Investigating the Relationship between Player Types and Learning Styles in Gamification Design

Zahra Abdollahzade , Seyed Mohammad bagher Jafari [*]

Department of Industrial and Financial Management, Faculty of Management and Accounting, College of Farabi, University of Tehran, Qom, Iran

Abstract

An educational gamification is a new approach that has developed hopes to increase the effectiveness of learning. Computer game users are actually players that are categorized according to their personalities and have different learning styles. To achieve maximum performance in designing gamified learning, one can determine the relationship between player types and their learning styles, and then use this relationship to design better gamification in the field of education. In this research, the relationship between types of players based on Hexad scale model and the dimensions of Felder-Silverman Learning Style Model (FSLSM) have been investigated. To this end, the research data were collected from 121 university students. After analyzing the results of the crosstab and Pearson's Chi-square test, five hypotheses were approved from ten developed hypotheses, which could be used to guide the more effective design of gamification elements.

Keywords

---

[*] **Corresponding Author, Email:** sm.jafari@ut.ac.ir

Introduction

At present, the major problems in modern education are the lack of motivation and engagement of learners for active participation in learning processes; for this reason, instructors and educators seek to use new approaches and techniques to stimulate learning and motivation to participate in the learning process (Kiryakova et al., 2014). This kind of opportunity is provided by educational gamification that uses gamified systems, player experiences and cultural roles to shape learners' behavior in an e-learning environment. One of the important components of game is the presence of players that play a role and influence the learning success; players have different types based on their characteristics and behaviors that they represent; categorization of player types has been illustrated by Bartle (1996), Yee (2006), Ferro et al. (2013), Nacke et al. (2014), and Marczewski (2015).

It should be noted that one of the important success factors for educational programs is an understanding of character and type of learners (Huang & Soman, 2013). For example, some learners have the best mode of learning when they interact with others, but others are more likely to learn individually; in fact, the learning style is the preferences of the learner for how to present material, internalize information and learn (Al-Jabari, 2015). The relationship between learning style and player type has been so far the center of attention in various researchers (Rapeepisarn et al., 2008; Ferro et al., 2013; Khenissi et al., 2013; Konert et al., 2013; Monterrat et al., 2014; Gil et al., 2015; Gil Pérez, 2015; Khenissi et al., 2016), and the importance of identifying the player type in choosing appropriate game elements is practically investigated by researchers such as Tondello et al. (2016) and Engedal (2016). And Gil Pérez et al. (2015) in their study emphasized the choice of appropriate game elements based on learner characteristics including learning styles, player types, and etcetera. But, they only examined the impact of types of player based on Hexad scale

model and gamification mechanics and did not study the learning style.

Grünewald et al. (2013) have also proposed the identification of personality and learning style in gamification to improve teaching services; however, it should be noted that the relationship between player type, learning style and the choice of gamification elements on the basis of this connection have been studied less. Therefore, in this research, it has been tried to fill in the mentioned gap by applying one type of player model, which, on the one hand, covers a comprehensive player type and is a suitable framework for the selection of gamification elements and, on the other hand, is adapted to the learning styles. For this purpose, the model of Hexad scale player types and the learning styles by Felder and Silverman were selected and studied.

Research Literature and Research Background

Learning Styles (LS)

Learners adopt different methods of processing, interacting, and dealing with information. These methods or preferences are called learning styles (Al-Jaberi, 2015). For example, some people like learning things by doing things, and others learn just by reading (Felder & Silverman, 2000). Understanding a student's LS helps to improve the learning process, for example, educators can provide personalized materials related to learners with a learning style, thereby the levels of satisfaction and learning outcomes are increased and the needed time for learning is decreased (Bernard et al., 2017).

The common types of learning styles are Kolb's model, Dunn and Dunn's VAK model, the Big Five model, the Honey and Mumford models, the Felder and Silverman learning styles (Khenissi et al., 2016), the Gregorian model, the Carl index model, and Brick Meyers, Howard Gardner and Chris Jackson's style (Deborah et al., 2014). Among the different learning styles, Felder and Silverman's style is selected by many researchers because it describes the learner's LS in more details, with four different dimensions of learner's preferences as well as psychological aspects of learning. Four dimensions of Felder and Solomon's learning styles are active/reflective, sequential/global,

visual/verbal, and sensing/intuitive.

