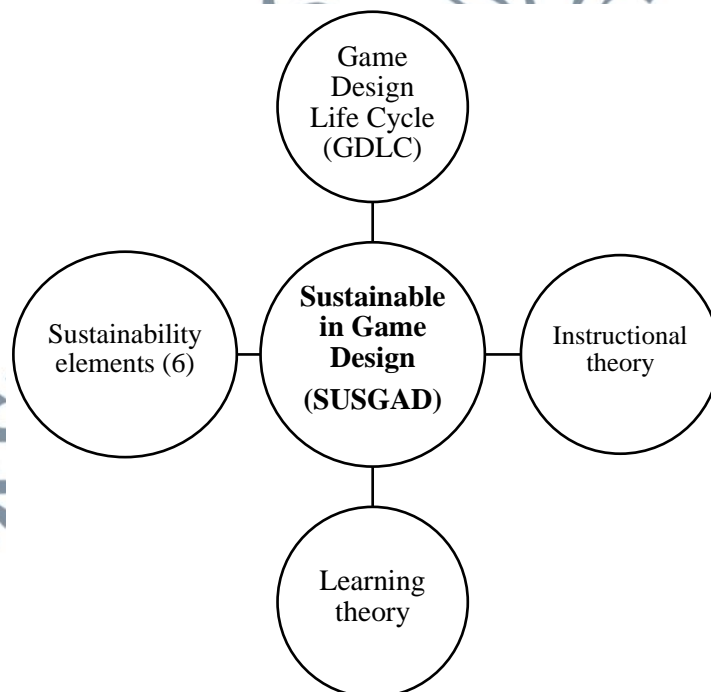


Figure 2.12: Sustainable in Game Design of the Research

Figure 2.12 illustrates the sustainable game design (SUSGAD) framework. Playing a game, according to Giannakos (2013), is engaging in activities aimed at achieving a specific condition of affairs using only means permitted by specific rules. Finally, the researcher finds four steps in sustainable game design. Start with choosing an appropriate game design life cycle (GDLC), implement instructional and learning theory, and then combine sustainability elements. Thus, the researcher will concentrate on a long-term framework involving a systematic process, specific goals, suitable game life cycle, and sustainability elements. Games inherently entice children to play them indefinitely without regard to the passage of time (Leith et al., 2019). Educational games, often known as serious games, are increasingly being used in classrooms to make school learning more engaging for kids (Anastasiadis et al., 2018). Creating a diagram, flowchart, and storyboarding are all part of this phase. Aside from that, during the design process, the researcher considers the sequence, activities, and time so that the audiences may understand and catch up with the objectives.

On the other hand, the following four steps make up the game design, and mechanism for determining content validity: (1) Analyze the qualification profile for the ICT manager to determine how the students should demonstrate the performance indicators; (2) Create a game scenario in which the assessment tasks are carried out; (3) Create assessment procedures, instructions, and forms; as well as (4) Determine whether the assessment tasks cover all of the performance indicators. The method is not only linear but also iterative (Hummel et al., 2017). As a result, the game component that should be involved in game design and development was described in length in the following section.

2.8 Design and Development Research (DDR)

Teaching, learning, development programmes, and training have all benefited from instructional products. Moreover, study done by Lee et al. (2017); Mishra and Iyer (2015), are two recent studies in education that focused on planning and implementing instructional programmes by merging educational theories to improve instructional approaches. The most prevalent approach used by instructional designers to produce any product is design and development research (DDR) (Muhammad Sabri et al., 2012).

Development research, design research, and design-based research are all terms used to describe DDR. DDR is defined by Richey et al. (2004) as a systematic approach to creating, implementing, and assessing instructional programmes, processes, products, and modules that must meet internal consistency and effectiveness criteria. In addition, DDR is a problem-oriented research approach that can be used in experimental and evaluative research to determine the module's effectiveness (Richey et al., 2004; Richey & Klein, 2014)

Type 1, Type 2, and Type 3 research models are the three types of research models in DDR (Richey, 1994). However, Richey and Klein (2005) have classified DDR into simply Type 1 and Type 2 in their most recent edition. Product research is the first type, and it focuses on the processes of designing, developing, and evaluating the module in a complete report (Richey, 1994; Richey & Klein, 2005). For example, research by Amanda and Katie (2016) shows how to create an interactive multimedia teaching module utilizing ADDIE, which is classified as Type 1. Similarly, Ellis and Levy (2010), who focus on the procedures for each phase of creation to provide insights to novice instructional designers on how to construct a module, are Type 1. Regardless of the sort of research, the setting and product specifications are usually provided.

Table 2.12: Type 2 of DDR

Type	Type of Research	Criteria
Type 2	Developmental research	Focuses on design and development models (framework in developing game-based learning called i-Tajweed)

Source: Richey et al. (2004)

Based on Table 2.12, this research adopts DDR approach Type 2 to represent the tasks conducted because this research comprises rigorous methods of creating and building a game. To fit in with the research goal, this research extends the model by merging Type 2 with the ADDIE Model. This research focuses on the game's design, development, and evaluation, as well as the effectiveness of the game.

