

Educational Games Quality Framework for Learning Islamic History in Primary School

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Abstract—Educational Games (EG) are regarded as the 21st century learning medium. Digital natives are highly engaged to games and internet technology like never before. Despite widely available of educational games, there are still very much lacking of good quality educational games that effectively helps students learning. This is due to missing part in games design aspects that is failed to satisfy a real games features plus inadequate educational content to represent the syllabus it intended to teach. Many educational games were developed without proper guide on good quality games due to lack of established guidelines. In addition, Islamic History is an important subject in Malaysian primary school, however student performance on the subject are below average. Thus, this study proposed an educational games quality framework that combine game design components and educational components. The framework will be use to design educational game prototype and afterwards conduct validation among students. Validated framework will serve as a guideline for game designer to ensure the games fulfill both game and educational aspects.

Index Terms—educational games, games design, games component, educational component

I. INTRODUCTION

In this modern and high technology society, it is very common to see a toddler playing some kind of games using mobile tab or phone. Games is among the most popular technology with value of billions of dollar per year [1] which some games title even surpass the sales of Hollywood box office movies. Due to this scenario, growing number of studies on educational games can be found in the literatures as well games development by commercial developers – both online or on-the shelf. Some researchers even regard educational games as the future of learning [2].

Educational games (EG) are the latest technologies that can be seen in the future of teaching and learning approaches [3], [4]. This is due to features of EG which are highly engaging, lots of fun, full of interactivity and challenging especially younger generation [5], [6]. In contrast, education is generally seen as a formal process and less enjoyable. Therefore, the combination of games as an educational approach is seen as an innovative and

futuristic way of making the educational process and experience more attractive, engaging as well as enjoyable.

As for now, many studies were conducted on EG but there are mixed findings of effective and ineffective games in helping students improve their learning performance. Thus it is important to established the key factors that contribute to effective educational games. Among the key factors in determining the effectiveness of the EG are the elements of good game design that effectively combine both games design and educational design elements [7]-[10]. Despite that, many games were developed on ad –hoc basis without clear and established guidelines to guide the design process [11]. This has resulted in poor quality educational games which failed to comply to even basic game features plus inadequate educational content as required in the syllabus. It is crucial to have the two components seamlessly integrated in educational games to ensure its learning effectiveness as well as highly engaging.

Petri [12] proposed and validate MEEGA+ to measure quality of educational games. MEEGA+ suggested two main dimensions of games namely Player Experience and Usability with 13 subcomponents. However, this model is lacking on educational components measurement due to its focus on player experience with the games. Additionally, most existing studies focus on player experience with the games and usability only without much attention given to a quality educational games design guidelines.



Figure 1. Educational Games and its relationship with computer and education field.

This paper review and analyses past studies on key components for educational game design and proposed a

framework for a quality educational design. Educational games combine several different areas namely games, computer and education. Those areas have its own extensive knowledge and application. Thus it makes the game design a complex process due to requirement for the designer to understand different field of knowledge in order to produce an effective game. Fig. 1 shows the relationship between game, education and computer area of knowledge.

II. REVIEW OF LITERATURE

Games and computers are a technology that seeks to enhance the motivation and quality of students learning experiences [13]-[15]. Aldrich [16] stated that educational games are designed for learning, which are the subset of both concepts of play and fun as well as combination of lesson content, learning principles and computer games. Generally, all games must have some basic criteria so that they are favorable to many, though, each game should have its own specific criteria so that it is more prominent than others. Basic criteria means the common feature each game has to offer while the specific criteria are the unique features of a game that is missing from other games [17]-[19]. The following paragraph discusses the common criteria of video games and computers.

History subject is part of mandatory curriculum throughout the world. This is due to importance of the subject in shaping the younger people minds and knowledge about their root, culture and process of civilisation that happen in the society. Apart from that, History subject also important to teach our kids about the lesson from the past, both on good and bad things that happen within the society. Despite its importance, student always regard History as boring subject [10], [20], [21]. In a preliminary analysis about the issues of learning History subject, [21] found that almost 15% of student taking Islamic History subject failed in their examination as compared to other subject with average of less than 5% failure rate. This make the subject with the highest failure rate.

A. Video and Computer Games Design Criteria

High level of interest among players, especially teenagers and children on video games and computers, has been an initiative for researchers to study what criteria are present in games that makes them so attractive. The next paragraph discusses these criteria as a result of the suggestions and views of experts and field game players.

According to [22] good games can make players “go” into the game and do not realize what's going on around them, the question is how to build such games? He added that there was no fixed formula to ensure this, but there are some general principles that can help us design a good game by paying close attention to how the game is played. Game designers also need to look beyond the basic features of the game and what a foundation makes it fun. They further suggest that some criteria for a good game includes game mechanic, interactive challenges, goal and subgoals, reward, and interactivity. Study by [23]

suggested six criteria for a good games which are goals, rules and games constraint, competition, interactivity, uncertainty and situated.