Gamification

According to Zicherman's definition, "gamification is the process that involves the application of game elements and design techniques in a non-game context, which often takes place in the formation of the final user's behavior"; the gamification is a combination of mechanics, dynamics, and game rules along with an important element of interaction. Mechanics and dynamics are expressed in a framework called MDA: This framework stands for mechanics, dynamics, and aesthetics (Zicherman & Cunningham, 2011, p. 18). Game mechanics are rules and rewards that create a competitive game between users and make the activities challenging, fun and satisfying. Mechanics are in fact extrinsic motivators. The game's dynamics are the motive for users to play by game mechanics. Dynamics are in fact intrinsic motivators (Bunchball, 2010). Game aesthetics represent the emotional response outcomes among end users as they participate in various activities in gamified applications (Ruhi, 2015). Game Mechanics, Dynamics and Aesthetics (MDA) are interconnected in the way depicted in Figure 1.
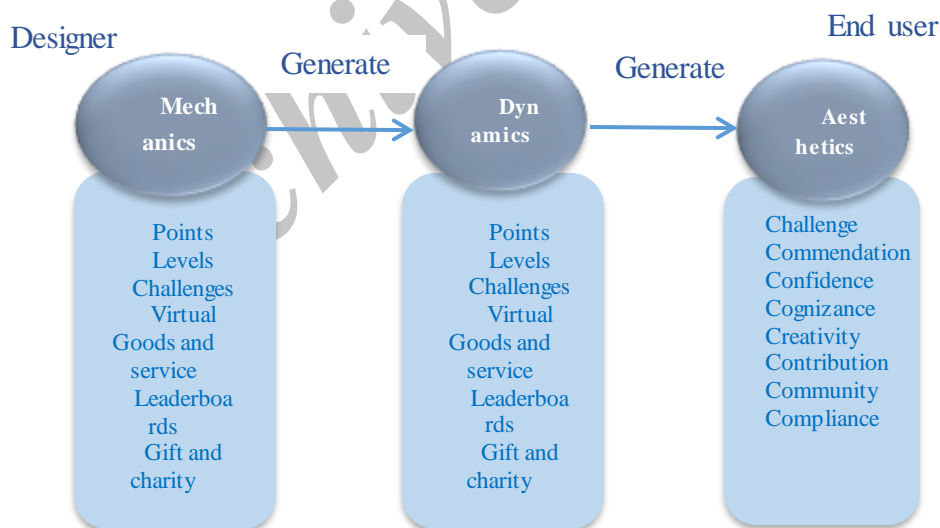

Figure *1.* The MDA Framework (Ruhi, 2015)

Educational gamification uses gamified systems, players' experiences and cultural roles to shape learners' behavior. The e-learning system, if properly used, can increase the satisfaction, effectiveness, and efficiency of all students; games often allow players to play again and make mistakes, and also it gives them freedom in failure, they can learn without fear and gain experience safely as they increase their engagement.

One of the important success factors for educational programs is an understanding of character which causes empowering learners in order to achieve their goals and educational programs (Huang & Soman, 2013). When the instructor decides to apply new approaches to the educational process, he must pay attention to the personality and LS of the learner to use the most appropriate game mechanics (Kiryakova et al., 2014). Thus, the choice of appropriate game elements is based on learner's characteristics.

Player types

The players' type model looks for the casting category according to the characteristics they show as they play. The most famous model of the cast, presented by Bartle (1996), which includes four types of players: Achiever, explorer, killer, and socializer is an informal and qualitative model (Engedal, 2016); but it does not reflect all types of players addressed by today's games (Monterrat et al., 2015), Yee (2006) categorized players based on three main motivations: Achievement, social interaction, and immersion. Ferro et al. (2013) also focusing on gamification personalization, have divided players into five categories: Dominant, objectivist, humanist, inquisitive and creative. Nacke et al. (2014) have also categorized players based on neurological findings and have identified seven types of players: Seeker, survivor, daredevil, mastermind, conqueror, and socializer. Marczewski (2015) proposed Hexad scale model that divided players into six categories: Philanthropists, socializer, free spirit, achiever, player, and disruptor (see Figure 2).
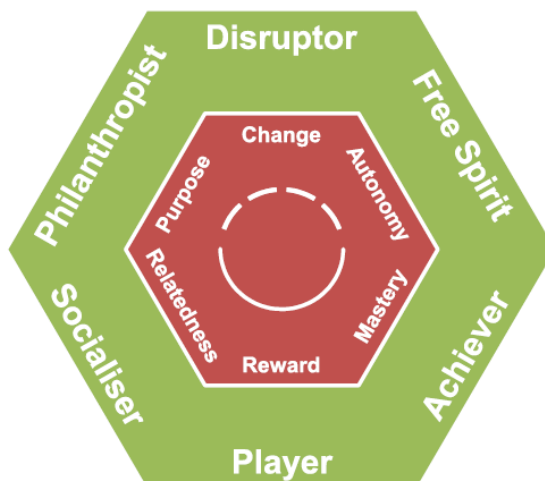
Figure *2*. Hexad scale player types model (Marczewski, 2015)

Due to the appropriateness of such categorization with Felder and Silverman's learning styles, this type of category has been used in this research.

The relationship between the model of learning styles and the Player types

Considering the fact that in previous studies, it has been emphasized that the composition of the LS and the type of player is fully analyzed (Konert et al., 2013; Engedal, 2016), in the present study, the relationship between the four dimensions of learning styles of Felder and Silverman, which are The active/reflective, sequential/global, sensing/intuitive, visual/verbal styles, as well as Hexad scale model of player type are studied.