Researchers employ a variety of approaches in DDR and adapt an instrument that meets the research criterion, as indicated by Richey et al. (2004). This recommendation was previously implemented by Lee et al. (2017). The scholars employed qualitative methodologies to evaluate the learning objectives and usability of the model on flipped learning strategy to research Mathematics by conducting analysis utilizing expert reviews and participant interviews. In addition, many studies used an experimental design in summative evaluation to test the effectiveness and justify the impact of items or tools developed earlier in the process (Box et al., 2019; Little et al., 2009).

In the process of identifying an issue, determining the instrument to assess reliability and validity, formative evaluation, and summative evaluation, DDR may include sub-studies (Richey & Klein, 2014) Many instructional design models, for example, the Kemp model (1985), Dick and Reiser model (1986), ASSURE model (1981), ADDIE model, and Sidek model (2005) can be used under DDR (Nurul Azizah, 2017). However, because of its basic properties and the ease with which it can be adapted to suit the research objectives, ADDIE is the most often used instructional

design model for developing programmes or tools (Almomen et al., 2016; Ellis & Levy, 2010; Koneru, 2010).

According to Richey and Klein (2004), the ADDIE phases are commonly classified as DDR research and are frequently employed as fundamental phases in the instructional design paradigm. For example, the ADDIE paradigm was used in game design, which comprises five phases: analysis, design, development, implementation, and assessment. The ADDIE model was used to create and develop a complete module that suited the learning requirements and objectives of the pupils. Furthermore, feedback from the ADDIE evaluation phase has been used to develop i-Tajweed for future programmes.

2.9 Theoretical Framework

In summary, this section summarises numerous theoretical frameworks that academicians have used to incorporate dynamic elements into game design and analyze its effectiveness, demonstrating that affective factors play a substantial role in facilitating learning in games. The theoretical framework is necessary for this research's theories to be supported. The CTML is included in the theoretical framework in this research, as illustrated in Figure 2.13.

