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Learning in a Gamification-enhanced Flipped Classroom: Q-Methodology, Learning Styles, and Individual Preferences

1. Introduction

There has been a growing awareness of the utilization of gamification (Devedžić, & Jovanović, 2015), which involves the application of game-like mechanisms to non-game situations or contexts, in higher education institutions in an attempt to engage, sustain, and motivate students during the teaching and learning processes (Abramovich, 2017; Sun & Hsieh, 2018). However, despite the recent promotion of the flipped classroom (FC) approach by many educators and practitioners, it seems that researchers have not yet fully considered the consequences of integrating gamification mechanisms in a flipped classroom. In fact, there is currently a profound debate within the gamification community as to whether specific game elements or badges may actually undermine users' intrinsic motivation (Muilenburg, & Berge, 2016). Furthermore, past researchers have found that some learners skip out-of-class learning activities or pre-class video lectures in FC (Chen, Chen, & Chen, 2015; Chen, Wang, Kinshuk, & Chen, 2014); hence, it is important to engage students in out-of-class learning activities in FC settings. Apparently, little is known of learners' subjective experience and preference for the critical components of a flipped classroom, nor has the use of this assessment approach been explored in Taiwan. Therefore, whether or not gamification will work in this setting remains to be seen.

Since the FC approach is increasingly being used and has the potential to address barriers and problems in higher education programs, it is essential to investigate students' perspective of the integration of gamification in out-of-class learning activities in flipped classrooms. Ascertaining users' perception during the initial application of this approach will indicate how to best integrate this technology into the learning process. It is well known that students learn in a variety of ways. Understanding how students learn is one of the challenges of traditional student learning from a teacher's perspective. Researchers explain that learning is a gradual development process based on educational experience and personal characteristics. Educators can observe that learning is valuable by using quantitative and qualitative methods because they can help to understand how students learn. One field of research, known as Learning Styles, focuses on understanding and characterizing individuals' preferences for acquiring knowledge. Most of the existing learning style instruments are quantitatively-based and group students into predefined categories, which consist of positive and negative attributes.

One of the main criticisms of existing tools is that they cannot provide an in-depth understanding of students' learning skills. Therefore, Q-Methodology will be used in this study as a powerful tool for educators to assess students' learning styles (Fang, & Chen, 2018). Various learning groups are expected to be identified and this may provide educators with more insight into how students learn via human subjectivity. Therefore, this study is based on Q-methodology, which capitalizes on the benefits of quantitative and qualitative methods to study human subjectivity. The aim is to identify and categorize students' opinion of a gamified flipped classroom at a Taiwanese university. The use of the Q method can deepen students' understanding of learning techniques and improve teaching methods through a more balanced and learner-centered curriculum approach. An understanding of the current beliefs, attitudes, and values of students will enable university educators and policy-makers to determine how to design, develop, and implement this model in order to enhance students' motivation to learn. The research questions are as follows;

1. How many groups of students share similar patterns of learning styles in this gamified flipped classroom?
2. Which specific aspects of the participants' learning preferences provide a basis for the emergence of these distinctive groups?

2. Literature Review

2.1 Flipped Classrooms

There is an increasing awareness of the implementation of FC methods in a variety of educational institutions (Song, & Kapur, 2017). Previous researchers have reported that the utilization of FC methods can promote academic performance, enhance interaction (Hung, 2015), improve attendance (Chen, Wang, Kinshuk, & Chen, 2014), and cultivate a positive attitude toward courses (Chen, Yang, & Hsiao, 2015). Bhagat, Chang, & Chang (2016) point out that the flipped classroom method can help low-achievers, because teachers will pay them more attention. However, contrary to these positive findings, Chen, Chen, & Chen (2015) believe that some students may not be able to watch videos online at home. Milman (2012) explains that the poor quality of video lectures is often a common problem in FC practice, while Kim, Kim, Khera, & Getman (2014) found no evidence that flipped learning could improve students' performance. Chen et al (2014) also reported that some students initially resisted this method because they did not have time to watch the video lecture before class. Therefore, some skipped the pre-class activities and came to the class unprepared. Potential negative effects of this method have also been found in higher education institutions. For example, Liou, Bhagat, & Chang (2016) found that videos in FC were not inherently interactive, and other technologies should be combined to promote the flipped classroom pedagogy.

