Chapter 14
Student and Teacher's Perceptions Toward the in-Game Card as Educational Reward (ICER) Moodle Plugin

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1 Introduction

Encouraging students' motivation could help students succeed in academic achievements (Dev, 1997). Therefore, giving rewards to students is frequently used in the classroom. Studies show that educational rewards can improve students' learning performance (Winefield, Barnett, & Tiggemann, 1984); however, the effectiveness of the traditional educational reward is limited when the reward is unattractive to students (Marinak, 2007).

The research shows that 67% of learners in the United States have used digital games in learning (Statista, 2018). Considering adopting the traditional educational reward system to the gamer generation, the research team has designed a reward plugin on Moodle for dispatching game-based educational rewards to students based on their performance in the learning activities (Chen, Chang, & Chang, 2016; Chen et al., 2017). To understand the usability of Chen's research, this research aims to investigate how students and teachers perceived using in-game cards as educational rewards in learning activities.

The next section introduces the game-based educational rewards and the Moodle plugin designed by the research team. The design of accessing students and teachers'

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perceptions in the game-based educational rewards is introduced in Sect. 3. Section 4 analyzed the data we collected from the experiment. The findings and suggestions are listed in Sect. 5. Section 6 summarizes the research and discusses the possible future works.

2 In-Game Card as Educational Reward (ICER) Moodle Plugin

Trading card game is a type of card game in which players use the cards they collected to compete with other players (Pittman & GauthierDickey, 2013). It has been used in teaching host defense (Steinman & Blastos, 2002), weather and climate (Klopfer, Sheldon, Perry, & Chen, 2012; Sheldon et al., 2010), human immune system (Su, Chen, & Lin, 2014), etc. The research team has developed Online Trading Card Game which is used for discipline independent educational rewards (Chen, Kuo, Chang, & Heh, 2009; Chen, Kuo, Chang, & Heh, 2017).

As Fig. 1 shows, teachers can deliver the in-game cards as educational rewards in any course, grade, and school level based on students' performance in the learning activities on the e-learning system. Students can use the reward cards to fight with their fellows in the Online Trading Card Game. In order to be in the higher rank in the game, students need to get higher level cards as well as rarer cards, which they could only get from the e-learning system when they perform better in the learning activities. Therefore, getting better cards in the Online Trading Card Game becomes an intrinsic motivation to students and they would like to work harder in the learning activities.

However, dispatching rewards to students one by one is a heavy burden for teachers. In-game Card as Educational Reward (ICER) Moodle plugin is developed to build a bridge between the e-learning system and the Online Trading Card Game (Chen, Chang, & Chang, 2016; Chen et al., 2017). Teachers can easily use the ICER

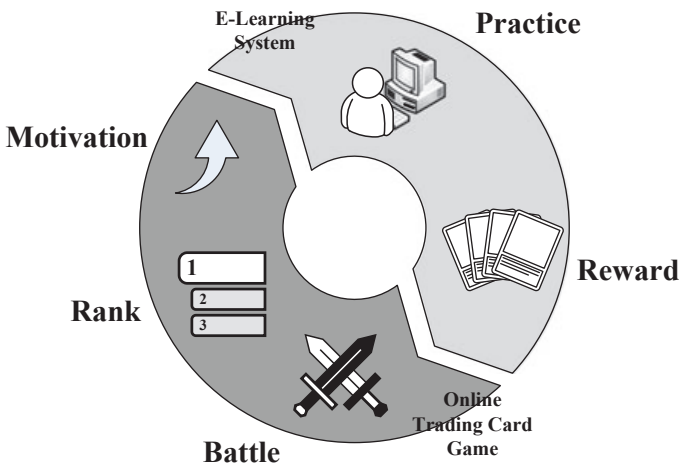

Fig. 1 Motivation enhancement cycle between e-learning system and online trading card game

Moodle plugin to set up the criteria of giving rewards based on students' performance in learning activities, such as quizzes, discussion forum, homework, etc. Figure 2 shows an example of how teachers set up the awarding criteria for the "Math" quiz: students who receive marks from 91 to 100 for the quiz will receive a level 3 avatar card, from 81 to 90 for a level 3 trap card, from 76 to 80 for a level 1 magic card, and below 75 for nothing.

