Research Article

A Conceptual Framework of the Assessment of the Effectiveness of Gamification in Learning Process

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Abstract

Higher education has recognized the generation gaps problem which cause the different perceptions between teachers and learners. As opposed to the traditional learning style, the active learning techniques have been introduced to mitigate the problems by creating more interaction and participation learning environments during the class. Gamification was brought into the educational institutes as one of the active learning activities and was reported as a successful approach. However, the problem was found the previous research regarding the measurement model of the effectiveness of gamification. The previous research used the similar measurement model that was noticed as a pattern providing predictable results as the game-involved group reported better performance than non-game-involved group. Therefore, this paper proposes the measurement model of the effectiveness of gamification by adapting the Flow theory (Csikszentmihalyi, 1990) as the grounded theory. Also, the framework includes the different game characteristics as the independent variables influencing the effectiveness of the gamification. Last, since personality traits of students plays an important role in learning achievement in terms of learning preferences and knowledge gaining, this framework includes the personality as a moderation variable affecting the relationship between game characteristics and the effectiveness of gamification. Both theoretical and practical implication were discussed in the paper.

Keyword: Conceptual framework; Gamification; Flow theory; Personality; Higher Education

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บทความวิจัย

กรอบแนวคิดสำหรับการประเมินประสิทธิผลของเกมมิฟิเคชันในกระบวนการเรียนรู้

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บทคัดย่อ

การศึกษาระดับอุดมศึกษา มักจะพบปัญหาช่องว่างระหว่างวัย ซึ่งเป็นหนึ่งในสาเหตุที่ทำให้เกิดมุมมองที่แตกต่างกันระหว่างครูและผู้เรียน เพื่อลดปัญหาดังกล่าว จึงมีการประยุกต์ใช้เทคนิคการเรียนรู้เชิงรุกเพิ่มมากขึ้น ซึ่งการเรียนรู้ดังกล่าวก่อให้เกิดการสร้างปฏิสัมพันธ์และการมีส่วนร่วมในชั้นเรียนเพิ่มมากขึ้นกว่าการเรียนรู้แบบดั้งเดิม และหนึ่งในกิจกรรมการเรียนรู้เชิงรุกที่น่าสนใจ คือ เกมมิฟิเคชัน อย่างไรก็ตาม งานวิจัยที่ผ่านมามักจะใช้วิธีประเมินประสิทธิผลของเกมมิฟิเคชันที่คล้ายหรือเหมือนกัน โดยผลลัพธ์ที่ได้มักจะพบว่า กลุ่มที่ประยุกต์ใช้เกมมิฟิเคชันจะมีประสิทธิผลในการเรียนรู้ดีกว่าและกลุ่มที่ไม่ได้ใช้ งานวิจัยนี้ จึงได้นำเสนอรูปแบบการประเมินประสิทธิผลของเกมมิฟิเคชันในกระบวนการเรียนรู้ที่แตกต่างงานวิจัยอื่น ๆ ด้วยการประยุกต์ใช้ทฤษฎีความเพลิน (Csikszentmihalyi, 1990) เป็นทฤษฎีฐานราก และนำเสนอกรอบแนวคิดที่นำคุณลักษณะของเกมต่าง ๆ ซึ่งเป็นตัวแปรอิสระมาใช้ในการประเมินประสิทธิผลของเกมมิฟิเคชัน และเป็นที่ทราบกันดีว่า บุคลิกภาพของนักศึกษาหรือผู้เรียนถือเป็นหนึ่งในปัจจัยสำคัญในการหาผลสัมฤทธิ์การเรียนรู้ในแง่ของรูปแบบการเรียนรู้และการได้รับความรู้ ดังนั้น กรอบแนวคิดของงานวิจัยนี้ จึงได้นำเสนอและอภิปรายเกี่ยวกับการศึกษาบุคลิกภาพของผู้เรียนที่มีผลต่อความสัมพันธ์ระหว่างคุณลักษณะของเกม และประสิทธิผลของการใช้เกมมิฟิเคชัน ทั้งในเชิงทฤษฎีและการปฏิบัติจริง

คำสำคัญ: กรอบความคิด; เกมมิฟิเคชัน; ทฤษฎีความเพลิน; บุคลิกภาพ; อุดมศึกษา

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Introduction

The adaptation of the constructivism theory in education has been increasing in the recent years in terms of active learning styles which are well-researched and versatile approach that has been integrated into teaching (Mogashoa, 2014). The main purpose of the integrating of the active learning styles is to integrate more interactive, persuasive, and engaging elements into the teaching and learning atmosphere to encourage students' interactions and participation during the class at any educational level (Tongtep & Boonlamp, 2017; Sumanasekera, et al., 2020; Sincharoenkul, Tongtep, & Boonlamp, 2020).

