Game-based Learning and Gamification: Searching for Definitions

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Abstract - **Different forms of computer games are widely used in the education field. Designing appropriate games can increase the acceptance of learning content by the learner. This study presents a definition of games, computer games, and the games that are employed within education. The definition of edutainment, educational games, game-based learning, and gamification are presented. The role of serious games for learning are clearly described. The differences between game-based learning and gamification are formulated. Researchers will find these findings helpful to distinguish game-based learning and gamification and to determine suitable designs for delivering learning content.**

Keywords - games, edutainment, educational games, game-based learning, gamification.

I. INTRODUCTION

The development of technology led to the fascinating progress of computer games. Despite the adverse effect of the computer game, positive involvement of game into several non-games areas is empirically proven [1], [2]. In the education field, games can be utilized as a mean to deliver learning content. Various form of game involvements in learning and pedagogy can be found in several studies [3]–[6]. Among them, game-based learning and gamification have become the prominent concern to many researchers. This study aims to highlight the differences between game-based learning and gamification. This study also tracked back the position of game-based learning and gamification in delivering learning content. Understanding this may lead to design appropriate design of learning deliverance. Some situation is suitable to solve by game-based learning, on the other hand, another situation may be proper to solve by game-based learning.

II. GAMES AND DIGITAL GAMES

Games is an activity that closely connected to the history of humankind. Games are sometimes related to "play" concept, as well as "fun" as they are basic characteristics of humankind. Johan Huizinga, [7] denotes play as an independent activity that considered as " not serious." The play can capture the player "intensely and utterly." Play defines specific rules and order, free from material interests and promote the creation of social grouping. Roger Callois [8] stated that play as a non-compulsory activity, with uncertain outcomes, defined by rules, generates no material fortune and uses its space and time.

Encyclopedia Britannica [9], differs play from games by several conditions. The Play is considered as spontaneous play, while games are regarded as organized play. An organized play (games) can be divided into noncompetitive games and competitive games (contest). And contests itself encompass physical contest or intellectual contests.

Prenski [10] stated games are a combination of fun and play, a significant force that enables engagement between games and their player. And furthermore, Prensky proposed six fundamental structural elements of games comprising: (1) Rules, (2) Goals and Objectives, (3) Outcomes and Feedback, (4) Conflict or Competition or Challenge or Opposition, (5) Interaction and (6) Representation or Story. Besides, Prenski stated digital games as merely putting games into a computer, where the most significant part of computer-enhanced "play experience"-took place.

More recent definition of games is proposed by [11], stated that playing games fulfill perennial psychological necessity. A game is a mental or physical contest according to specific objectives. Framework or rules determine what player allowed and not allowed to do within a game realm. And a digital game is any game executed on digital equipment and cover the large variety of games played at game console, mobile phone, tablet Computer, over the internet, and even at the arcades. It means that serious games implement serious combination of serious aspects such as education, communication, or information and playful characteristics of games (video games). Furthermore, [12] argued that serious games should combine video games with one or more utility function for example training, data exchange, disseminating a message. Furthermore, it has target market beyond entertainment are for example education, training, communication, defense. And finally, to classify the serious games, [12] proposed G/P/S model consisted of gameplay, purpose, and sector, a serious game should bring gameplay (G) as well as deliver purpose (P) in specific domain (S).

III. SERIOUS GAMES

Since this study focused on digital game-based learning, it is essential to verify the position of digital game-based learning, e-learning, edutainment and serious games. According to [13], their domain is somehow related and overlapped.

The authors in [14] claim serious games are the games that exclude fun, entertainment, and enjoyment from their important objectives. Nevertheless, serious games still bring entertainment, joy, and happiness to their user, with a hidden purpose. For example, a game called America's Army created by United States Army delivered an entertaining experience to their use as a "soldier," but it has hidden purposes that is training and testing environment for mission rehearsal, intelligence capability training, survival and first aid training.

Long before serious games became famous, edutainment existed to bring combination of education and entertainment. According to [14], edutainment represents any form of education that also has an entertaining purpose. And Edutainment is not limited to utilization of video games or digital games but also any other variety of application even though most of the edutainment is delivered in video games.

Several studies showed that in the beginning, concepts of edutainment brought strong evidence as the significant education innovation. Implementation of these edu-games delivered effective and efficient learning among variety level of students in numerous subjects [15].

Unfortunately, some research reveals the weakness of edutainment. According to [16], edutainment offered drill and practices type of education blend into gameplay. It is considered to be the worst kind of education activities. Besides, [17] argued that edutainment is a perfect example of Shavian reversals. Edutainment inherits poor characteristics of their ancestors, worst type of education activities (drill and practices) and less enjoyable gameplay.