Philanthropists seek to share their knowledge with others and help their peers, and they are motivated by administrative roles (Gregorc, 1979; Gil et al., 2015; Gil Pérez, 2015; Tondello et al., 2016), and in the active learning style, learners seek experimental learning and learning through participation in teams, (Tondello et al., 2016), Active

learners prefer teamwork and collaboration (Huang et al., 2012). So, it can be said that the active LS is consistent with Philanthropist players, and thus, the first hypothesis is as follows:

H1: Philanthropists have an active learning Style (LS).

In an active LS, learners prefer convergence with the surroundings and communicate with others; they enjoy teamwork and collaboration (Felder & Silverman, 1988). On the other hand, socializer users also want interaction and social communication, and teamwork motivates them (Tuunanen & Hamari, 2012). So, it seems that socializer players are fit for active LS and the second hypothesis is presented as follows:

H2: Socializers have an active LS.

In the reflective LS, learners like to analyze the subjects on their own and make theories (Felder & Silverman, 1988); on the other hand, free spirit players also like independence and prefer to take control of things and hate others to control them (Tuunanen & Hamari, 2012; Tondello et al., 2016). So, it can be said that the free spirit players have a reflective LS and, accordingly, the third hypothesis is formulated as follows:

H3: Free spirits have a reflective LS.

In the sensing LS, sensing learners tend to learn facts and solve problems with known methods and standard approaches (Felder & Silverman, 1988). On the other hand, achiever players like to accomplish their tasks by discovering facts and evidence and reach the goal by following the setout standard steps (Tuunanen & Hamari, 2012; Tondello et al., 2016). Therefore, the fourth hypothesis is expressed as follows:

H4: Achievers have a sensing LS.

Intuitive learners are very inclined to discover relationships and opportunities, as well as to create creativity and innovation. In this style, repetition is very unpleasant, and complexity and exploration are very desirable (Felder & Silverman, 1988). On the other hand, free spirit players are also looking for creativity, system creation, and discovery, and are keen on exploratory work, creativity, and innovation. They want to create and discover a system. The motivating elements of this category include exploratory work, non-linear play, unobtrusive

content, creativity and customization tools (Tuunanen & Hamari, 2012; Tondello et al., 2016). Given the above explanation, the fifth hypothesis is as follows:

H5: Free spirits have an intuitive LS.

Also, given that in intuitive LS, learners avoid repetition of the present situation and seek to discover new relationships and create creativity and love complexity (Felder & Silverman, 1988; Felder & Soloman, 2000) and, on the other hand, disruptor players are very interested in changing the status quo and have the morale of disturbance and disruption of the current system (Tuunanen & Hamari, 2012; Tondello et al., 2016). Therefore, the sixth hypothesis is expressed as follows:

H6: Disruptors have an intuitive LS.

Visual learners prefer to receive content in visually similar ways, such as images, diagrams, and photos. The best way to remember for this group of people is to look at what they have seen others (Huang et al., 2012; Khenissi et al., 2016). Player also have motivational elements such as prizes and rewards, leaderboards, achievements and badges, virtual cash and luck games and lotteries (Gregorc, 1979; Gil et al., 2015; Gil Pérez, 2015; Tuunanen & Hamari, 2012; Tondello et al., 2016), and, so it can be said that these types of players are fit for visual LS. And the seventh hypothesis is formed:

H7: Players have a visual LS.

Learning in verbal learners is at the highest possible level while connecting with others and explaining the content to them (Huang et al., 2012; Khenissi et al., 2016) and socializer players also want to connect and interact with other people and participate in networks and firms (Tuunanen & Hamari, 2012; Tondello et al., 2016). And, so it can be said that the verbal LS is very suitable for socializer learners and the eighth hypothesis is formed:

H8: Socializers have a verbal LS.

In the sequential LS, the content is injected sequentially into the learner, and the degree of difficulty increases in stages (Felder & Silverman, 1988). Sequential learners also tend to categorize

information in a straightforward style and follow logic steps in solving problems. The achievers are also looking for following step-by-step periods to ensure and complete the tasks that have been given over to them (Tondello et al., 2016; Huang et al., 2012; Kenosis et al., 2016). Accordingly, the ninth hypothesis is formed as follows:

H9: Achievers have a sequential LS.

In the global LS, learning is done using large leaps, and learners tend to browse the content and gain widespread knowledge. It does not matter to them how they solve a problem and take steps and stages, but they can solve difficult problems (Huang et al., 2012; Khenissi et al., 2016). On the other hand, disruptor players are not tied to order and they are not happy at all with step-by-step stages (Tondello et al., 2016). In this way, the tenth hypothesis is formulated as follows:

H10: Disruptors have a Global LS.

Research Method

Participation

Since 97% of the youth play computer and video games (Jackson, 2016) and especially 62% of Iranians who play computer games are between 12 and 34 years old (Roshandel, 2017); and because the majority of these groups are students, a sample of 121 was randomly selected from university students in Qom province who are involved with education and learning.