One of the reasons why the active learning has been increasingly integrated in higher education is the generation gap. Each generation has unique characteristics in terms of values, attitudes, experiences, opinions, habits, and behaviors (Mendez, 2008), so the gap creates the misunderstanding between the learners and the teachers. Currently, university students are classified as generation-Z, while teachers are either generation-X or Y. The educational behavior of the generation Z is likely to spend on digital devices than reading books and have a relatively short attention span (Twenge, 2018). Moreover, the generation-Z is found to be less self-indulgent, more isolated (The Economist, 2018), and more concerned about academic performance and future careers (The Economist, 2019).

Gamification is one the approach in applying the active learning in the educational institutions by designing game-like rule systems with designated role-playing which is suitable for learners' behaviour (Su & Cheng, 2013). Among a various type of games, board games have been applied as an educational tool to increase the learners' interaction during class throughout all educational levels including pre-school (Fotini & Makrina, 2017), school (Retalis, 2008), higher education (Taspinar, Schmidt, & Schuhbauer, 2016; Müller, Reise, & Seliger, 2015).

There is several research reporting the effectiveness of board games in boosting up the academic performance of students, however, the research design and methodology are limited in terms of the comparison between two separated groups including game-involved and non-game-involved (e.g., Fotini & Makrina, 2017; Khan & Pearce, 2015; Kayımbaşıoğlu, Oktekin, & Hacı, 2016; Müller et al., 2015; Taspinar et al., 2016). As a result, all research reported that the game-integrated group provided better academic outcome and achievements and concluded that the gamification has the potential to enhance learning and teaching productivity.

Therefore, this research is based on the academic gap of the repetition of the measurement model that may be noticed as a pattern providing predictable results stating that the game-involved group would have a likelihood of better academic performance.

Research Objective

The purpose of the research is to fill the academic gap by proposing a conceptual framework to assess the effectiveness of the application of gamification in educational institutions by integrating the existing models with learners' personal characteristics.

Literature Review

Gamification in Education

Generally, games are a contest between players under the rules and a winning condition, which can be classified by using instructional mediums such as computer games, mobile phone games, board games, card games, and word games. Games have certain characteristics including the number of players, complexity and rules, degrees of luck, skills needed, and reward-to-effort ratio (Elias, Garfield, & Gutschera, 2012). These issues are often discussed by players and designers regarding the appropriateness of the game for a certain type of player. Also, games normally provide fun to the players and keep players participating in the game because fun is a physiological state that human needs as the nervous system like to be stimulated, rather than being boredom. Moreover, competition and status claimed during a game is another factor for players to maintain focusing on the game because they can receive high-social standing among others (Müller et al., 2015).

From the above characteristics of games, regarding the concept of gamification (Deterding, Dixon, Khaled, & Nacke, 2011), game-related elements can be used in non-game environments for motivating and increasing participants' activity and participation. This includes the application of gamification in educational contexts to boost up students' motivation to learn in an environment defined by objectives, rules, rewards, and interaction between people and learning materials (Müller et al., 2015). Psychologically, the application of gamification in learnings can create cognitive stimulation, emotional participation, people's engagement and promote certain behaviours (Simões, Redondo,

& Vilas, 2013). Also, the use of educational gamification can be reproducible, widely available, and language independent (Müller et al., 2015).

However, the gamification promotes the intrinsic behaviours of the students through the learning process by adapting the game-like learning environments, so a grading or exam system may not be applicable to assess the achievement of intrinsic behaviours. To dissolve this problem, the Flow theory (Csikszentmihalyi, 1990) could be used to measure the learners' achievement through the learning process.

Flow Theory in Learning Measurement

The Flow theory provides an understanding of the experience from deep engagement when a psychological state is formed in which people are immersed in an activity that nothing can interfere (Csikszentmihalyi, 1990), and in which people feel simultaneously cognitively efficient, motivated, and happy (Moneta & Csikszentmihalyi, 1996). During the flow state, experience is gained by the integration of tasks and awareness that the learners lose both time and self-consciousness. Also, the flow model provides the commonalities in both optimal experience and its underlying conditions (Schmidt, 2010).

The model has been further expanded into three dimensions: absorption, enjoyment, and motivation (Bakker, 2005) to well measure the flow state of the learners. Absorption refers to the total immersion in an activity; enjoyment refers to feeling happy during the activity, and motivation refers to the pleasure and satisfaction in the activity (Bakker, 2008).

