The Effects of Gamification Instruction on the Roles of Perceived Ease of Learning, Enjoyment, and Useful Knowledge toward Learning Attitude

Jonathan Lin
National Cheng-Kung University
johna02361@gmail.com
Orcid number: https://orcid.org/0000-0003-2712-6554

Abstract
This study has separated into two stages. In the first stage, we interview with nine students and discover three crucial elements, perceived ease of learning, enjoyment, and useful knowledge, which will affect students' learning attitude. Then we develop a series of gamification curricula for those learners. In the second stage, we adopt gamification instruction in this semester and intend to verify the changes in learning attitude. To assess the effects of perceived ease of learning, enjoyment, and useful knowledge, toward learning attitude and the changes in learning attitude, an experimental design is employed in gamification curricula of a primary school in Taiwan. From the experimental results, we find out that perceived ease of learning, enjoyment, and useful knowledge all have positive effects on learning attitude. Besides, we have also verified the significantly positive effects of the gamification curricula in learning attitude in comparison with conventional curricula. Two contributions are in this study. First, perceived ease of learning, enjoyment, useful knowledge and two concepts of adopting mobile devices and competition strategy are the prerequisite elements while developing curricula. Second, students gain functional and behavioral competencies and utilize them into practical field.
Keywords: gamification instruction, learning attitude, perceived ease of learning, perceived enjoyment, perceived useful knowledge

INTRODUCTION

Alternative education, innovative pedagogy practice in Jenaplan school, plays an important factor such as dialogue, play, work, and celebration effects on students' learning attitude. The concept of alternative education may rely on supports of two key pillars, Game-based learning incorporating social learning theory. The two theories mainly intend to provide students interested and exciting curricula for drawing pupils' attentions in learning. However, owing to the culture differences, Asia education aims at competition until now. Naonaka and Toyama (2007) indicated that competition strategy provides external stimulations to learners as well as affects their efficiency of knowledge acquisition. Burguillo (2010) defined that competitive stance might stimulate peers' wills to receive challenges of learning tasks. Via conquering the difficulties, learners may improve their performance and motivation. Additionally, students who were born in cyber era are familiar with computer interfaces like on-line games and social media. The vivid interactive interfaces have captured the eyes of those learners from new generation. In order to tackle the challenges, Ubiquitous learning is introduced in education domain. It is considered a crucial element to inspire apprentices on learning and enhance learner participation in educational settings (McLoughlin & Lee, 2010). Therefore, innovative curriculum design should comprise of the elements above mentioned.

However, presently most teachers in the primary school only lecture students in the classroom by reading those cold lines words by words from textbooks. Comparing to the vivid interactions with network games, those learners show less interested in learning in school study. Even though some teachers intend to improve students' learning attitude via arranging field trip programs such as visiting historic constructions and appreciating natural beauty in the National Park, it is still difficult to inspire their passion in learning (C. P. Chen, Shih, & Ma, 2014).

Currently, the advancement of integrated technologies in computer, telecommunication, and internet content have provided students great opportunities to explore knowledge Treasure Island in cyber world. Owing to a variety of information hidden in the network, we have to utilize the advantages of high-tech devices such as smartphone and tablet as teaching aids for ubiquitous learning (Klopfer, Sheldon, Perry, & Chen, 2012). Therefore, we plan to design interactive curricula with game attributes in both real and virtual worlds. First, we invite students to co-design new curricula. With students' involvement in designing curricula, they might show great interesting in learning. Second, utilizing mobile devices as teaching aids. Students can immediately acquire the latest information like historic constructions or natural habitat of black-faced spoonbill by simply typing the key words or scanning the QR code. Finally, the element of competitive strategy (Fu, Wu, & Ho, 2009) was incorporating in the new curricula is proven as an effective and efficient method to encourage students in learning. In order to improve

students' learning attitudes and satisfaction, systematic gamification curricula with features of pleasurable activities, ease of learning, useful knowledge, mobile devices, and competition strategy are desperately to be developed.

In this study, we plan to examine research issues. Firstly, we intend to explore the relationship of perceived ease of learning, enjoyment, and useful knowledge toward learning attitude via students' perspectives of the new curricula. Secondly, we focus on examining the changes of learning attitude and satisfaction between gamification and conventional curricula. Finally, the research questions are as follows:

1. What is the effect of gamification curricula in perceived ease of learning to attitude?
2. What is the effect of gamification curricula in perceived enjoyment to attitude?
3. What is the effect of gamification curricula in perceive useful knowledge to attitude?
4. What is the effect of the gamification curricula in learning attitude in comparison with conventional curricula?