Serious games definition that can be found in research or industry area proposed that serious games bring entertainment aspect with it, and sometimes employed multimodal interaction to enhance their user's experience [18], [19]. [20] stated that an essential component of a serious game is the experience. A serious games' user is exposed to a designated environment that delivered unique content such as know-how or expertise. Experience along with two others components-entertainment and multimedia-shapes the definition of serious games. [20] also differentiated serious games from training Simulator, video games and sports as depicted in figure 1. Furthermore, [20] also proposed a taxonomy of serious games that consists of five elements: Activity, modality, interaction style, Environment, and Interaction Style.
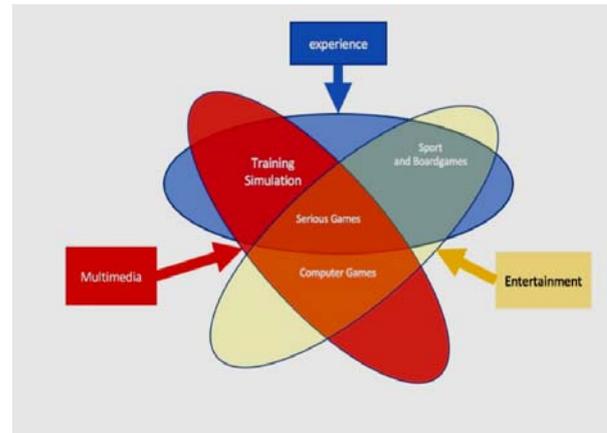

Figure 1: the position of serious games among another application source: [20]

Another definition is stated by [12], that summarized the definition of serious games into :

Serious Game = Utilitarian function(s) + Video Game

It means that serious games implement a serious combination of serious aspects such as education, communication, or information and playful characteristics of games (video games). Furthermore, [12] argued that serious games should combine video games with one or more utility function for example training, data exchange, disseminating the message. Furthermore, it has target market beyond entertainment are for instance education, training, communication, defense. And finally, to classify the serious games, [12] proposed G/P/S model consisted of gameplay, purpose, and sector, a serious game should bring gameplay (G) as well as deliver purpose (P) in a specific domain (S).

IV. GAME-BASED LEARNING

According to [21], nowadays' student is different from the people our learning system was designed to give learning. These students from all level of education institutions denote the first generations that surrounded by and employing the computer, computer games, mobile device and another digital device during their growth periods. They are so-called "Digital Natives." Digital natives get used to twitch speed, multitasking, random access, graphics-first, active, connected, fun, fantasy and quick payoff world of their digital games, internet and weary by existing learning approaches. " New media socialization" created all these cognitive deviations and changed the abilities and learning style of the Digital Natives. This is the significant reason why digital game-based learning arises and evolves.

Furthermore, [21] introduced digital game-based learning, a term for utilization of educational game software

for learning. Prensky also stated that two significant reasons why learning should be blended with games are radical changes on learner and how to motivate this kind of learners.

According to [22], the term "educational game" is sometimes used to replace game based learning term. [22] argued that definition of educational games is the utilization of computer or video games to deliver immersive and attractive learning experiences for giving particular learning goal, experiences, and result.

Another definition is proposed by [23]. Their study stated game-based learning is innovative learning approach applying computer games completed with educational value. It also covers games software equipped with educational intention such as learning aid, teaching improvement, and students' evaluation.

In addition, [24] proposed definitions of game-based learning are the type of gameplay with defined learning outcomes. Adjacent to this definition, (Plass, Perlin, & Nordlinger, 2010) as stated in [25] argued that, the process of designing games for educational purposes comprises balancing the demand to encompass the subject matter with the intention to emphasize on gameplay.

Based on existing theory and previous research, game-based learning is believed as an effective learning environment. There are at least four arguments that support it: Motivation, Player Engagement, Additivity, and Graceful Failure [25].