This paper proposes a conceptual framework that is grounded on the flow theory for measuring the effectiveness of the gamification in higher education in terms of the enhancement of learning environments.

Effect of Personality on Learning Styles

Nevertheless, in an educational context, the effectiveness of learning process and academic achievement are influenced by students' personality traits. The personality traits influence the preferred learning process and information perception which results in the heterogeneity of learning preferences and performances (Marcela, 2015; Emerson, English, & McGoldrick, 2016; Siriphunwaraphon, Tongtep, & Charoenporn, 2016; Buckley & Doyle, 2017; Dungey & Yielder, 2017).

The main purpose of higher education is to operate the process of knowledge transfer from lecturers to students by using different learning methods. Felder and Silverman (1988) adapted the Kolb's learning model (1984) and developed the Index of Learning Styles (ILS) for the classification of students' learning styles. The ILS includes four dimensions: information perception, perception method, information processing, and understanding and problem solving as can be seen in Table 1. The ILS model was proved to be a suitable learning style that is used by lecturers to design teaching activities based on students' learning styles (Felder & Spurlin, 2005). Also, the ILS model was proved its validity in educational contexts (Litzinger, Lee, Wise, & Felder, 2007; Wang & Mendori, 2015; Buckley & Doyle, 2017).

Table 1. Four dimensions of the index of learning styles.

No	Dimension	Explanation	
1	How a student perceives information from a lecturer	Sensing:	learning facts; requiring well-established methods; being patient with details; being careful and practical
		Intuitive:	discovering possibilities and relationships; avoiding repetition and routine; working fast but lack of attention to detail
2	How the information is perceived by a student	Visual:	via pictures, diagrams, flow charts, and timeline
		Verbal:	via written and spoken
3	How a student proceeds with information when received	Active:	engaging in an activity and practice; discussing; doing group work
		Reactive:	doing things quietly; doing introspective processes; working alone
4	How a student understands and solves problems	Sequential:	understanding logically; solving problems in a sequential manner
		Global:	understanding overall; solving problems in general but lack explanation.

source: (Felder & Silverman, 1988)

Moreover, human personality traits can be measured by several theories, however, the Myers–Briggs Type Indicator (MBTI), which was developed by Jung (1923) and extended by Myers (1962), is the widely-used theory in personality classification despite its limitations and criticism. This theory classifies individuals from how they proceed

information to summarize the conclusion. The classification has four dimensions including Extroversion- Introversion, Sensing-Intuitive, Thinking-Feeling, and Judgment-Perception, which could form a total of sixteen different personality traits as can be seen in Table 2 (Neris Analytics Limited, 2021).

Table 2. Summary of 16 MBTI personality traits.

Group	Personality traits	Personality Highlight
Analysts	INTJ - Architect	Imaginative and strategic thinkers, with a plan for everything.
	INTP - Logician	Innovative inventors with an unquenchable thirst for knowledge.
	ENTJ - Commander	Bold, imaginative, and strong-willed leaders.
	ENTP - Debater	Smart and curious thinkers who cannot resist an intellectual challenge.
Diplomats	INFJ- Advocate	Quiet and mystical, yet very inspiring and tireless idealists.
	INFP - Mediator	Poetic, kind, and altruistic people, always eager to help a good cause.
	ENFJ - Protagonist	Charismatic and inspiring leaders, can mesmerize their listeners.
	ENFP - Campaigner	Enthusiastic, creative, and sociable free spirits
Sentinels	ISTJ - Logistician	Practical and fact-minded individuals
	ISFJ - Defender	Very dedicated and warm protectors.
	ESTJ - Executive	Excellent administrators, unsurpassed at managing things.
	ESFJ - Consul	Extraordinarily caring, social, and popular people, always eager to help.
Explorers	ISTP - Virtuoso	Bold and practical experimenters, masters of all kinds of tools.
	ISFP - Adventurer	Flexible and charming artists, always ready to explore and experience.
	ESTP - Entrepreneur	Smart, energetic, and very perceptive people.
	ESFP - Entertainer	Spontaneous, energetic, and enthusiastic people.

source: Neris Analytics Limited (2021)

The MBTI is persistent in the educational contexts in terms of the measurement of the student's learning process from receiving information from lecturers to concluding their knowledge. Also, research confirms that personality traits strongly influence the students' learning process and achievement (e.g., Dungey & Yielder, 2017; Emerson et al., 2016); Weiser, Blau, & Eshet-Alkalai, 2018). The benefit of the MBTI in education is mainly to specify the students' learning process and knowledge perception. For example, the Sensing-Intuition and Judging-Perceiving traits show differences in the learning process between two student groups (Dungey & Yielder, 2017). Cooperative learning facilitates students who are introverts, rather than an extrovert (Emerson et al., 2016). The introverts prefer online classes while the extroverts prefer face-to-face learning environments (Weiser et al., 2018).