LITERATURE REVIEW

Theories & Gamification Curriculum Acceptance Model

Social learning theory puts great efforts on observing the connections of the behaviors, attitudes, and emotional reactions of others via continuous reciprocal interaction (Bandura, 1977). Interactive curriculum design such as game-based learning, which is served great influence on cognition development, motivation improvement, and decision making, facilitates students to gain attention, memory and motivation through intensive interactions. (Gee, 2003). From the perspective of emotion, the curricula of game-based learning should include agents in enjoyment, excitement, frustration, and achievement (Lazzaro, 2004) through active engagement in collaboration (Huang, Yeh, Li, & Chang, 2010). Some studies stated that motivation comprises of intrinsic and extrinsic motivation and perceived usefulness belongs to extrinsic motivation (Davis, Bagozzi, & Warshaw, 1992). Other studies indicated the positive relationship between perceived of usefulness and ease of use toward attitude and intention (Venkatesh & Morris, 2000). Still others suggested that enjoyment was a crucial element toward attitude and intention (Grant, 1991). More importantly, design a portable machine and virtual content platform with game attributes, Ubiquitous learning integrating the functions of mobile device and wireless technology (Hwang, Tsai, & Yang, 2008), to provide students a convenient mobile learning environment anywhere and anytime on formal education context (Liu & Hwang, 2009). Furthermore, we also invite scholars, experienced teachers, and local elders as external resources (Enkel, Gassmann, & Chesbrough, 2009) to develop a framework of local culture courses. Moreover, students are empowered to co-design illustrations, audio books, and activities. With opportunities to design curricula with teachers, students have shown greater learning attitude (Dickey, 2005). In this study, we adopt social learning theory to develop new curricula with game attributes, perceived ease of use, enjoyment, usefulness. We reason that the gamification curricula might improve students' learning attitude and expect those attributes have connections with learning attitude corresponding to technology Acceptance Model (Davis, 1989). In the following pages, we intend to discuss attitude, perceived ease of learning, enjoyment, useful knowledge and satisfaction.

Attitude

Attitude was defined unconsciously natural responses (Benavides-Velasco & Quintana-Garcia, 2008). Previous studies suggested that both usefulness and ease of use had positive influence on attitude (Davis et al., 1992). Other study stated the perceived ease of learning also acts as key element affecting learning attitude (Lin & Chuang, 2017). Besides, learning desire delivered positive influence on learning attitude (B. H. Chen, Hsu, & Chen, 2012). According to current studies, we understand prior studies that had aimed at the fields of information technology for young generation. To our acknowledgement, few studies integrate curriculum design, gamification, mobile devices, and competitive strategy to lecture young learners. Hence, game attributes such as ease of use, enjoyable environment, and abundant built-in textbook knowledge are designed in the new curricula to satisfy young students in learning. We expect those young learners might have increased their learning attitude via these new curricula.

Perceived ease of learning

Davis (1989), Venkatesh (1996), and Al-Gahtani and King (1999) stated that perceived ease of use affected on both attitude and intention. Some studies had been proven the connections between perceived ease of use and attitude in both mobile medical (Wu & Wang, 2005) and educational domains (Lin & Chuang, 2017). Other studies in mobile technology indicated that perceived usefulness and ease of use deliver positive effects on attitude and intention (Lu, Yao, & Yu, 2005). Hence, we plan to introduce mobile devices and gamification concepts to design ease of learning curricula like ubiquitous learning incorporating competitive strategy for guiding students to acquire prerequisite knowledge as well as to increase their learning attitude.

Perceived enjoyment

Enjoyment had been defined to deliver hedonic experiences (Csikszentmihalyi, 1975). Playful, fun, and enjoyment were also suggested to have positive effects on attitude (Davis et al., 1992; Nysveen, Pedersen, & Thorbjørnsen, 2005). Previous research indicated that the lively on-line interactive interface made young buyers enjoy the experiences of on-line purchasing (Wan, 2000). On the other hand, enjoyable environment provide gamers a comfortable place for social interaction (Tseng, 2001). Additionally, Lin and Chuang (2017) had proven the relationships between perceived enjoyment and learning attitude. Owing to the mentioned above, we intend to develop interested curricula like routes of field trips to make students closely experience the beauty of nature as well as to have further understanding of culture of Anping. We hope the innovative curricula create a comfortable learning environment for students as well as better their learning attitudes.