Instruments

In this research, two questionnaires were used, first one of which was related to the model of learning styles provided by Felder and Solomon and used in this study to assess the students' LS. The questionnaire contains 44 questions related to four dimensions of LS and it can be used to learn the style of each person in each dimension, which is a number between − 11 and +11.

Learners have individual preferences for each dimension that can be strong, moderate, or balanced. FSLSM expresses these preferences on a scale from +11 to − 11 per dimension. For example, in sequential/global dimension, the value +11 means that a learner has a

strong preference for sequential learning style, whereas the value − 11 states that a learner has a strong preference for global LS.

The second questionnaire used to measure the type of player (here the learners) is presented by Tondello et al. (2016). In the questionnaire, 24 questions were asked about the six types of players, each of the four questions being related to one player. Respondents were able to answer the questions using the 5-point Likert scale (1 = *I totally agree* and 5 = *totally disagree*). In order to assess the reliability of these two types of questionnaires and to ensure the consistency of the questions, the Cronbach's alpha coefficient is used, which is shown in Table 1.

Table 1. Cronbach's Alpha Computation Dimensions of Two Questionnaires

Questionnaire	Dimensions	Number of questions	Cronbach's alpha coefficient	References
Learning Styles Index	Active/Reflective	11	0.5	(Felder & Soloman, 2000)
	Sensing/Intuitive	11	0.5	
	Visual/Verbal	11	0.645	
	Sequential/Global	11	0.544	
Hexad Scale Player Type	Philanthropists	4	0.631	(Tondello et al., 2016)
	Socializer	4	0.761	
	Free Spirit	4	0.666	
	Achiever	4	0.638	
	Disruptor	4	0.625	
	Player	4	0.6	

According to Sekaran and Bougie (2016, P. 290), the high alpha coefficient of 0.6 is the confirmation of the reliability of questions in the Likert spectrum questionnaires. According to Tuckman (1999), the alpha coefficient of 0.5 in this type of questionnaire is confirmatory of learning style index. According to the table, this study is reliable and

consistent.

Method

After distributing questionnaires among students, 121 respondents answered the questions. After reviewing, 22 questionnaires that did not have reliable answers were left and the Analysis was done with the remaining 98 questionnaires. The values obtained from the learning style index of the respondents were classified into three groups according to recommendation of Felder et al., Which were the first group values that range between 5 and 11 referring to the beginning of the pole (for example, active), the second group values that range between -3 and 3, which imply a balanced LS (for example, between active and reflective), and the third group values including the ranges between -11 and -5 referring to the end of the pole (for example, the reflection) (Table 2).

Table 2. Grouping Values Obtained by Felder and Soloman Learning Style

	Values	Dimensions
Group 1	5,7,9,11	Active, Sensing, Visual, Sequential
Group 2	1,3,-1,-3	Balanced Active-Reflective
		Balanced Sensing-intuitive
		Balanced Visual-Verbal
		Balanced Sequential-Global
Group 3	-5,-7,-9,-11	Reflective, Intuitive, Verbal, Global

Replies to the player type questionnaire were also divided into three groups namely, agree, neutral, and disagree, so that values between 1 and 2 were allocated to agree, values between 2 and 4 as neutral, and values between 4 and 5 to disagree. To ensure that a relationship exists between the LS and that kind of player, the Pearson Chi-Square test was used (from the crosstab table), and the Spearman Chi-square test and, if there was a relationship, the strength of the relationship between two variables was measured with the criterion known as "*Cramer's V*". The potential of this test to analyze, based on categories was the main reason for using it in the present study.

Results and Findings

Active/Reflective Dimension

Table 3 . Statistical Results Related to the Relationship between Active/Reflective Dimension and Type of Philanthropist Player

LS			Agree with Philanthropists Player			
			Agree	Neutral	Disagree	Total
Active		Count	14	2	0	16
		% within LS	87.5%	12.5%	0.0%	100%
Balanced		Count	65	1	0	66
		% within LS	98.5%	1.5%	0.0%	100%
Reflective		Count	13	3	0	16
		% within LS	81.3%	18.8%	0.0%	100%
Total		Count	92	6	0	98
		% within LS	93.9%	6.1%	0.0%	100%

According to Table 3, philanthropist people have an active LS. Table 3 shows that people with an active LS and philanthropist are 87.5%, which is higher than those with a philanthropist and reflective LS of 81.3%, and thus, the first hypothesis can be confirmed. To ensure that this relationship is between the active LS and the philanthropist player, the Pearson Chi-Square test was used, whose number is 0.018 and less than the alpha significance level of 0.05. Therefore, the first hypothesis can be safely accepted. The strength of the relationship between active

LS and the type of philanthropist player using Cramer's V measure is 0.286, indicating a weak relationship between the two variables.