On the other hand, after students finish a learning activity on Moodle, they should receive correspondent rewards; however, they do not know what rewards they get as Fig. 3a shows because they have not given Moodle permission of accessing their card collection information in the online Trading Card Game. After the Trading Card Game button in Fig. 3a is clicked, students will be redirected to the Permission Granting page on the online Trading Card Game server.

As Fig. 4a shows, students need to enter their username and password of the game and tell the system which permission(s) they would like to grant to Moodle

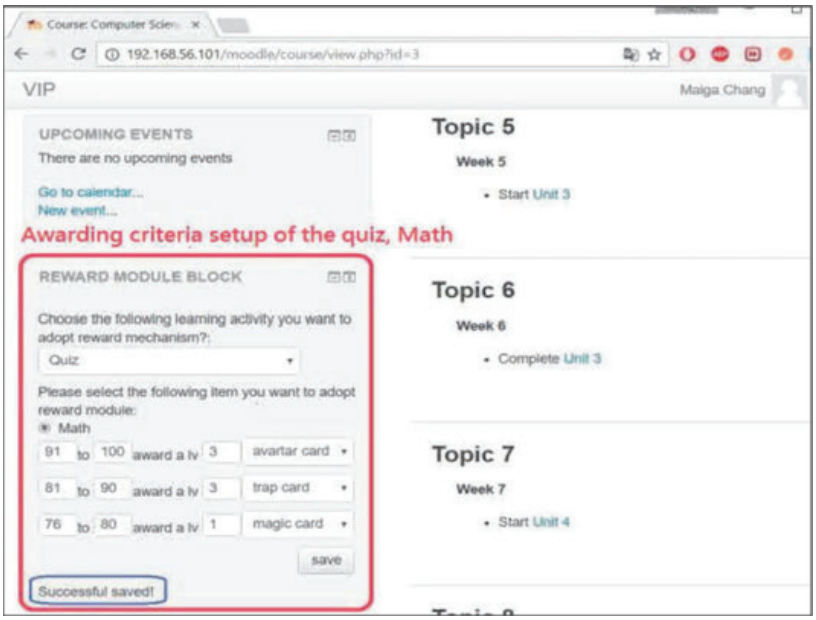

Fig. 2 Reward module block for teachers to set up awarding criteria for the "Math" quiz

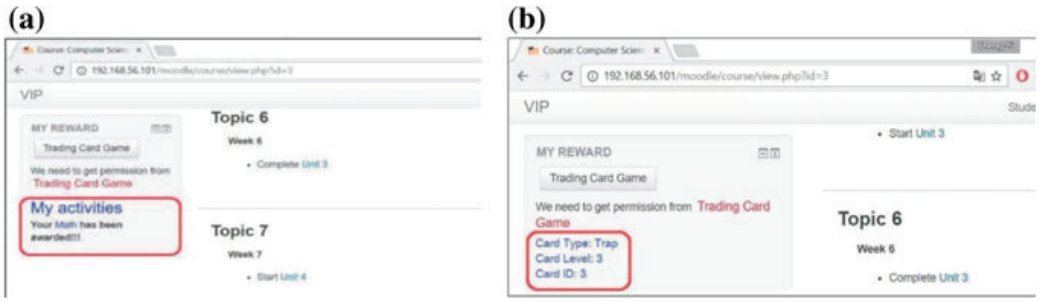

Fig. 3 My reward block in Moodle: **a** before authorizing Moodle to give cards to the game server; **b** after the authorization