2.2 Learning Styles

Learning styles have matured and a number of inventories have been available in the past 30 years. Inventories are also evolving and students' learning styles are now associated with persuasive variables related to learning strategies. Instruments are based on concepts that reflect the different backgrounds of diverse developers. In fact, there are various theories, instruments, and empirical work in the field of learning styles. Past researchers developed several measures based on different theoretical approaches to students' learning styles. For instance, Curry (1987) suggested a metaphor like an onion and he categorized learning styles as three layers: cognitive personality elements, information-processing style, and instructional preferences and Riding and Cheema (1991) used more than 30 constructions of theories of styles designated cognitive or learning styles. Influenced by Kolb's learning processes, Jung's model of psychological types, and the Myers–Briggs Type Indicator, Felder and Silverman (1988) proposed a model of learning styles called an Index of Learning Styles (ILS). This was a questionnaire consisting of four scales (i.e. sensing–intuitive, visual–verbal, active–reflective, and sequential–global). Neil Fleming's VARK model is one of the commonly-utilized models to categorize instructional preferences (Aldosari, Aljabaa, Al-Sehaibany, & Albarakati, 2018). This model classifies learning preferences based on sensory pathways into four kinds: visual (V), aural (A), read/write (R), and kinesthetic (K). Numerous models have been developed to characterize preferred learning styles in pedagogics; however, it is imperative for instructors to recognize individual and group differences.

3. Methodology

3.1 Trainer and Research Participants

The research was conducted during an eighteen-week flipped course at a university in Hsinchu. Twenty-three undergraduate students attended this required course. The researcher, who had experience of implementing a flipped classroom, was the instructor, the curriculum designer, and the moderator in the individual and focused-group interviews. All the participants have web-based learning experience, and many of them know each other and the moderator.

3.2 Description of the Course

This approach was implemented in a Human Resource Management (HRM) course, which is a required component of the undergraduate program in the Department of Technology Management. The aim of the course is to prepare students for a career in general management or a specialized staff

function known as HRM. The course contents include recruitment, selection, development, appraisal, retention, compensation, and labor relations. The participants were assessed based on six individual written assignments and case studies, 16 sessions of gamified-enhanced activities that incorporate a flipped classroom, plus a mid-term and a final exam.

3.3 Instructional Strategies in the Flipped Classroom

This course consists of three 1-hour sessions per week. A self-paced flip learning activity was introduced after the class. A “partial-flip” approach, where only a portion of the class time (5 times) was spent in a flipped classroom format, was used in this course. Each team consisted of two to four trainees who were assigned different tasks (i.e. team problem solving, decision tasks, and peer review). A formal team was organized in this training program. The design of the course is as follows;

1. Text-based lecture notes and pre-recorded multimedia micro-lectures (two to three micro-lectures per session, five to ten minutes) were presented via the school's Moodle e-learning system. The lectures were recorded using Camtasia Studio 8 screenshot software.
2. The students were asked to watch the pre-recorded multimedia course and read the lecture notes before each class and they were asked to answer some group/personal questions to assess their basic knowledge of the materials.
3. The time spent on lectures in the classroom was reduced, giving the students more time to engage in structured team-based problem solving and feedback. They were assigned to work in groups of two to three. The team members compared their responses to their individual/team assessments and agreed with a team response. The teacher then reviewed any common misunderstandings and summarized key concepts. Finally, the group completed a group-based essay topic or case study with a higher level of application issues.
4. The teacher provided assistance, clarification and feedback if needed.

In summary, since students are more concerned with more complex and longer-term issues in the physical classroom, they were formally organized and supervised by the instructor. Therefore, they gathered to develop and help each other to master the various course themes by discussing the materials and supporting their team members.