Table 4. Statistical Results Related to the Relationship between an Active/Reflective and the Socializer

LS			Agree with Socializer			
			Agree	Neutral	Disagree	Total
Active	Count % within LS		16 100%	0 0.0%	0 0.0%	16 100%
Balanced	Count % within LS		54 81.8%	12 18.2%	0 0.0%	66 100%
Reflective	Count % within LS		10 62.5%	6 37.5%	0 0.0%	16 100%
Total	Count % within LS		80 81.6%	18 18.4%	0 0.0%	98 100%

According to Table 4, socializer individuals also have an active LS. Socializers with an active LS > socializers and reflective LS (100%>62.5%). Pearson's Chi-square test = 0.023 and is below the alpha significance level of 0.05. Cramer's V measure = 0.277, indicating a weak relationship between the two variables. Therefore, the second hypothesis can be confirmed.

Table 5. Statistical Results Related to the Relationship between Active/Reflective and the Free Spirit

LS		Agree with Free Spirit			
		Agree	Neutral	Disagree	Total
Active	Count % within LS	14 87.5%	2 12.5%	0 0.0%	16 100%
Balanced	Count % within LS	50 75.8%	16 24.2%	0 0.0%	66 100%
Reflective	Count % within LS	11 68.8%	4 18.2%	1 6.3%	16 100%
Total	Count % within LS	75 76.5%	22 22.4%	1 1.0%	98 100%

According to Table 5, free spirits do not have reflective LS.

Free spirits with a reflective LS< Free spirits with an active LS (68.8%<87.5%) and with a high level of Pearson's Chi-square (P= 0.174), more than a significant level of 0.05, the third hypothesis is rejected.

Sensing/Intuitive LS

Table 6. Statistical Results Related to the Relationship between the Sensing/Intuitive and the Achiever

LS			Agree with Achiever			
			Agree	Neutral	Disagree	Total
	Sensing	Count	50	2	0	52
		% within LS	96.2%	3.8%	0.0%	100%
	Balanced	Count	38	8	0	46
		% within LS	82.6%	17.4%	0.0%	100%
	Intuitive	Count	0	0	0	0
		% within LS	0.0%	0.0%	0.0%	0.0%
Total		Count	88	10	0	98
		% within LS	89.8%	10.2%	1.0%	100%

According to Table 6, achiever people have a sensing LS.

Achievers with a sensing LS > achiever with an intuitive LS (96.2%>0%), Pearson's Chi-square test = 0.023 and is below the alpha significance level of 0.05. Cramer's V measure = 0.223, indicating a weak relationship between the two variables. Therefore, the fourth hypothesis can be confirmed.

Table 7 . Statistical Results Related to the Relationship between the Sensing/Intuitive and the Free Spirit

LS		Agree with Free Spirit			
		Agree	Neutral	Disagree	Total
Sensing	Count % within LS	40 76.9%	12 23.1%	0 0.0%	52 100%
Balanced	Count % within LS	35 77.9%	10 22.2%	0 0.0%	45 100%
Intuitive	Count % within LS	1 100 %	0 0.0%	0 0.0%	1 100%
Total	Count % within LS	76 77.6%	22 22.4%	0 0.0%	98 100%

Table 7 shows that free spirit people do not have an intuitive LS.

Free sprits with an intuitive LS> free spirits with a sensing LS (100%>76.9%), but this happens by chance because Pearson's Chi-square (P=0.860) is not significant at the 0.05 level and therefore, the fifth hypothesis is rejected.

Table 8. Statistical Results Related to the Relationship between the Sensing/Intuitive and the Disruptor

LS		Agree with Disruptor			
		Agree	Neutral	Disagree	Total
Sensing	Count % within LS	5 9.6%	36 69.2%	11 21.2%	52 100%

		Agree	Neutral	Disagree	Total
Balanced	Count % within LS	5 10.9%	34 73.9%	7 15.2%	46 100%
Intuitive	Count % within LS	0 0.0%	1 1.4%	0 0.0%	1 100%
Total	Count % within LS	10 10.1%	71 71.7%	18 18.2%	98 100%

Table 8 shows that disruptors do not have an intuitive LS.

Disruptors with an intuitive LS < disruptor with a sensing LS (0%<96%). Because the statistic Chi Pearson (P=0.748) is not significant at the 0.05 level, the sixth hypothesis is also rejected.

Visual/Verbal Learning Style

Table 9 .Statistical Results Related to the Relationship between the Visual/Verbal and the Player

LS		Agree with "Player"			
		Agree	Neutral	Disagree	Total
Visual	Count % within LS	46 73.0%	17 27.0%	0 0.0%	63 100%
Balanced	Count % within LS	17 53.1%	15 46.9%	0 0.0%	32 100%

Verbal	Count % within LS	0 0.0%	3 100.0%	0 0.0%	3 100%
Total	Count % within LS	63 64.3%	35 35.7%	0 0.0%	98 100%

The results of Table 9 show that individuals who are players have a visual LS.

Visual LS and player> verbal LS and player (73.0%>0%)

Pearson's Chi-square test =0.010 and is below the alpha significance level of 0.05. Cramer's *V* measure =0.307, indicating a moderate relationship between the two variables. As a result, the seventh hypothesis can be confirmed.