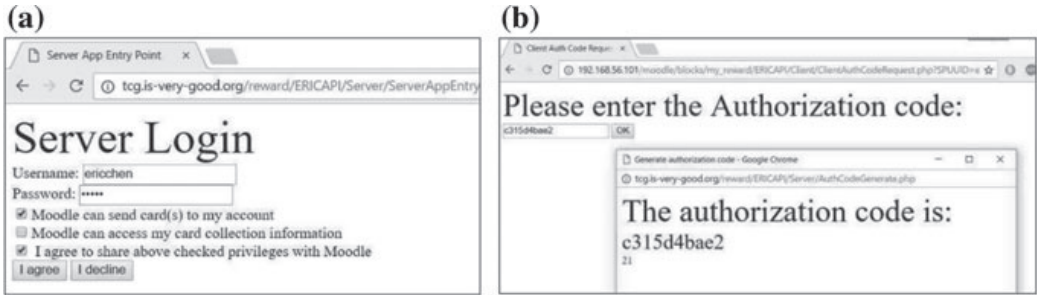

Fig. 4 Authorizing Moodle the permission of accessing students' information in the game server: **a** granting particular permission for Moodle; **b** entering authorization code generated by the game server on Moodle

by selecting specific checkbox(s), for instances, allowing Moodle to send reward cards to the game or to browse their card collection in the game. After selecting the permissions, the game generates an authorization code for students entering when they are redirected back to Moodle as Fig. 4b shows. This process keeps students' private data (e.g., student ID) in Moodle and the game remaining unknown for the other application.

After the permission is granted by Moodle, students can find out what types of cards they have got for a learning activity as Fig. 3b shows. With the ICER Moodle plugin, the online Trading Card Game can be integrated into Moodle smoothly without leaking students' private information in both of the applications.

3 Research Method

The research team has two hypotheses and four moderators regarding how and what factors will affect teachers' and students' attitude toward the ICER Moodle plugin as Fig. 5 shows.

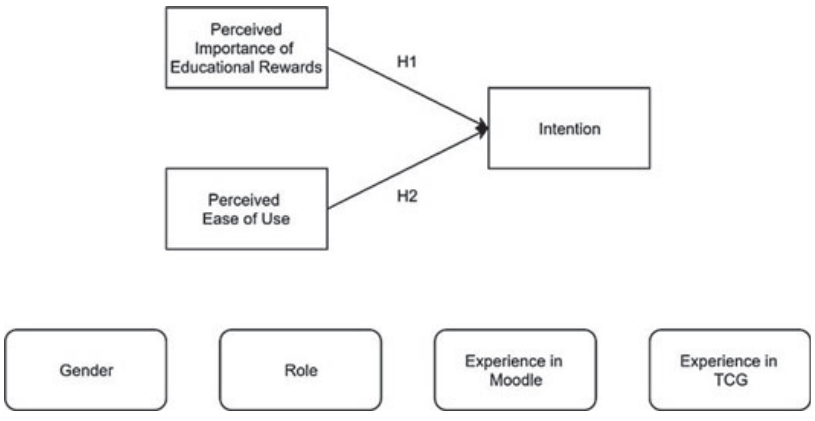

Fig. 5 Hypotheses and the moderators of ICER Moodle plugin

The hypotheses are

- H1: Participants' perceived importance of educational rewards will affect their intention of using ICER Moodle plugin in the future.
- H2: Participants' perceived ease of use toward ICER Moodle plugin will affect their intention of using the plugin in the future.

The moderators are

- Gender: It is used to understand whether the participant is a male or a female. Gender gap is always an important issue in the adoption of new technology. Some studies found out that males have more positive attitudes toward new technologies than females (Durndell & Thomson, 1997; Whitely, 1997). With better understanding of gender difference in acceptance toward learning technology, researchers can design a better product or learning process to overcome the gender gap (Ong & Lai, 2006).
- Role: It is used to understand the participant is a teacher or a student. Christensen (2002) argued that the difference in attitudes toward learning technology between students and teachers might increase anxiety when using the new techniques. This study would like to investigate whether or not teachers and students have different attitudes toward ICER Moodle plugin in order to find out the proper way to adopt the new educational reward system in teaching.
- Experience in Moodle: It is used to understand the participant's past experience in Moodle, including whether or not the participant has heard Moodle as well as whether or not the participant has used Moodle. The research team would like to know whether or not participants who have used Moodle will have higher intention of using ICER Moodle plugin in the future.
- Experience in TCG: It is used to understand the participant's past experience in trading card games, including whether or not the participant has heard any trading card games, whether or not the participant has played any trading card games, and whether or not the participant has seen others playing any trading card games. The research team would like to see if participants who have more experience in any trading card games have higher intention of using in-game cards as educational rewards.