The Relationship between The ILS and MBTI

By further understanding, the authors adopted the explanation of the ILS and the personality highlights of the MBTI and found the similarities and patterns among the learning styles and personality traits as can be seen in Table 3. The first dimension of the ILS is matched by Sensing-Intuitive personality trait. The second and third dimension of the ILS is matched by the Extroversion-Introversion trait. Introverts are likely to perceive information reactively by visual, while extroverts are likely to perceive actively by verbal. The fourth dimension of the ILS is matched by the Judgment-Perception personality traits. The Judgement traits are likely to solve problems logically and sequentially, while the Perception traits are likely to solve problems without the well-defined procedures.

Table 3. The ILS and MBTI matrix (adoped from the ILS and MBTI)

		The Index of Learning Styles							
MBTI Personality		Dimension 1		Dimension 2		Dimension 3		Dimension 4	
Group	Traits	Sensing	Intuitive	Visual	Verbal	Active	Reactive	Sequential	Global
Analysts	INTJ		/	/			/	/	
	INTP		/	/			/		/
	ENTJ		/		/	/		/	
	ENTP		/		/	/			/
Diplomats	INFJ		/		/		/	/	
	INFP		/		/		/		/
	ENFJ		/	/		/		/	
	ENFP		/	/		/			/

Table 3. (Continue)

		The Index of Learning Styles							
MBTI Personality		Dimension 1		Dimension 2		Dimension 3		Dimension 4	
Group	Traits	Sensing	Intuitive	Visual	Verbal	Active	Reactive	Sequential	Global
Sentinels	ISTJ	/			/		/	/	
	ISFJ	/			/		/	/	
	ESTJ	/		/		/		/	
	ESFJ	/		/		/		/	
Explorers	ISTP	/		/			/		/
	ISFP	/		/			/		/
	ESTP	/			/	/			/
	ESFP	/			/	/			/

Research Methodology and Results

Since the previous studies used two student groups to comparably measure the effectiveness of the learning process by integrating gamification. This measurement approach may be questioned in terms of the reliability and validity of the measurement results because the participants in each group are different. Generally, the learners would have completely different personality traits and behaviours which cause the differences in the preferences of learning styles, information perception, and academic advancement.

From the above reason, the proposed conceptual framework attempts to fill the academic gap and enhance the practical implication by measuring the effectiveness of the use of gamification in education for all learners simultaneously without any group separation. The conceptual framework is grounded on two main theories: the extended flow theory (Csikzentmihalyi, 1975; Bakker, 2005) and the MBTI (Myers, 1962) as can be seen in Figure 1.

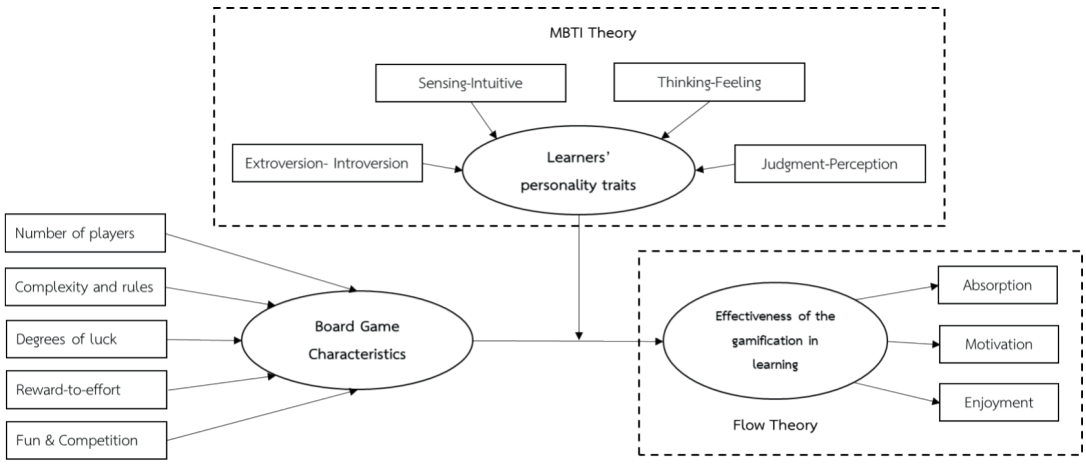

Figure 1 Conceptual framework of the measurement of effectiveness of the gamification in learning