Table 10 . Statistical Results Related to the Visual/Verbal and the Socializer

LS		Agree with Socializer			
		Agree	Neutral	Disagree	Total
Visual	Count % within LS	51 79.7%	13 20.3%	0 0.0%	64 100%
Balanced	Count % within LS	27 87.1%	4 12.9%	0 0.0%	32 100%
Verbal	Count % within LS	2 66.7%	1 33.3%	0 0.0%	3 100%
Total	Count % within LS	80 81.6%	18 18.4%	0 0.0%	98 100%

Table 10 shows that socializers do not have a verbal LS.

Socializer with a verbal LS < socializers with visual LS (66.7%< 79.7%)

Also, considering the fact that Pearson's Chi-square (0.541) is not significant at the 0.05 level, the eighth hypothesis is rejected.

Sequential/Global Learning Style

Table 11. Statistical Results Related to the Relationship between the Sequential/Global and the Achiever

LS			Agree with Achiever			
			Agree	Neutral	Disagree	Total
Sequential		Count % within LS	29 93.5%	2 6.5%	0 0.0%	31 100%
Balanced		Count % within LS	58 90.6%	6 9.4%	0 0.0%	64 100%
Global		Count % within LS	1 33.3%	2 66.7%	0 0.0%	3 100%
Total		Count % within LS	88 89.8%	10 10.2%	0 0.0%	98 100%

The results of Table 11 show that achievers have a sequential LS. Achievers with a sequential LS > Achiever with a global LS (93.5%>33.3%). Pearson's Chi-square test =0.004 and is below the alpha significance level of 0.05. Cramer's V measure =0.334, indicating a moderate relationship between the two variables. Thus, the ninth hypothesis can be confirmed.

Table 12. Statistical Results Related to the Relationship between the Sequential/Global Disruptor

LS			Agree with Disruptor			
			Agree	Neutral	Disagree	Total
Sequential		Count % within LS	4 12.9%	20 64.5%	7 22.6%	31 100%
Balanced		Count % within LS	6 9.4%	48 75.0%	10 15.6%	64 100%
Global		Count % within LS	0 0.0%	2 66.7%	1 33.3%	3 100%
Total		Count % within LS	10 10.2%	70 71.4%	18 18.4%	98 100%

Table 12 shows that disruptors do not have a global LS.

Disruptors with a global LS < disruptors with a sequential LS (0%< 12.9%), and given that the Pearson Chi (P= 0.767) is higher than the alpha significance level of 0.05 %, the tenth hypothesis is rejected.

Discussion and Conclusion

In this research, the relationship between the model of learning styles of Felder and Silverman and the Hexad scale player types was studied among the students of universities in Qom province.

The findings of this study are in line with the investigation of Khenissi et al.'s (2016), with the difference that they investigate the relationship between learning styles and genres of games.

The findings of this study are also in line with the findings of Gil Pérez (2015), who believed that the gamification mechanics and player

types were effective in the tested learning environment; but he only examined four player types of Hexad Scale model which were philanthropists, socializers, free spirits and achievers, and in fact, the LS and its relationship with the player type had not been studied in his research.

The findings of this study are also consistent with the findings of the research done by Tondello et al. (2016), saying that the Hexad Scale model is suitable for choosing the elements of the gamification. The difference is that they have used the Big Five learning styles.

According to Orji et al. (2017), people's personality traits play a significant role in designing gamification systems, although their study concerns health games and gamified systems.

Given that this research confirms the relationship between the type of socializer player and active learning style, the results of the second hypothesis are consistent with the findings of the research by Konert et al. (2013), which stated that the preferences of the type of socializer player in the Bartle model are identifiable, and therefore, such players will learn better by interacting with others (Konert et al., 2013).

According to Gil et al. (2015), socializers, achievers, and philanthropists, from the Hexad scale model, have better learning activities in electronic learning environments; according to the results of this study, it happens in a way that socializer players have a sensing learning style, while the socializer and philanthropist players have an active learning style.

According to Ferro et al. (2013), achievers have a low level of creativity and anxiety, and on the other hand, the sensing LS deals with fixed and defined standards and does not involve much creativity. Also, according to the results of this study, the relationship between the style of sensing learning and the type of achiever player has been confirmed, it can be said that the appropriate LS with the type of achiever player is sensing. Also, in the above categories, socializer players have low autonomy and tension and high social communication, and on the other hand, the active LS is highly consistent with interaction and participation in the team and community, and also, with the confirmation of the second hypothesis that was based on the existence

of a relationship between active LS and the type of socializer player, it can be said that the findings of this study are aligned with the categorization of socializer and achiever players by Ferro et al. (2013).

The interesting point is that the hypothesis of the relationship between sensing and sequential learning styles with achiever players are confirmed, because the sensing LS uses standard rules and steps, and the sequential LS is also followed by steps to achieve the goal (Felder & Silverman, 1988), and on the other hand, achiever players, are willing to reach their goal by going through standards and step-by-step challenges. As a result, the confirmation of these two hypotheses in the present study seems logical, but it may be that an achiever player in some circumstances has a sequential LS and, in some circumstances, a sensing LS.