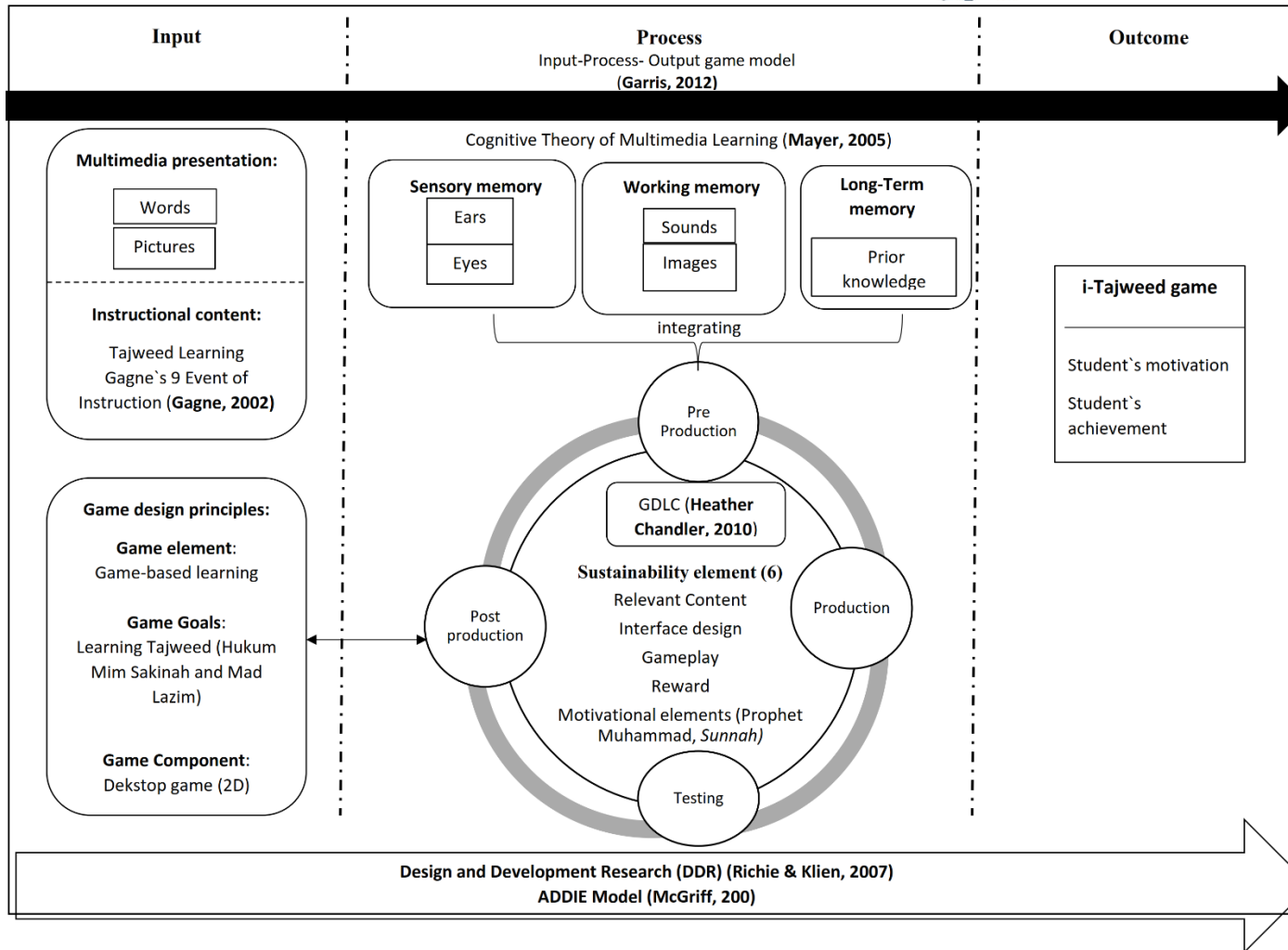


Figure 2.13: Theoretical Framework

Figure 2.13 explains the theoretical framework describes the relevant theories implemented to answer the corresponding difficulties. According to CTML, multimedia should be generated by combining words and images. To describe processes, words can be used in the narration or on-screen text, whereas graphics or animation can be used to present pictures. Students will be given pertinent notes and asked to create a series of mental visual representations during the presentation. The visuals will then be organized into a logical framework in their visual mental model. Students will pick appropriate words and gather and combine them in their mental model when instructional messages are provided verbally. As a verbal, mental model, the organization of the words will be put into a coherent framework.

Theories have stressed various essential cognitive processes concerned with learning based on this cognitive architecture. For example, Mayer's cognitive theory of multimedia learning distinguishes three types of cognitive processing: selecting relevant information by paying attention to the presented material, mentally organizing the new information into a coherent structure, and integrating this structure with prior knowledge (Mayer, 2001).

To begin with, gamers may be easily affected by the abundance of information, the multimodal presentation of information (often on several regions of the screen at the same time), and the potential choices available to them (Wouters & Van Oostendorp, 2013). Theoretical Framework for Learning with Computer Games in Education Transfer refers to the ability to apply what you've learnt in one setting to solve issues or learn in another (Mayer, 2011). A key purpose of most educational companies is to stimulate learning in ways that encourage transfer (Pellegrino & Hilton, 2012).

Based on three essential concepts from the science of learning (Mayer, 2011, 2014), it describes how learning works in various types of multimedia learning

situations. First, the dual channels principle states that people have separate channels for processing visual and verbal information. Moreover, the limited capacity principle states that people can only process a small amount of information in each channel at any given time. Finally, the active processing principle states that deep learning occurs when people engage in active cognitive processing while learning.

Attending relevant incoming material (i.e., selecting), mentally structuring it into a coherent representation (i.e., organizing), and connecting the incoming material with relevant prior knowledge (Tajweed) activated from long-term memory are examples of active cognitive processing (i.e., integrating). Hence, Figure 2.13 shows how words and graphics in instructional material (such as a computer game provided on a desktop computer, tablet, smartphone, or game console screen) enter the learner's visual sensory memory (through the eyes) as well as auditory sensory memory (through the ears), where they fade quickly.

The purpose of educational computer game instructional design is to reduce excessive processing, guide important processing, and encourage creative processing. Two essential additional factors must be included in this cognitive model of multimedia learning to better comprehend game-based learning: motivation and metacognition. First, motivation is characterized as an internal condition that originates and maintains goal-directed activity and refers to the learner's willingness to put up effort to understand the subject (Mayer, 2011, 2014). The alleged motivational effect of instructional computer games is one of their advantages.

The theoretical framework in this research integrates Mayer and Moreno (2002) cognitive theory of multimedia learning and the incorporation of sustainability aspects with particular learning theory. Students will begin to create their own visual and spoken mental models with a set of information accumulated in their working memory

after viewing the multimedia presentation. The six sustainability element is connected with the working memory, which is linked with the new collection of knowledge.

Prior knowledge from the students' long-term memory will be combined with six sustainability elements to boost motivation and achievement among students. Students' achievement was divided into three categories in this research: motivation, *Hukum Mim Mati*, and *Hukum Mad Lazim*. The improved performance of students as a result of this proposed theoretical framework could have far-reaching implications in the Islamic subject, particularly in terms of how Tajweed learning can be implemented in a more specific manner in the future.

2.10 Summary

The sophistication of today's technology provides a great deal improvement and opportunity for researchers and educators to continue to play a vital part in the information era's borderless globalization. Aside from that, the benefits of incorporating technology into the teaching and learning process, such as educational games, can no longer be debated. However, a review of the relevant literature revealed many gaps regarding the effects of incorporating educational games and multimedia elements into Tajweed learning on improving students' motivation and achievement. To fill in the gaps, this research aims to implement a theoretical framework using CTML and sustainability elements, as well as Prophet's inventive technique. The research's principal implications are for the design of game-based educational interventions to create a better understanding of players' attitudes and preferences that should improve teachers' game selection and deployment strategies.