Perceived useful knowledge

Davis (1989) regarded perceived usefulness is the degree of a personal belief in adopting particular system to deliver better performance on their jobs. Pfeffer (1982) indicated that providing people incentive such as state-of-art knowledge acquisition, promotions, and bonuses will deliver good performance. Additionally, Utilizing the knowledge related to online airline ticket purchasing system will make people to get tickets easily (Renny, Guritno, & Siringoringo, 2013). Lin and Chuang (2017) addressed that applying the useful knowledge gained in classroom learning assisted students to accomplish the assigned projects. Therefore, gaining useful knowledge acts as a crucial element of improvement in learning attitude because it can solve many challenges in our everyday life. We anticipate that students might improve their learning attitude via the integrated curricula.

METHODOLOGY

Case Introduction

The faculties of SI-Men elementary school plans to investigate what determinant elements will influence students' perspectives toward learning attitude. In order to provide learners a comfortable learning environment and to acquire useful knowledge, we design new curricula in this study and hope the ones will make students feel comfortable and enjoyable in learning during the era of primary school. In 2014, the participating faculties had won golden medal of Program for Promoting Teaching Excellent.

Gamification curriculum development

With a close observation on learning attitude of young students in primary school, we find that students show less interested in learning. However, on the purpose of awaking and increasing their learning attitude, teachers begin to work with students and develop seven interesting routes of field trips; Furthermore, mobile learning and competitive strategy in gamification are adopted in new curricula. The former supports young learners to acquire instant knowledge without location and time limits; however, the latter stimulates students with stronger desires to win over others. For example, demand students to be narrators and in different tourist sites. When tourists satisfy with your service, you get one point. Finally, the team with more points wins the game. Those are the key elements to make students enjoy learning. In conclusions, we expect that the package of the innovative curricula increases students' learning attitude and satisfaction in the real world.

An example of new curriculum development in described as follows: Innovative curriculum includes six main parts, design concept, teaching materials, teaching strategy, measurements, teaching processes and challenges. The following pages will describe the detail information of this curriculum. The new curriculum names walking with Anping sword-lion and the design concept of this curriculum aims at sharing the knowledge of sword-lion with America and Australia sister schools. Teaching material, textbook, is collaboratively written and drawn by teachers and students. Teaching strategies comprises of ubiquitous learning, teamwork and sharing the knowledge of sword-lion with sister school's students via social media. Measurements of students' performance are graded by mobile device utilization, teamwork, film shooting and building a website. Teaching processes include field study, team observation, information searching, making films and presentation. Finally, translation and sharing the knowledge of sword-lion history with foreign students are challenges for primary school students. The detail information is listed on table 1.

Research Design

Figure 1 depicted the experimental processes of this research. We first interviewed with nine students and found out three critical factors to influence students' learning attitude shown on table 2. Then, we applied those key factors to technology acceptance model in this study. In the second stage, we demand those students who received conventional curriculum lecturing to take pre-test for analyzing their learning attitude. Then, the students had been arranged to receive gamification curricula of lecturing for three months. After completing the gamification courses, students were asked to fill out post-questionnaire for measuring the possible change in their learning attitude and satisfaction.

Table 1. An example of Curriculum design of Lion-Sword

Curriculum design	**Descriptions**
Design concept	The design concept intends to support students to gain heterogeneous competencies such as observation, information collection, and oral presentation via the curriculum of Sword-Lion.
Teaching materials	**The textbook of Sword-lion**: Written & drawn by teachers and students **Mobile device (Tablet)**: Engaging in ubiquitous learning
Teaching strategy	**Ubiquitous learning**: Use tablets to research information of sword-lion. **Teamwork**: Gather and share information for presentation.
Measurements	● Skills of using mobile device ● Efforts in teamwork ● Film-shooting ● Presentation ● Building up a website.
Teaching processes	**Utilizing tablets** to record information of sword-lion during field study **Teamwork**: Observation training and improvements of interpersonal skills **Presentation** for students in foreign countries: Language and oral expression.
Challenges & Solutions	**Challenges**: Translation problems **Solutions**: Each student delivers his part of presentation in English.