Furthermore, [26] proposed vital principles and mechanisms involved within game-based learning as depicted in figure 2. [26] also separate gamification from game-based learning definition, as it stated gamification is about employing 'elements' taken from video-game design to be adopted and implemented in various contexts, rather than using sole video games.
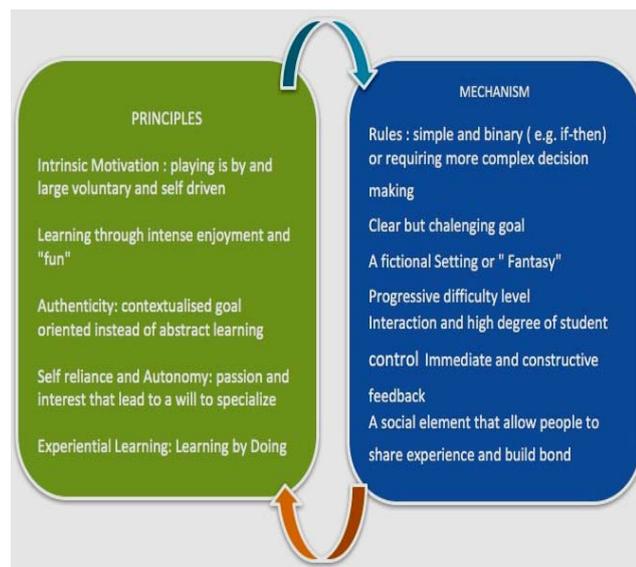

Figure 2. The principles and mechanisms of game-based learning [26].

V. GAMIFICATION

Gamification has been widely discussed among academics, professionals in business and practitioners in various areas such as learning, computer-human interaction, health and information studies [27]. In a discussion concerning digital game-based learning, gamification sometimes comes up to the surface of the concept as it is believed to be the same concept as gamification. This section will explore the definitions of gamification and the differences or if any relationships between those two concepts.

It seemed that there is no precise or standardized definition of what gamification is, but there is a little linkage according to supporting theories and what gamification covers. The term Gamification is used to express those aspects of the interactive system that intend to motivate and get end users to become involved, through the utilization of game mechanics and elements [27].

Gamification is known since a long time ago, derived from marketing efforts such as points card and rewards memberships, structures of education, most crucial scientific level, degrees and grade and productivity in the workplace.[28]. [29] Proposed a strong definition that can be used to distinct gamification with other gaming or playing concepts. They claimed Gamification refers to:

- the use (rather than the extension) of
- design (rather than game-based technology or other game- related practices)
- elements (rather than full-fledged games)
- characteristic for games (rather than play or playfulness)
- in non-game contexts (regardless of specific usage intentions, contexts, or media implementation).

VI. GAMIFICATION AND GAME-BASED LEARNING

A study conducted by [30] stated game-based learning employs a real game to deliver skill and knowledge. It has an independent unit with a certain start, gameplay and ending state. There is a "win state" for learner engaged within game. And games offers different kind of educational content in various setting.

On the contrary, Gamification only employs a small number of game elements. The student does not interact with the whole game from start to the end, and they get involved in a session that utilizes game elements such as getting awarded for finishing a task/problem, cope with obstacle/challenge and getting points.

Game-based learning is sometimes employed as a one-period instructional occurrence to give formal learning within the classroom as well as online. Otherwise, gamification does not always take place in class. It can be delivered to a learner PC or handheld devices [30].

TABLE 1: THREE TRAJECTORIES RELATING TO VIDEO GAMES AND HCI

The use of games in the non-game context	Fully-fledged games/ Serious games	Health Games
		News Games
		Persuasive Games
		Simulation and Training Games
		Edugames
		Design Games
		Games with Purposes
	Game elements	Game technology
		Gameful design (Gamification)
		Game practices
Extension of games/ pervasive games	Alternate Reality Games	
	LARPs	
	Augmented Reality Games	
	Location-based Games	
Playful Interaction	Serious Toys	
	Playful Design	

According to [29], within the socio-cultural trend of ludification (an act of deception or mockery, see https://en.wiktionary.org/wiki/ludification), there are at least three trajectories relating to video games and HCI: the extension of games (pervasive games), the use of games in non-game contexts, and playful interaction.