3.4 Implementation of Gamified-enhanced Activities

The Moodle course management platform was designed to support the upload of course resources and activities, quizzes, assignments, and a digital badge-display. Students of the HRM course attended this flipped classroom, which incorporates the notion of meaningful gamification with the use of game mechanics in the form of digital badges based on the self-determination theory. Active learning strategies were also used in this class. The gamification-enhanced activities particularly were designed to fulfill students’ psychological needs, namely, the need for autonomy, relatedness, and competence. All the badges collected by individual students were accumulated and displayed on the course board on the Moodle course management platform.

Three types of badges were used in this flipped classroom: (1) Autonomy-based badges (i.e. Early-bird badges), (2) Relatedness-based badges (i.e. Retort Warrior badges, and (3) Competence-based badges. There are two levels of Competence-based badges: (1) Level 1-Apprentice badge and (2) Level 2- Knowledge Expert badge. Students who log into the Moodle e-Learning system to access the course materials before class were awarded an Autonomy-based badge. Those who replied and participated in the discussion forum were awarded a Relatedness-based badge and those who completed flipped activities, such as self-directed quizzes were awarded a Competence-based badge.

3.5 Measuring Subjectivity

Although learning style instruments provide clues to learning and learning strategies, the Q-method can be an alternative research tool to distinguish learning styles and obtain a deeper

understanding of students' learning styles and perceptions. Q-methodology is used as a tool to provide educators with a better way to understand how students learn. It is utilized in this study to ascertain the subjective viewpoints of a few people by asking many questions, rather than exploring the reaction of a large number of people to fewer questions (Fang, & Chen, 2018). The objective of Q-methodology is neither to uncover causes nor to generalize the demographic prevalence of variables to a large population. Most Q studies are effective with 40 to 60 participants, but this is merely a guideline, and highly effective Q studies can be conducted with far fewer participants (Watts & Stenner, 2005). Likewise, Brown (1993) observes that no more than 40 participants are required to represent the views of a whole population. Therefore, a small sample size is quite common and acceptable when utilizing Q-methodology (Stellefson, Hanik, Chaney, & Tennant, 2012). The five steps of Q-methodology are as follows: (1) Exploring a concourse on the given topic. Q is rooted in the concourse theory of subjective communicability, which facilitates the observation of subjective perceptions or consciousness; (2) Choosing a representative set of statements (i.e. Q sample) from the larger concourse; (3) Specifying the participants of the study (i.e. P-sets; people who have something to say in relation to the topic and conditions of instructions); (4) Completing the Q sort (i.e. rank ordering of statements); and (5) Factor analysis and interpretation.

3.6 Data Collection

After completing the course, 23 learners participate in a Q-study led by the researcher. Semi-structured interviews were conducted with all the students one week after the end of the training program in order to ascertain their perspective of the topic. The research instrument was based on a representative sample of 30 statements containing key ideas from the interviews. These 30 statements, which represented the final Q-set, were selected using a content analysis that characterizes the aspects of technology, content, and teacher/students.

It is imperative to note that the Q-statements (i.e., the opinions of the research instrument) in Q-methodology are selected as cautiously as the participants are selected using any other scientific method (Brown, 1993). The Q-sample can be developed from various sources, including essays, pictures, publications, paintings, photographs, art pieces, interviews, or group discussions, as long as it represents the viewpoints in the concourse (viz. collection of opinion statements) (Chen et al., 2015). The concourse is sampled systematically; in other words, random and cluster sampling techniques are applied. A Q-study can be implemented with as few as 10 statements because all the participants have the opportunity to express their point of view (Cross, 2005). Generally speaking, no specific number of Q-statements is adequate for a Q- sample; however, the size depends on the number of multiples of the basic design. In other words, five or six statements are taken from each category of Fisher's "balanced block" design in order to ensure that the Q-statements are sufficiently comprehensive to represent the participants' views.