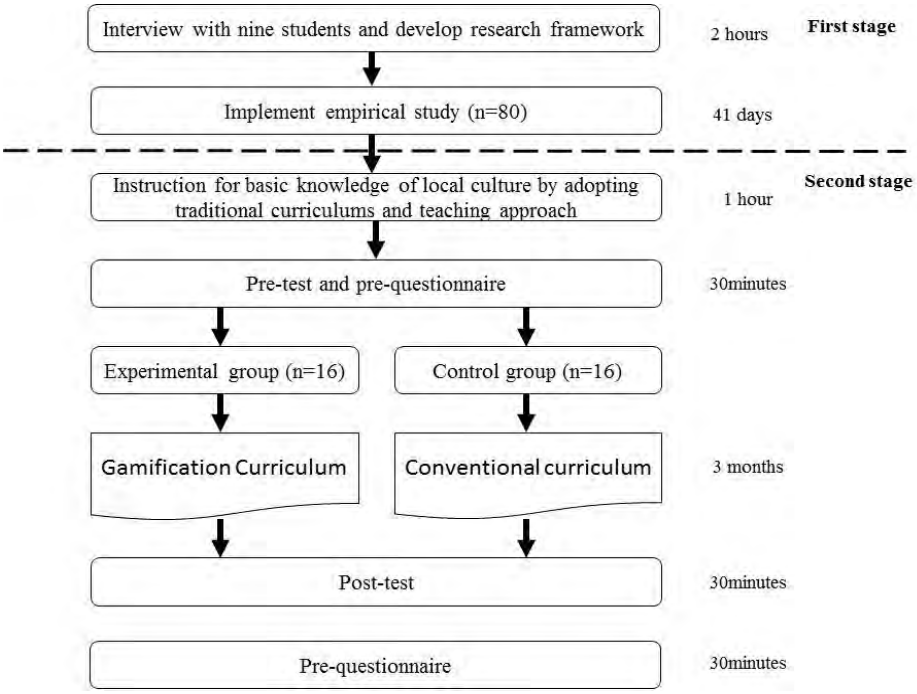

Figure1. Experimental procedure

Table 2. Background of nine students (n=9)

NO.	**Gender**	**Grade**	**Age**
ST.1	Female	6	12
ST.2	Female	6	12
ST.3	Male	6	12
ST.4	Male	6	12
ST.5	Female	6	12
ST.6	Female	6	12
ST.7	Male	6	12
ST.8	Male	6	12
ST.9	Female	6	12

Interview results

The purpose of this interview aims at exploring the key elements of adopting innovative lecturing from young learners' perspectives. This interview included nine sixth grade students. After interviews with nine students, we conclude four scopes, perceived ease of learning, enjoyment, useful knowledge, and attitude in this study. The results indicate that seven students (77%) agree with perceived ease of learning in the new curricula. Nine students (100%) show enjoyable feeling while lecturing. Furthermore, nine students (100%) express that they prefer to acquire useful knowledge. Finally, there are seven students (77%) demonstrate that interesting curricula affect their learning attitudes. The detail information is shown on both tables 3 and 4 respectively. Therefore, empirical research was developed.

Table 3. The results of constructs while interviewing with students (n=9)

Scope	**Issues**	**Users' experience**
Ease of learning	Simple and easy	7/9
Enjoyment	Enjoyable course	9/9
Knowledge usefulness	Heterogeneous competence	9/9
Attitude	Accept new teaching approach	7/9

Table 4. The detail information of interviewing with nine students (n=9)

Scope	No.	Content
Ease of learning	**ST. 1,5,8**	Knowledge taught by this teaching approach is easy for me.
	ST. 2,3,5,9	The interface is simple and easy to understand.
	ST. 3,4,8	This platform provides leaners an easy way to access.
Enjoyment	**ST. 1,2,4**	I feel interested in this teaching approach.
	ST. 3,4,5,7,8	New teaching approach is fun; besides, I also learn heterogeneous
	ST. 6,7,8,9	The new teaching approach makes me feel comfortable in learning.
	ST. 2,3,5,8	When I am asked to answer questions, I feel pleasant.
Knowledge usefulness	**ST. 1,2,5,7**	I learn responsible attitude.
	ST. 6,8,9	I begin to concern local culture.
	ST. 3,4,5,6,7	I improve my oral expressions.
	ST. 1,2,3,4,5,6,7,8,9	I learn the ability to use mobile technology.
	ST. 2,5,6,8	I develop ability in independent thinking and problem solving.
	ST. 1,3,4,6,7,8,9	My attitude becomes more optimistic when facing challenges
Attitude	**ST. 1,3,4,5**	I will suggest this course to my classmates.
	ST. 1,2,4,6,7	I feel enjoyable and I plan to get better grades.
	ST. 2,6.7	I want to introduce this course to other teaches.
	ST. 1,3,4,5	I will pay attention on relative information of this course.