Finding teachers to participate in the evaluation is not easy. To get both teachers and students' views toward ICER Moodle plugin, the research team needs to recruits teachers and students from different cohorts. The educational-related conference is a good place to recruit teachers for the evaluation. Therefore, the teachers were recruited from a hands-on workshop jointly held in advanced learning technology in June 2017 in Beijing and 19 participants (7 males and 12 females) participated in the workshop. On the other hand, the research team recruited students from a course given by the Department of Information Management in a north Taiwan university in 2018 Spring semester. Twenty-six students were recruited, including 7 males and 19 females. In the experiment process, the research team demonstrated how to use ICER Moodle plugin in the beginning. Following with the demonstration, the participants spent 10 min to use the plugin. In the end, the research team asked the participants to

Table 1 Descriptive statistics of participants' Moodle usage experience in two groups

	Have heard Moodle		Have used Moodle	
	Yes	No	Yes	No
Teacher	11 (57.89%)	8 (42.11%)	5 (26.32%)	14 (73.68%)
Student	13 (50.00%)	13 (50.00%)	7 (26.92%)	19 (73.08%)
Total	24 (53.33%)	21 (46.67%)	12 (26.67%)	33 (73.33%)

Table 2 Descriptive statistics of participants' trading card games experience in two groups

	Have heard		Have played		Have seen	
	Yes	No	Yes	No	Yes	No
Teacher	14 (73.68%)	5 (26.32%)	7 (36.84%)	12 (63.16%)	14 (73.68%)	5 (26.32%)
Student	21 (80.77%)	5 (19.23%)	11 (42.31%)	15 (57.69%)	22 (84.62%)	4 (15.38%)
Total	35 (77.78%)	10 (22.22%)	18 (40.00%)	27 (60.00%)	36 (80.00%)	9 (20.00%)

fill out a questionnaire asking them their perceived importance of educational reward, perceived ease of use toward the ICER Moodle plugin, and intention of using the plugin in the future.

After collecting the data, the research team investigated the participants' past experience in Moodle and trading card games. Table 1 shows that 53.33% of participants have heard about Moodle before but only 26% of total participants have used Moodle. There is no significant difference between teachers and students whether they have heard about Moodle before (χ^2 (1, $N = 45$) = 0.275, $p < 0.413$) nor they have used Moodle (χ^2 (1, $N = 45$) = 0.002, $p < 0.619$).

In trading card game experience, 77.78% of participants have heard what trading card game is and 80% have seen other people playing trading card games. However, only 40% of participants have played any trading card games before. There is also no significant between teachers and students in their past experience in trading card games. The results of the chi-square tests corresponding to participants have heard trading card games, have played trading cards, and have seen others playing trading card games are χ^2 (1, $N = 45$) = 0.319 where $p < 0.416$, χ^2 (1, $N = 45$) = 0.137 where $p < 0.477$, and χ^2 (1, $N = 45$) = 0.820 where $p < 0.297$ (Table 2).