Meanwhile, [24] discuss several criteria of a good games including storyline, game mechanics, immersive graphics environment, interactivity, challenges, risk and impact. In conclusion, several criteria of good games were derived from past studies as follows – goals, challenges, rewards, competition, rules, games story, games mechanics, interactivity, uncertainty, situated and nice graphic. Here are the description of the above criteria.

Goal refers to the ultimate goal to be achieved during the game play process. Can consist of several side goals. Challenges refers to difficulties that players need to overcome in their quest for specific goals. Rewards refers to scores or any bonuses / rewards if the player can overcome the challenge. Competition refers to an opponent who needs to be solved in the game, either another player or computer. Rules refers to Things that need to be met in the process of achieving goals. Storyline refers to The story of the game that may be related to the real world or fictional story. Integrating these criteria is important to determine the success and effectiveness of a video game and computer. This criterion must also be applied during the process of designing a computerized educational game.

B. Educational Computer Games Design Criteria

High interest and consumption of games worldwide resulted in high number of studies conducted on the area both on entertainment and educational games. However, the challenge lies on how to design a games that effective enough for learning a specific subject or topic. Several studies proposed that good EG must carefully combines both game features and appropriate learning features [25]-[27] [7]. Game features include game properties that make it a real game, and not just an interactive computer application as claim by many but it is just an interactive multimedia application [28], [29]. Learning features refer to the theory or concept of learning applied into educational games. The following paragraph contains suggestions about the design of good educational games.

Computer games are said to be able to convey the basic concepts of complex science [30] but it is difficult to design and implement a game that contained the concept of deep science and at the same time, could attract students continuously. The study has outline several consideration during the design process as follows:

- 1) *Game Design*: develops strategies for engaging play activities, also delivers real lesson content to players;
- 2) *Integration*: Build learning tools to generate and answer questions that guide students to the exploration and discovery of desired content;
- 3) *Multiple Measurements*: build simulations and visualizations for biological processes display on various physical measurements.

Study by [31] suggests three major elements of an educational games design: content, fun and social interaction. Details can be refer to Table I.

TABLE I. GOOD GAMES ELEMENTS [31]

Element and Explanations
Content
The suitability of the target /goal - the content should be appropriate to user's development, level of instruction and learning goals. Integration - lesson content should be a component integrated into the game. Scaffolding - feedback given to improper action responses should provide opportunities for learning, exposing players to the content of the lesson and supporting them to continue playing. Extensibility-learning is facilitated by an effective combination of multiple sources (digital and physical). Media match - a topic can be effectively displayed using appropriate media for the topic such as animation, sound and interactive map according to the content suitability.
Fun: Game centred of activity
A clear goal - the game should provide players with a clear goal at a certain time to help them focus on game activity, build appropriate strategies and define their actions. Concentration - the game should maintain the concentration of the player through the appropriate stimuli so the player's attention is fully against the game's activity. Challenges - to most players, testing their capabilities and overcoming obstacles is the main reason they play. Feedback - players must receive feedback not only on interacting effects but also on success or study process to terminate game tasks. Feedback is informative. Preoccupation - the player should feel completely absorbed by the game, feeling "absorbed" into the game until it is unaware of the surroundings.
Social interaction: for learning collaboration
Relationships - games should make players feel "there" with other players. Collaboration - collaboration with "far" players and close co-located players. Resistance - the child is especially happy when he or she can beat his peers or games.

Another interesting study suggested three concepts of effective games design elements which are: matching of topic with appropriate activity, educational content as the centre of learning and games needs to provide feedback that able to scaffold the players towards advanced content [25]. A study looking at game design features from the user experience perspectives [32] in order to measure a good educational games. Their review shown that the important elements are flow, immersion, game system, player context, game usability, learnability and learning content. Those elements are important to be apply both during design and evaluation process to ensure a good game was created or chosen for the students.

It is suggested that educational games design and development should combine both expertise in game design as well as content experts to ensure the development of successful games [33]. If the development is left to educators, the resulting games may be neither fun, nor engaging; in contrast, if entertaining games designers dominate the design process, the games may fail to apply key pedagogical principles that are vital for effective learning.

Hays [34] in his study suggested several elements of good instructional game design including challenges, fantasy, curiosity, and instructional quality. Challenges refers to game goal, results, and competition while instructional quality refers to logical instructional structure and wider teaching program. Challenges include goal, difficult results, and competition. Fantasy consists of emotional instructions and metaphor while curiosity include optimized level of complexity and instructional quality is about logical instructional structure. Another study [7] suggested educational games should carefully combined three aspects: game design, pedagogy and learning content. Similarly, [20] suggested that good educational games should incorporate educational elements and digital game elements with a detailed sub-element or that is more in depth to suit the specific games. The details of their recommendation shown in Fig. 2.