The use of games in non-game contexts falls into full-fledged games (serious games) and game elements, which can be further differentiated into game technology, game practices, and game design. The latter refers to "gamification." The position of gamification within the socio-cultural trend of ludification can be described in table 1 and figure 3.
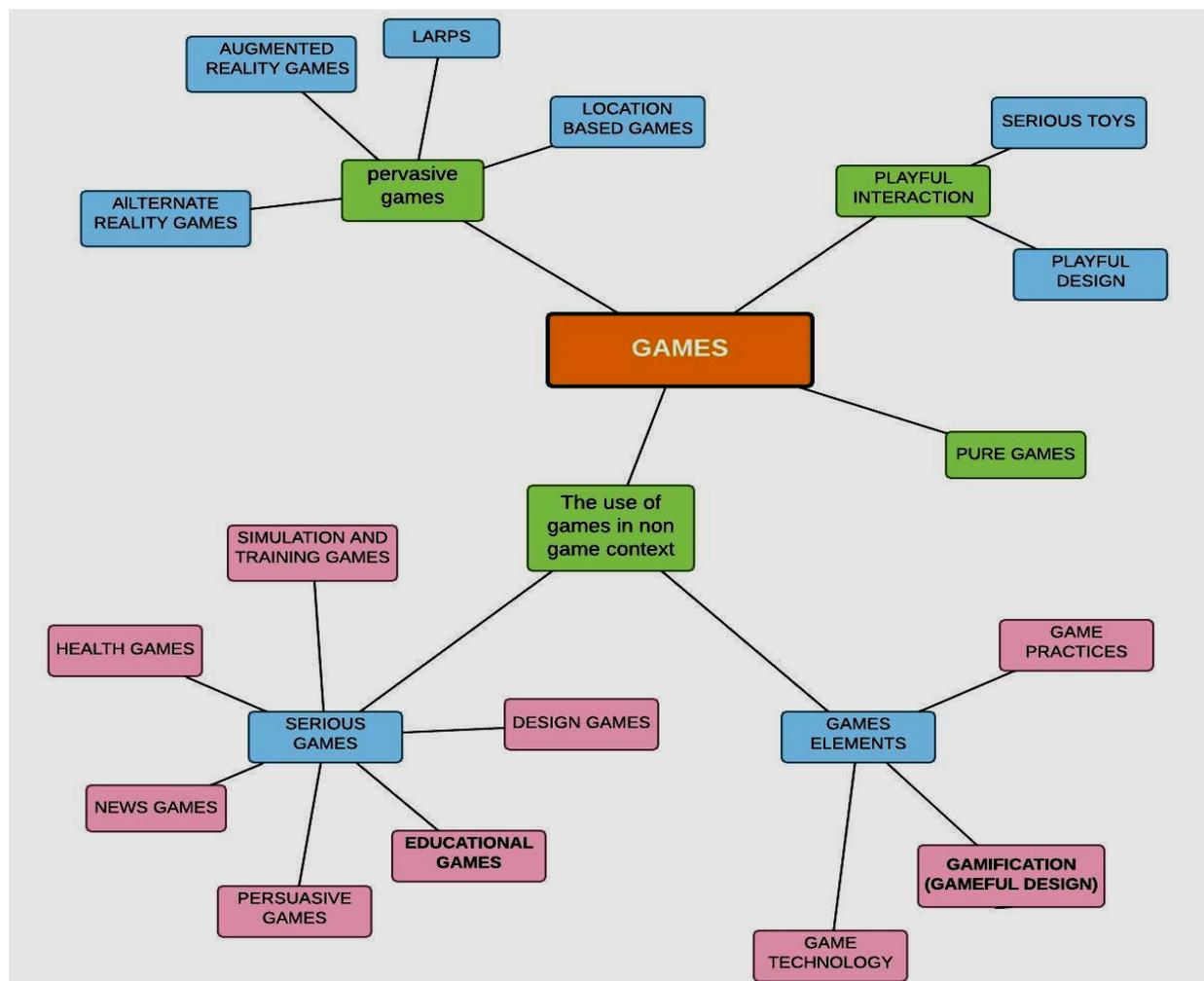

Figure 3: Position of Gamification within other use of the game in non-game context [29].

VII. CONCLUSIONS

This study has led us to these following proposed concepts:

- Serious games are a part of digital games where the serious or hidden purposes are well blended inside the digital application where fun, entertainment and enjoyment, is not a primary objective of the application itself but as strategies to deliver the real purposes such as education, training or basic knowledge in particular area.

- Serious games perfected edutainment concept to get rid of drill and practice as a primary method for delivering learning content, offering the richer concept of playing such as puzzle, role-playing game, simulation, etc.

- Game-based learning that can be regarded as educational games is a subset of serious games, where fully- fledged game is developed to deliver immersive and attractive learning experiences for giving particular learning goal, experiences and result [22]. Thus, game-based learning is a game containing learning content derived from school curriculum or essential life skill to enhance the learning experience that is believed increased the understanding of learner upon delivered learning contents.

- On the other hand, gamification is a concept outside serious games, since it implements game element-not fully fledged game into a non-game environment. It can be applied to school learning, software production process, sales management or even into the web-based e-learning application.

- Finally, it is undeniable that game-based learning differs from gamification. Game-based learning presents fully-fledged games form while gamification utilizes game element into non-game context without using fully-fledged games inside the activities.

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