4 Analysis

The research team used SPSS 20.0 to verify the validity and reliability for the Importance of Educational Reward (IER) and Perceived Ease of Use (EoU) factors in the questionnaire. The Cronbach's Alpha value of Importance of Educational Reward is 0.919, which sites on "excellent" range and shows that questionnaire is reliable (Georage & Mallery, 2010). The analysis result, as well as the questions, is listed in Table 3. The item description in Table 3 with pair brackets ([…]) indicates

Table 3 Validity analysis result for the questionnaire in the Importance of Educational Reward

Item		Factor
		1
Factor 1: Importance of Educational Reward (IER)		
I8:	I believe [students/I] will work harder in the learning activities (e.g., doing homework, participating in discussion) if [they/I] can get rewards through working on them	0.903
I7:	Once [the student/I] achieves the criteria of the getting rewards in the learning activity, [he/she/I] can get the cards from Trading Card Game as the reward	0.882
I3:	A course should have a rewarding mechanism	0.846
I1:	If a course has a rewarding mechanism, [students/I] will finish the learning activities in the course faster	0.820
I9:	[I believe students/I] prefer [they/I] can get rewards from all learning activities	0.816
I2:	If a course has rewarding mechanism, [students/I] will concentrate [their/my] attention more	0.803
Eigenvalue		4.292
% of variance		71.541
Overall $\alpha = 0.919$, total variance explained is 71.541%		

Table 4 Validity analysis result for the questionnaire in Ease of Use

Item		Factor
		1
Factor 1: Perceived Ease of Use (EoU)		
I5:	I believe [students/most of the people] can easily learn how to authenticate Moodle dispatching cards in the Trading Card Game as a reward	0.818
I4:	The ways of getting cards in Trading Card Game through different learning activities are similar	0.802
I6:	I still remember the process of how [students authorizing/to authorize] Moodle to give cards to [themselves/me] in Online Trading Card Game as a reward	0.786
Eigenvalue		1.930
% of variance		64.320
Overall $\alpha = 0.720$, total variance explained is 64.320%		

the difference description in teachers and students' questionnaire. The description before the slash (/) is for teachers, and the one after the slash is for students.

The Cronbach's Alpha value of Ease of Use is 0.720, which sits on "acceptable" range. The result is shown in Table 4.

Table 5 Correlation analysis between two factors (Importance of Educational Reward and Perceived Ease of Use) and Intention of ICER usage

	IER	EoU
Pearson correlation	0.600	0.660
Sig.	0.000	0.000
N	45	45

IER: Importance of Educational Reward; EoU: Perceived Ease of Use

Table 6 Independent t-test result for Importance of Educational Reward (IER) and Perceived Ease of Use (EoU) in teachers' and students' group

		Descriptive statistics			*t*-test		
		N	Mean	SD	*t*	*df*	*p*
IER	Teacher	19	4.21	0.464	2.252	43	0.029*
	Student	26	3.74	0.831			
EoU	Teacher	19	3.70	0.442	2.729	43	0.009**
	Student	26	3.18	0.744			

*$p < 0.05$, **$p < 0.01$

There is only one 5-point Likert scale item (5 for "Strongly Agree" to 1 for "Strongly Disagree") in the Intention factor, which is asking whether participants agree "I would like to use Moodle ICER Moodle plugin in all the courses" or not. The average rating from all participants is 3.58 with 0.892 standard deviation. There are 42.2% of total participant rated Neutral and 51.1% rated Agree or Strongly Agree. The result shows that most of the participants give positive responses to the intention of using ICER Moodle plugin in the future.

To understand if there is a significant difference between teachers' and students' intention of using ICER Moodle plugin, *t*-test is applied in the analysis. The result shows that there is no significant difference in teachers ($M = 3.84$, $SD = 0.834$) and students ($M = 3.38$, $SD = 0.898$) groups; $t(43) = 1.739$, $p = 0.089$. In the next step, the research team verifies the two hypotheses in Fig. 5. The results in Table 5 show that both participants' Perceived Importance of Educational Rewards (IER) and Perceived Ease of Use (EoU) factors have a positive correlation to Intention of ICER Usage significantly.

Furthermore, the research team finds out that there is a significant difference between teachers and students in their Perceived Importance of Educational Rewards as well as the Perceived Ease of Use in ICER Moodle plugin. Teachers believe educational rewards are important to students in engaging students' learning motivation; they also give higher score toward the ease of use of the ICER Moodle plugin. The test results are listed in Table 6.