Research Model

Four major constructs of model were delivered by interviewing with nine students in this study (see figure 2). Considering developing the Gamification Curriculum Acceptance Model, we redefined those mentioned factors into perceived ease of learning, enjoyment, useful knowledge and learning attitude.

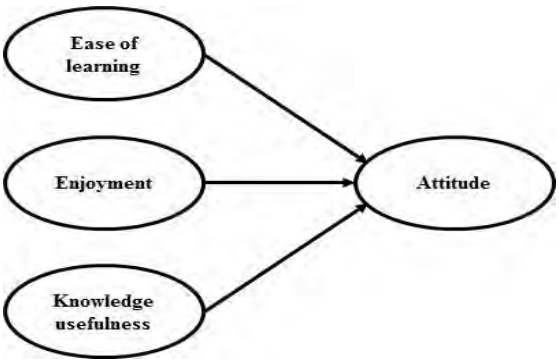

Figure2. Research framework

Definition and measurement of constructs

Four items in perceived ease of use and five items in perceived knowledge usefulness (Davis, 1989), enjoyment (Nysveen et al., 2005), and attitude (Davis et al., 1992) are modified and developed respectively. Operational definitions are shown on table 5.

Table 5. Operational Definitions of Constructs

Operational Definitions
Perceived ease of learning:
EOL1. It is easy to learn the knowledge taught by teacher in class.
EOL2. Interactive teaching approach is flexible to students.
EOL3. It is easy to make students involve in scenarios during lecturing.
EOL4. The purpose of lecturing knowledge to students is clear.
Enjoyment Sources:
EJY1. I think learning should make students feel enjoyable.
EJY2. I think learning should make students feel excited.
EJY3. I think learning should make students feel pleasant.
EJY4. I think learning should make students feel interested.
EJY5. I think learning should deliver students joyful hours.
Knowledge usefulness:
KU1. The knowledge taught in this innovative curriculum is useful to students.
KU 2. The knowledge taught in this new curriculum can be apply to real world.
KU 3. The new curriculum helps students acquire knowledge effectively and efficiently.
KU 4. The new curriculum is innovative.
KU 5. The learned knowledge can be applied to our daily lives.
Learning Attitude:
ATT1. I think innovative teaching curricula are attractive.
ATT2. I have positive attitude toward innovative teaching curricula.
ATT3. I will particularly aware of information about innovative teaching curricula.
ATT4. I will recommend others about this innovative teaching approach.
ATT5. I think that innovative teaching curricula are worth to take.

Sample and procedure

Our sampling of research model focused on eighty students studying in grade four, five, and six in Si-Men elementary school. The problem of common method variance is considered via three measurements. First, we hid reverse questions in the questionnaires. Second, two stages of filling out questionnaires were designed in the middle of semester and in the end of semester respectively. Finally, verify discriminant validity. Polite study, only 30 responses, examines consistency, semantic, and syntax. The survey took place from September 1st. to October 11th in 2014. 100 percentage of response rate. In the second stage, the 16 participants, average 12 years old, were sixth grade students taught by the same teacher. We plan to examine the selected students' learning attitude via different teaching approaches. Figure 3 shows students' pictures in gamification curricula.