Measurement of The Gamification Effectiveness

In conceptualising the measurement of the effectiveness of gamification in learning process, the framework was based on the three dimensions of the flow model: absorption, motivation, and enjoyment (Csikzentmihalyi, 1975; Bakker, 2005). The effectiveness of the application of gamification in learning process is measured by the flow state of the learners. Firstly, the absorption dimension refers to the total immersion in an activity. This dimension assesses how the gamification convinces and keeps the learners participated during study as the major problems of the generation-Z students are the spending time on digital devices and relatively short attention span (Twenge, 2018). The gamification would be effective if it could keep students focusing longer on the study.

The second dimension, enjoyment, refers to feeling happy during the activity. This dimension assesses how the gamification creates fun and happiness among the learners. Other problems of the generation-Z are less self-indulgent and more isolated (The Economist, 2018). The gamification would be effective if it could create fun and bring the students to be together by using the activity as a medium. When students feel fun, they would be stimulated and finally they would be happy during the study.

Third, the motivation dimension refers to the pleasure and satisfaction in the activity. This dimension assesses how the gamification creates the mutual objectives between teachers and students. As the generation-Z students are objective-oriented and more concerned about their performance (The Economist, 2019). The gamification

would be effective if it could create the achievement and recognition system based on the study to enhance students' pleasure and satisfaction to reach the educational goals.

Board Games Characteristics

However, since there is a variety of available commercial board games and there are not any universal games that can be well-suited to any group of students or provide the ideal effectiveness in the educational gamification. Regarding Figure 1, the framework is composed of board game characteristics, which could differentiate the game mechanisms and finally affect the effectiveness of the gamification. The characteristics include number of players, complexity and rules, degree of luck, rewards-efforts ratio (Elias et al., 2012), fun, and competition (Müller et al., 2015).

Therefore, this framework proposes that when board games are used as a medium in the learning process to encourage learners' interaction and motivation throughout their study to mitigate the problems of the generation gap, the board game characteristics would influence the effectiveness of the use of gamification in the educational contexts.

The Influcence of Personality Traits on The Learning Process

As the framework proposes the assessment of the learning process by using the gamification, the personality traits play a vital role in an individual learning process in terms of preferences and information perception. Thus, the personality of students is considered as a key factor that can influence the outcomes the framework, that is the effectiveness level of the gamification.

This conceptual framework applied the MBTI theory (Myers, 1962) as a determinant to distinguish learners' personality. The theory separates the human personality into four dimensions: Extroversion-Introversion, Sensing-Intuitive, Thinking-Feeling, and Judgment-Perception. Each dimension can combine into sixteen different MBTI personality traits representing the unique characteristics (Neris Analytics Limited, 2021), resulting in different learning styles and preferences as previously shown in Table 3.

Therefore, this paper concludes that the personality traits of students may moderate the relationship between board game characteristics and the effectiveness of gamification in learning process (Baron & Kenny, 1986).

Conclusion and Recommendation

This paper was to propose the measurement of the effectiveness of the gamification in learning process to mitigate the generation gap problems in the higher education. The paper fills the academic gap as the existing research uses the repetition measurement model of gamification performance by comparing two groups of learners. The existing approach cause the lack of theoretical understanding of the learning performance measurement since the participants in each group were different in terms of the learning behaviour and academic perception.

The conceptual framework applied the flow model as a grounded theory to measure the intrinsic behaviours of students while integrating the gamification. The intrinsic behaviours can promote the effectiveness of the learning process because it enhances the participation and interaction of learners during the study with the teachers.

However, to use board games as the gamification tools, the selection of games should be concerned to be well-suited to the classes. The board game characteristics must be considered as factors affecting the effectiveness of the gamification. Also, the learners' personality types can moderate the relationship between the game characteristics and effectiveness of the gamification because the personality traits can influence the level of learning preferences of learners.

Regarding practical implication, the proposed framework can be adopted by instructors who plan to apply the gamification in the learning process. This paper may facilitate the game selection process to acquire the most suitable game for the class based on requirements such as class size, class time, and learners' game-related experience. Teachers may gather the personality types of students in class before designing the suitable gamification approach. In some cases, the gamification may not be appropriate if there are a completely different personality traits among students or teachers must minimise the gamification activity into a smaller scale that could well match with a particular group.

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