In this study, the sample statements were reviewed by two domain experts to ensure the validity of the contents. A pilot test was conducted with two volunteers who participated in the first interview in order to make any minor changes necessary to clarify some of the Q-statements. The Q-set (viz. Q-methodology questionnaire) was then being distributed to all learners based on their assessment of this innovative pedagogy. Without bias, and treating disagreement and agreement issues alike, the participants were asked to rank-order 30 statements into nine categories within the response grid, ranging from Most Disagreeable (-4) to Most Agreeable (+4) (see Figure 1). In other words, the participants construct their views in Q-sorts on the sorting answer sheet.

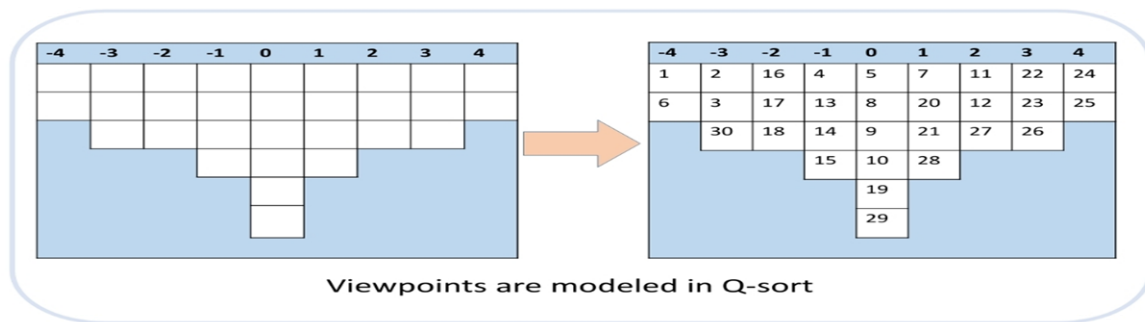


Figure 1: Q sorting

3.7 Data Analysis

PQMethod (version 2.11) statistical software was used for the data analysis. The data and Q-sorts were entered into the program as they were collected, thereby producing different piles of statement numbers. Unlike the Likert survey technique, the statements related to one another were examined in Q-methodology and various factor rotation and statistical procedure methods can be applied to safeguard the reliability of the factors. In this study, correlation, a centroid factor analysis, and judgmental rotation (i.e., hand rotation) was employed to derive the significant factors. These was selected and defined for a final analysis of the learning styles in this FC context (Watts & Stenner, 2012).

4. Teaching and Research Outcomes

The analysis of the Q-sorts yielded two distinctive factors. Twenty-two (95.65%) of the twenty-three students' Q-sorts were divided into these factors, while one was not considered to be statistically significant. It should be noted that 16 (72.73%) of the students' Q-sorts were identified as Factor A and the remaining six (27.27%) as Factor B.

4.1 Factor A: Online and Offline Socializer

16 students comprising 7 males and 9 females were significantly loaded on this factor, as evidenced by the ranking of the following strong positive statements:

“When I encounter problems with the flipped learning materials, my classmates will support and assist me.” (Statement 7, +4).

“I enjoy interacting with the instructor in this way.” (Statement 8, +4).

“I found that I had a meaningful conversation with my classmates through this course activity.” (Statement 1, +3).

“I met some good classmates in this course activity.” (Statement 3, +3).

“I like to grow through this learning mechanism.” (Statement 11, +3).

The rankings of the following strong negative items provided further evidence;

“I prefer to follow rather than lead the group discussion.” (Statement 9, -4).

“I think it is better to score the courses directly. There is no need to issue course badges.” (Statement 27, -4).

“I usually do not discuss too many PPT classroom materials with other group members in this class.” (Statement 2, -3).

“I find that I mainly study alone in this course.” (Statement 4, -3).

“This class mechanism is too complicated.” (Statement, 16 -3).