<table>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Discussion with scholars</td><td>Co-design textbook</td><td>Lecturing</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Teamwork</td><td>E-learning</td><td>Field trip</td></tr>
</table>

Taijiang National Park

OP sailboat

Narrators

Plays

Digital game

Epals platform

Figure3. Students' pictures in gamification curricula

ANALYSIS & RESULTS

Validity and Reliability

Some criteria for validity and reliability are given as follows: KMO >0.5, communality >0.5, eigenvalue >1, factor loading >0.6, Cronbach's alpha >0.7 and item-total correlation >0.6. The factor loadings for three items of Attitude construct were 0.90, 0.69, and 0.88 (α=0.85) fitting requirements. Independent variables: three items of factor loadings in perceived ease of learning construct were 0.85, 0.86, and 0.81 (α=0.88). Three items of Enjoyment construct fitted requirement with factor loadings 0.87, 0.60, and 0.72 (α=0.77). Furthermore, four items in useful knowledge were preserved with factor loadings among 0.70, 0.91, 0.76, and 0.75 (α=0.84) shown on Table 6. Then, the values of CMIN/DF=1.43, NFI=0.88, RFI=0.84, IFI=0.95, TLI=0.94, CFI=0.95, and RMSEA=0.07 presented a good model fit. The convergent validity is examined by composite reliability and average variance extracted, which should be higher than 0.6 and 0.5, respectively (Fornell, 1981). The values of composite reliability are 0.87, 0.77, 0.86, and 0.86. Besides, figures of AVE were 0.70, 0.54, 0.61, and 0.68. The diagonal values were 0.84, 0.73, 0.78, and 0.82 all higher than the correlation coefficients, as shown on Table 7; thus the constructs showed good discriminant validity.

Table 6. Validity and Reliability

Construct	Items	Contents	Factor Loading	α	CR	AVE
Ease of learning	POE1	It is easy to learn the knowledge taught by teacher in class.	**0.85**	**0.88**	**0.87**	**0.70**
	POE3	It is easy to involve in scenarios during lecturing.	**0.86**			
	POE4	The purpose of lecturing knowledge to students is clear.	**0.81**			
Enjoyment	EJY1	I think learning should make students feel enjoyable.	**0.87**	**0.77**	**0.77**	**0.54**
	EJY2	I think learning should make students feel excited.	**0.60**			
	EJY4.	I think learning should make students feel interested.	**0.72**			
Knowledge usefulness	KU1	Knowledge in new curriculum is useful to students.	**0.70**	**0.84**	**0.86**	**0.61**
	KU2	Knowledge in new curriculum can be apply to real world.	**0.91**			
	KU3	Curriculum helps learners acquire knowledge efficiently.	**0.76**			
	KU4.	The new curriculum is innovative.	**0.75**			
Learning Attitude	ATT1	I think innovative teaching curriculum are attractive.	**0.90**	**0.85**	**0.86**	**0.68**
	ATT3	I particularly aware of information about new curricula.	**0.69**			
	ATT5	I think the courses in new curriculum are worth to take.	**0.88**			

Table 7. Discriminant Validity

	Ease of Use	Enjoyment	Knowledge usefulness	Attitude
Ease of learning	(0.84)			
Enjoyment	0.65**	(0.73)		
Knowledge usefulness	0.65**	0.53**	(0.78)	
Attitude	0.76**	0.68**	0.66**	(0.82)

Analysis of learning attitude

Table 8 shows the descriptive statistics and Independent-Sample T Test result of learning attitude. Both of the mean value and standard deviations in post-questionnaire were 5.97 and 1.06 for gamification curricula, and 5.07 and 0.78 for conventional curricula. From the Independent-Sample T Test result, significant effects are found in perspective taking (t=2.72, p<0.01). This suggests that gamification curricula could increase students' learning attitude more than conventional curricula.

Table 8. Descriptive data and t-test in learning attitude toward different curriculum

Experiment design	N	Mean	SD	Std. error	t	Eta square
Conventional curriculum	16	5.07	0.78	0.19	2.72**	0.19
Gamification curriculum	16	5.97	1.06	0.26		

Results of the Research Model

The VIF values were below 10 (Neter, Kutner, Nachtsheim, & W., 1996) which verified no issue of multi-collinearity in this research model. In addition, those figures showed good model fit of Structural Equation Models were as following: CMIN/DF=2.76, IFI=0.88, TLI=0.84, TLI=0.80, CFI=0.83. The results of the regressions were shown as follow: Firstly, perceived ease of use had significant influence on learning attitude (β=0.61, $p<0.001$) so hypothesis 1 was supported. Secondly, perceived learning enjoyment had positive influence on attitude (β=0.55, $p<0.001$); therefore, hypothesis 2 was supported. Finally, we also found out that knowledge usefulness had positive influence on Attitude (β=0.29, $p < 0.01$) and the results of research model was shown on figure 4. Finally, H1, H2, and H3 were all supported. Table 9 show the results of regressions.