In the study done by Engedal (2016), the relationship between the LS and the type of player was not approved, which is not consistent with the results of this study; this may be due to the choice of subjects. In this way, their research was not done on the group that is related to the field of education, and its community is different, but the present study focuses on students that are consistent with the field of education and learning, and on the other hand, the model of the player employed in the study by Engedal (2016), called the Yee Model, does not cover all the players, while the research uses the more comprehensive Hexad scale model that could be another reason for the difference in the results from the two studies.

With regard to the results, it can be said that identifying the relationship between the player types and the LS of learners could have a significant impact on the success of a gamified electronic learning and the effectiveness of learning, because it increases the probability of the appropriate selection of gamification techniques based on these relationships.

The confirmed relationships can be used by e-learning recommendation systems in order to consider specific needs and preferences of learners and satisfy their different demands. These systems could increase learners' motivation, resulting in improved chances for success in the learning process. For example, using

recommender systems can deliver the framework for personalized gamified systems (Tondello et al., 2017).

According to Monterrat et al. (2014), we can create the adaptive educational game system by using the adaptive system which receives the player type model, the elements of the game and the adaptation engine for selecting user's features. These adaptive systems can benefit from the current investigations, by recommending to educator the appropriate instances of a gamified system according to their students' learning styles and player types.

In addition, this study can help educational game designers in designing educational games. For example, for socializers who have an active learning style, game designers can include game elements such as leaderboard that has a social and collective nature, inside the educational game. After that, the educators and coaches can select the suitable educational game based on their students' learning styles and player types.

Although there is little knowledge to identify individual's player types and learning styles (Böckle et al., 2017; Tondello et al., 2017; Orji et al., 2017; Dichev & Dicheva, 2017), in the simplest way, the educator can use the test of Hexad Scale model and the Felder-Silverman LS model for this purpose.

In this research, there was no confirmation of the relationship between reflective LS and free spirit player, intuitive LS and free spirit and disruptor player, verbal LS and socializer player, global LS and disruptor player. One reason for this could be the type of statistical society chosen. For example, free spirit players have autonomy, but students are often interested in teamwork and participation, and therefore, the reflective style may not be suitable for them or a larger sample needs to be investigated.

Suggestion for Future Works

Since the subject of this research has been studied very little in past researches, some research suggestions will be proposed here. First, investigating the relationship between other player-type models,

including the Brain-Hex model with Felder's learning styles is suggested. Conducting this research among other population rather than students and comparing the results with the findings of this study can provide more insight on the issue. Focusing on the relationships among other learning styles, such as the Kolb model with Hexad scale player model can also shed lights on this issue from a different perspective. One more research suggestion can be the selection of the appropriate gamification elements based on the relationship between the type of player and the style of learning, field research and laboratory.

References

Al-jaberi, N. M. (2015). University students' learning styles and their ability to solve mathematical problems. *International Journal of Business and Social Science*, *6*(4).

Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD Research*, 1, 1-19.

Bernard, J., Chang, T. W., Popescu, E., & Graf, S. (2017). Learning style identifier: Improving the precision of learning style identification through computational intelligence algorithms. *Expert Systems with Applications*, *75*, 94-108.

Böckle, M., Novak, J., & Bick, M. (2017). Towards adaptive gamification: A Synthesis of current developments. Proceedings from the *25th European Conference on Information Systems (ECIS)*, Guimarães, Portugal.

Bunchball, I. (2010). Gamification 101: An introduction to the use of game dynamics to influence behavior. *White Paper, 9*.

Deborah, L. J., Baskaran, R., & Kannan, A. (2014). Learning styles assessment and theoretical origin in an e-learning scenario: A survey. *Artificial Intelligence Review*, *42*(4), 801-819.

Dichev, C., & Dicheva, D. (2017). Gamifying education: What is known, what is believed and what remains uncertain: A critical review. *International Journal of Educational Technology in Higher Education*, *14*(1), 9.

Engedal, J. Ø. (2016). *Gamification: A study of motivational affordances* . Department of Computer Science and Media Technology, Gjøvik University College.

Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering Education, 78*(7), 674-681.

Felder, R. M., & Soloman, B. A. (2000). *Learning styles and strategies.* Retrieved 19 October 2017 from http://www.engr.ncsu. edu/learningstyles/ilsweb.html.

Ferro, L. S., Walz, S. P., & Greuter, S. (2013, September). Towards personalised, gamified systems: An investigation into game design, personality and player typologies. *Proceedings from the 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death,* (p. 7), ACM.

Gil, B., Cantador, I., & Marczewski, A. (2015). Validating gamification mechanics and player types in an e-learning environment. *Design for Teaching and Learning in a Networked World*, 568-572. https://doi.org/10.1007/978-3-319-24258-3_61

Gil Pérez, B. (2015). *Applying gamification to education: A case study in an e-learning environment* (Master's thesis).