4.2 Factor B: Self-Motivated Achiever

The Q-Sorts of six participants, consisting of four males and two females, were significantly loaded on this factor, as evidenced by the ranking of the following distinguishing items;

“I like to grow through this learning mechanism.” (Statement 11, +4).

“I will continue to try to set, pursue and achieve the objectives of this course.” (Statement 12, +4).

“I find that I mainly study alone in this course.” (Statement 4, +3).

“I enjoy interacting with the instructor in this way.” (Statement 8, +3).

“Before starting the classes, I try to study the content of the course materials posted in the Moodle system.” (Statement 15, +3).

The rankings of the following strong negative items provided further evidence;

“I prefer to follow rather than lead the group discussion.” (Statement 9, -4).

“I think it is better to score the courses directly. There is no need to issue course badges.” (Statement 27, -4).

“I met some good classmates in this course activity.” (Statement 3, -3).

“For me, it is important for everyone to see the number of badges obtained by each student on the leaderboard so that I can know my overall ranking in the class.” (Statement 28, -3).

“For me, the appearance, color, and design of the course badges are very important.” (Statement 29, -3).

4.3 Agreed statements

The overall results revealed that there were several statements with which the two groups equally agreed. Although both groups had different perspectives of a number of aspects of this pedagogy, there was a consensus on several statements as follows:

“I like to talk about interesting topics in the group discussion of this course.” (Statement 5, +1 and +2).

“I will talk to the members of this activity group about any issues I do not understand.” (Statement 6, +2 and +2).

“When I encounter problems with the flipped learning materials, my classmates will support and assist me.” (Statement 7, +4 and +1).

“I enjoy interacting with the instructor in this way.” (Statement 8, +4 and +3).

“I can't stand people who only care about the grading results and don't participate in the discussion.” (Statement 10, +1 and +1).

“I like to grow through this learning mechanism.” (Statement 11, +3 and +4).

“I will continue to try to set, pursue and achieve the objectives of this course.” (Statement 12, +2 and +4).

“I try to get as many digital badges as possible.” (Statement 14, +1 and +1).

5. Recommendations and Reflections

5.1 Conclusion

The following conclusions can be drawn based on the viewpoints of the two groups:

Firstly, it is concluded that the gamification of out-of-class activities in a flipped classroom could be an effective approach to generally enhance the learning of Factors A and B students. Secondly, nine (81.81%) of the 11 female students were in the Factor A group (viz. Online and Offline Socializer), which suggests that female students are more concerned than male students with affiliation needs and social relationships in this learning context. Women may have a more interpersonal-oriented learning style than men. Hence, it should be noted that gender differences may have existed in this gamified classroom. Thirdly, students believed that the digital badge system could record and monitor changes in their knowledge, skills and abilities due to reliable procedures and assessments. All the participants strongly believed that digital badges could motivate students to learn. These findings are not in line with those of Facey-Shaw, Specht, van Rosmalen, & Bartley-Bryan (2020), who found that badges did not increase students' intrinsic motivation in an Introductory Programming course. Fourthly, partially flipped teaching may be better than flipping the entire semester. Especially, it could be quite challenging to persuade

freshman students to “buy in” to the inverted learning idea at first. Finally, gamification using digital badges has the potential to encourage learners to participate in the class and facilitate social interaction, as well as foster students’ autonomy and competencies.

5.2 Recommendations

This research was based on the application of gamified out-of-class activities in a flipped classroom setting. A series of further studies is needed to investigate the effects of the game elements in both in-class and out-of-class activities in this flipped environment. There is also a need for further studies to examine whether gamification through the use of digital badges can foster positive learning outcomes in a flipped business classroom. The effects of learning styles on learning outcomes in a gamified flipped classroom may also need to be explored.

5.3 Final thoughts and reflections

In summary, trainers need to be aware that there are diverse preferences and distinctive sets of learning styles (i.e. Factors A and B); hence, there is a need to support the use of digital badges in a partially flipped classroom on an individual basis so that instructors may understand the personal differences and agreed viewpoints due to different incentive mechanisms in this learning context.

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