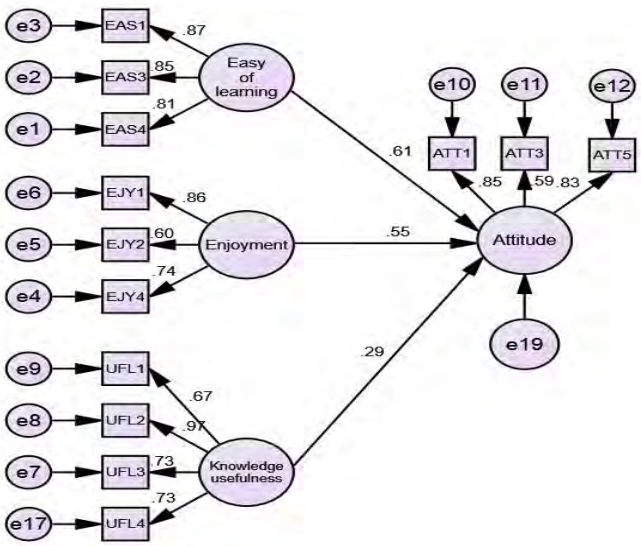

Figure 4. The results of framework

Table 9. Results of hypothesis

	Hypothesis	Results
H1	Perceived ease of learning has positive influence on attitude	Supported
H2	Perceived enjoyment has positive influence on attitude	Supported
H3	Perceived useful knowledge has positive influence on attitude.	Supported

CONCLUSIONS & DISCUSSIONS

The connections of research model

Gamification instruction has changed the learning attitudes of students, who study in primary school. Three aspects will be discussed as follows: (A). perceived ease of learning and learning attitude, (B) perceived enjoyment and learning attitude, and (C) perceived useful knowledge and learning attitude. In the aspect A, the ease of learning curricula is design to make young learners gain knowledge easily in different courses. We expect the curricula will assist pupils to acquire new knowledge step by step in the classroom teaching as well as to improve their learning attitudes. The result is in line with previous study (Davis, 1989). In the aspect B, the curricula are comprised game and competition attributes. We anticipate students enjoy the learning atmosphere and obtain the knowledge comfortably in the classroom teaching in order to enhance students' learning attitudes. The outcome appears to be consistent with prior study (Davis et al., 1992; Nysveen et al., 2005). In the aspect C, students apply the learned knowledge to accomplish the assigned tasks via mobile device like tablet. The achievement of finishing assignment makes those learners feel the learned knowledge in the classroom teaching is useful. Thus, students increase their learning attitudes. The consequent corresponds with former study (Davis, 1989). In conclusions, we have proven that perceived ease of learning, enjoyment, and useful knowledge have positive and significant influence on learning attitudes. Furthermore, we also verified that gamification curricula could increase students' learning attitude more than conventional curricula.

Integrated curriculum design and instruction

From the experiment conducted in a primary school local culture course, it is verified that curricula with game attributes incorporating co-deign curriculum, mobile device, competition strategy, and trip studies enable to improve students' learning attitude. In this study, we have successfully proven that the elements of perceived ease of learning, enjoyment, useful knowledge do affect students' learning attitudes. In the following pages, we will have further discussions on increasing students' learning attitudes via four different teaching elements by the example of sword-lion curriculum.