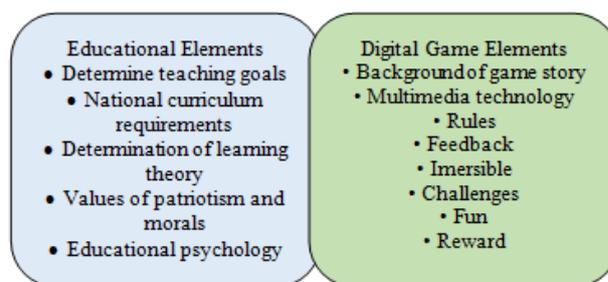


Figure 2. Educational games elements and educational elements by [22].

III. PROPOSED FRAMEWORK FOR QUALITY EDUCATIONAL GAMES DESIGN

The analysis of the EG design suggests that it must be designed by integrating two main components, Game Components and Learning Components. Both of these components need to be carefully crafted to ensure that the game is effective in meeting the objectives of a game as well as the learning objectives in order to meet the learnign goals that is to ensure students learn the subjects effectively within an enjoyable learning environment.

Therefore, the careful and balance mixture of game and learning features is a key issue for the design and development of the EG. Following is the recommendation on the subcomponents of the two main components discussed above. This subcomponent should be the basis for the design of any EG together with additional subcomponents based on specific subject or requirement of the EG.

A. Games Components

There are 6 subcomponents of the Game as shown in Fig. 3. Challenges means that the EG must have certain challenge that players need to go through as a normal computer game. This challenges becomes a matter of dealing with players ego knowledge to play and win the game. Careful consideration needed in order to design an

acceptable level of challenges which is not too difficult nor too easy.

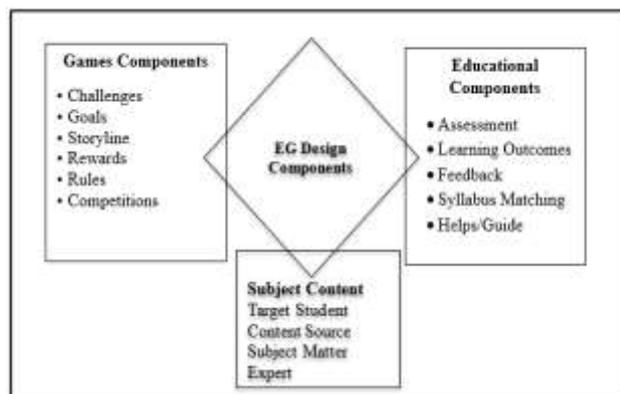


Figure 3. Proposed educational games design quality framework

The storyline can make a player imagine that he is inside an atmosphere and a unique world he represented during the playing process. This storyline is important to build up the connection between game early and final stage as well as the process that takes place during the game. Reward is a result earned by the player during and after completing the game. It can be money, life, weapons and so on that players can use to cope with challenges while playing or evaluating the extent of player skills for the game. A game already has rules that players need to follow. It is a set of guides that can be made or can not be made while playing. Competition refers to battle or fight with other characters in the game or against the computer to achieve higher rank in the games. Certain cases whereby the games does not have character to fight with, competition may be possible in the form of a predetermined amount of time and players need to reach a certain target within that time.

B. Educational Components

Meanwhile, the learning component needs to meet some of the key aspects of learning, the game must have an element of assessment to enable players to assess their level of control over the subject being studied. The game also needs to use the learning outcomes element to ensure that the developed games meet the learning outcomes of a specific topic or subject. To ensure the learning process takes place well, the game needs to have a feedback element at a certain time in the game; for example if the player wants to ask about something or if the player makes a mistake especially during the assessment activity. The EG should also include actual learning content by matching the syllabus that is being used as game content. This is important to ensure the learning content match with the content that students need to learn. Also to ensure that the games contains the authentic content in the right manner. Last but not least, the basic components of the EG are the help elements in which the game provides assistance throughout the playing process to ensure the game session does not stop just because the student has no knowledge of certain things. Assistance is also important in helping students build knowledge during the EG playing process.

C. Subject Content

Refers to specific learning subject that the games will need to be developed. This contains target student, content source and subject matter expert. Target student refers to who the student are and what are their issues with learnign the subject. Content source refers to the main content that is used to teach the subject, it can be text book, digital materials or learning modules. Subject matter expert is useful to confirm the soruce and validity of content. It would be more useful if they are from the group who teach the subject so inputs on student learning issues abotu the subject also can be obtained from them.

IV. CONCLUSION

In conclusion, the developer of a game app and members involved must take into account and understand the components that need to be considered during the design process of educational games applications. This is to ensure that important features have been carefully reviewed and properly selected in optimizing the outcome of the game on student learning. Furthermore, it is also to ensure that the developed games fulfill the games features rather than just a multimedia interactive application, together with balance of games and educational elements. This is also to ensure the return for cost of investments due to nature of games development that requires high amount of investment value. What is certain is that a EG must be carefully designed and developed to ensure the balance of game elements and educational elements so that the ultimate goal of EG will be met.

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