Gregorc, A. F. (1979). Learning/teaching styles: Their nature and effects. Student learning styles: diagnosing and prescribing programs. *National Association of Secondary School Principals,* Reston, VA.

Grünewald, F., Meinel, C., Totschnig, M., & Willems, C. (2013, September). Designing MOOCs for the support of multiple learning styles. *European Conference on Technology Enhanced Learning* (pp. 371-382), Springer, Berlin, Heidelberg.

Huang, W. H. Y., & Soman, D. (2013). *Gamification of education: Research Report Series: Behavioural Economics in Action.* Rotman School of Management, University of Toronto.

Huang, E. Y., Lin, S. W., & Huang, T. K. (2012). What type of learning style leads to online participation in the mixed-mode e-learning environment? A study of software usage instruction. *Computers & Education*, *58*(1), 338-349.

Jackson, M. (2016). *Gamification in education: A literature review*. West Point, NY: United States Military Academy.

Khenissi, M. A., Essalmi, F., & Jemni, M. (2013, March). Toward the personalization of learning games according to learning styles. Proceedings from *International Conference on Electrical Engineering and Software Applications (ICEESA)* (pp. 1-6). IEEE.

Khenissi, M. A., Essalmi, F., Jemni, M., Graf, S., & Chen, N. S. (2016). Relationship between learning styles and genres of games. *Computers & Education*, *101*, 1-14.

Kiryakova, G., Angelova, N., & Yordanova, L. (2014). Gamification in education. Proceedings from *9th International Balkan Education and Science Conference.*

Konert, J., Göbel, S., & Steinmetz, R. (2013, January). Modeling the player, learner and personality: Independency of the models of Bartle, Kolb and NEO-FFI (Big5) and the implications for game based learning. Proceedings from *European Conference on Games Based Learning* (p. 329), Academic Conferences International Limited.

Marczewski, A. (2015). Marczewski's user type test. Gamified UK.

Marczewski, A. C. (2015). *Even Ninja monkeys like to play: Gamification, game thinking and motivational design*. CreateSpace Independent Publishing Platform.

Monterrat, B., Desmarais, M., Lavoué, E., & George, S. (2015, June). A player model for adaptive gamification in learning environments. Proceedings from *International Conference on Artificial Intelligence in Education* (pp. 297-306), Springer, Cham.

Monterrat, B., Lavoué, É., & George, S. (2014, September). A framework to adapt gamification in learning environments. Proceedings from *European Conference on Technology Enhanced Learning* (pp. 578-579), Springer, Cham.

Nacke, L. E., Bateman, C., & Mandryk, R. L. (2014). BrainHex: A neurobiological gamer typology survey. *Entertainment Computing*, *5*(1), 55-62.

Orji, R., Nacke, L. E., & Di Marco, C. (2017, May). Towards personality-driven persuasive health games and gamified systems. Proceedings from *the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 1015-1027), ACM.

Rapeepisarn, K., Wong, K. W., Fung, C. C., & Khine, M. S. (2008, June). The relationship between game genres, learning techniques and

learning styles in educational computer games. Proceedings from *International Conference on Technologies for E-Learning and Digital Entertainment* (pp. 497-508), Springer, Berlin, Heidelberg.

Roshandel, M. (2017). *Shabestan News Agency .* Retrieved on August, 23, 2017, from http://www.*shabestan.ir/detail/News/564615.* *(Persian)*

Ruhi, U. (2015). Level up your Strategy: Towards a descriptive framework for meaningful enterprise gamification. Technology Innovation Management Review,5(80),5-16

Sekaran, U., & Bougie, R. (2016). Research methods for business: A skill building approach. John Wiley & Sons. Soloman, B. A., & Felder, R. M. (1999). *Index of learning styles questionnaire*. Accessed on March 26, 2003.

Tuckman, B. W. (1999). *Conducting educational research* (5th ed.). Wadsworth Group.

Tondello, G. F., Wehbe, R. R., Diamond, L., Busch, M., Marczewski, A., & Nacke, L. E. (2016, October). The gamification user types Hexad scale. Proceedings from *the 2016 annual symposium on computer-human interaction in play* (pp. 229-243), ACM.

Tondello, G. F., Orji, R., & Nacke, L. E. (2017, July). Recommender systems for personalized gamification. Adjunct Publication of *the 25th Conference on User Modeling, Adaptation and Personalization* (pp. 425-430), ACM.

Tuunanen, J., & Hamari, J. (2012). Meta-synthesis of player typologies. Proceedings from *Nordic Digra 2012 Conference: Games in Culture and Society,* Tampere, Finland.

Yee, N. (2006). Motivations for play in online games. *Cyber Psychology & behavior, 9*(6), 772-775.

Zichermann, G., & Cunningham, C. (2011). *Gamification by design: Implementing game mechanics in web and mobile apps*. O'Reilly Media, Inc.