The example of sword-lion curriculum is success of this program and it comprises four key components, co-designing a curriculum, ubiquitous learning, competition strategy, and outdoor activities. *In the perspective of co-design curricula*: Teachers invite students to co-design the textbook both in writing contents and drawing the illustrates. Teachers expect those participators to collect necessity information to complete the textbook via close observations on sword-lion in Anping during trip study. Additionally, introducing the sword-lion knowledge to foreign students in America and Australia strongly depends on the setting up of sound social platform and fluent language capability. The gained achievements improve students' learning attitudes. *In the perspective of ubiquitous learning*: Students were demanded to use mobile device to acquire related information of sword-lion such as stories and historic constructions while walking on the oldest street in Taiwan. Students via the learning processes not only improve the competencies of self-study and using of mobile deice, but also increase their learning attitudes well. *In the perspective of competition strategy*: Instructors host a competition for students who participating the Anping tour. Students were separated in several teams and which team uses less time to calculate the right number of sword-lion in Anping village is the winner. The strategy did inspire students' motivation. They showed great desires to win the game. Students in one particular team adopt the strategy of separating the village into four areas and each area is responsible by two participators. Through the proactive moves, we understand that competition strategy serves as an important role on enhancing students' learning attitudes. Finally, *in the perspective of trip studies*: Teachers ask students to pre-study related information of this particular curriculum. Owing to the preview and teachers' clear explanations, students are easier to immerge in this learning circumstance and to gain practical knowledge. In short, participating the innovative curricula not only makes students perceive ease of learning, perceive enjoyment, and gain useful knowledge, but also gain functional and behavioral competencies (shown on table 11) and improve their learning attitudes. The results suggest that the innovative curricula have great impact on students' learning attitudes (Hwang, Wu, & Chen, 2012).

In conclusions, three contributions are in this study. First, we develop interesting and interactive gamification curricula through social learning theory. Second, we have proven that perceived ease of learning, enjoyment and useful knowledge do affect students' learning attitudes. Third, students learn practical functional and behavioral competences and apply those competences to improve their daily life. Via the processes of developing gamification instruction, six crucial factors are found in this study.

(1) Co-designing curriculum of game attributes with students.
(2) The trend of future in interdisciplinary curriculum development.
(3) Utilizing mobile devices as teaching aids.
(4) Adopting tour studies to experience lives.
(5) Improvements of interpersonal skills via teamwork.

(6) Measure individual competences via multi-assessment.

Finally, we sincerely suggest teachers and researchers to take the six elements as references when developing innovative curricula.

Implication

To ensure the improvements of students' learning attitudes, it is important that instructions and curricula should be redesigned by adding game and competition attributes. Instructors must focus on the key ingredients of to increase learning attitudes. For example, lecturers should first invite students to co-design textbooks via gamification instruction. As such, innovative curricula comprising pedagogical information and measurement should be integrated effectively with teaching approaches. Because of these efforts, students will improve their learning attitudes in the future. This study presented empirical data comparing conventional and gamification instruction at Si-Men primary school.

Limitation & future studies

It should be noted that this study was a small-scale investigation on a project basis. The subjects of this study were elementary students in Taiwan. Cultural differences in terms of the curriculum design may have a potential impact learning attitude. Future research should be focused on training primary students to gain interdisciplinary competencies and apply the learned knowledge in the real-world practice. For example, it would be interesting to explore the connections of knowledge absorption capacity, listening and interdisciplinary competence acquisition via project-based learning.

Table 11. Acquiring functional and behavioral competences by adopting gamification curricula

Si-Men Sailing King(Curriculums)	Measurement	Functional competence				Behavioral competence	
➢ **Adventure of voyage**	Drawing	●	Imagination	●	Oral expression	◆	Presentation skill
➢ **Yes! Captain**	Puzzle & role play	●	Art performance	●	Teamwork	◆	Listening skill
➢ **Taiowan incident**	Storytelling	●	Independent thinking	●	Writing skill	◆	Communicative skill
➢ **Sailing to dream world**	Team work	●	Computer skill	●	Problem-solving	◆	Social interaction
➢ **Trading firms & tree house**	Art performance/ narrating	●	Oral expression	●	Language (Taiwanese)	◆	Listening skill
➢ **Visiting Wax Statues**	Information searching	●	Information collection	●	Information analysis	◆	Tolerant multi-culture
➢ **Beauty of sword-lion**	Route designing/Teamwork	●	Knowledge integration	●	Knowledge application	◆	Communicative skill
➢ **Field trip -Natural beauty**	Knowledge sharing	●	Botany knowledge	●	Observation	◆	Social interaction
➢ **Sea silk route**	Use mobile devices	●	Culture and economy	●	Business evolution	◆	Embrace challenge
➢ **Sword-lion on epals**	Anping local culture	●	Computer skills	●	Language (English)	◆	Communicative skill
➢ **OP boat**	tie knots/ assemble and OP boat	●	Sailing skill	●	Innovative thoughts	◆	Social interaction
➢ **Taijiang National Park**	Knowledge in reclamation & environmental change	●	Team work	●	Presentation skill	◆	Cooperation
						◆	Collaboration

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