The research team also evaluated whether the other moderators (gender, past experience in Moodle, and past experience in trading card games) would affect participants' intention of using ICER Moodle plugin. First of all, gender is examined. The results show that gender is not the factor which affected participants' perceived

Table 7 Independent t-test result for Importance of Educational Reward (IER), Perceived Ease of Use (EoU), and Intention of ICER Moodle plugin in future usage in gender

		Descriptive statistics			*t*-test		
		N	Mean	SD	*t*	*df*	*p*
IER	Male	14	4.04	0.979	0.594	43	0.555
	Female	31	3.90	0.604			
EoU	Male	14	3.36	0.902	−0.282	43	0.779
	Female	31	3.42	0.571			
Intention	Male	14	3.36	1.216	−1.119	1.704	0.371
	Female	31	3.68	0.702			

Table 8 Independent t-test result for Importance of Educational Reward (IER), Perceived Ease of Use (EoU), and Intention of ICER Moodle plugin in participants' past experience in Moodle usage

			Descriptive statistics			*t*-test		
			N	Mean	SD	*t*	*df*	*p*
Have heard Moodle	IER	Yes	24	4.06	0.602	1.226	43	0.227
		No	21	3.80	0.851			
	EoU	Yes	24	3.47	0.564	0.758	43	0.453
		No	21	3.32	0.800			
	Int	Yes	24	3.63	0.770	0.376	43	0.709
		No	21	3.52	1.030			
Have used Moodle	IER	Yes	12	4.00	0.711	0.341	43	0.735
		No	33	0.39	0.750			
	EoU	Yes	12	3.47	0.558	0.426	43	0.673
		No	33	3.37	0.726			
	Int	Yes	12	3.67	0.778	0.399	43	0.692
		No	33	3.55	0.938			

IER: Importance of Educational Reward; EoU: Perceived Ease of Use; Int: Intention of using ICER Moodle plugin in the future

importance of educational reward, perceived ease of use, and intention of using ICER Moodle plugin in the future as Table 7 shows.

The next moderator the research team investigated was participants' past Moodle experience. Two questions were asked for understanding participants' past Moodle experience, which are "Have you heard of Moodle before?" and "Have you used Moodle before?" The research team uses *t*-test to evaluate whether the past Moodle experience will affect participants' intention of using ICER Moodle plugin in the future. The results are listed in Table 8 which shows that there is no significant difference in intention of using ICER Moodle plugin between participants who have and have no experience in Moodle.

Table 9 Independent t-test result for Importance of Educational Reward (IER), Perceived Ease of Use (EoU), and Intention of ICER Moodle plugin in participants' past experience in trading card games

			Descriptive statistics			*t*-test		
			N	Mean	SD	*t*	*df*	*p*
Have heard TCG	IER	Yes	35	3.88	0.786	−1.037	43	0.306
		No	10	4.15	0.475			
	EoU	Yes	35	3.41	0.715	0.168	43	0.867
		No	10	3.37	0.577			
	Int	Yes	35	3.60	0.914	0.310	43	0.758
		No	10	3.50	0.850			
Have played TCG	IER	Yes	18	3.79	0.900	−1.134	43	0.263
		No	27	4.04	0.594			
	EoU	Yes	18	3.35	0.780	−0.387	43	0.701
		No	27	3.43	0.619			
	Int	Yes	18	3.39	1.037	−1.165	43	0.250
		No	27	3.70	0.775			
Have seen others playing TCG	IER	Yes	36	3.92	0.770	−0.274	43	0.786
		No	9	4.00	0.596			
	EoU	Yes	36	3.43	0.698	0.506	43	0.615
		No	9	3.30	0.634			
	Int	Yes	36	3.58	0.906	0.083	43	0.935
		No	9	3.26	0.882			

The last moderator in the evaluation was participants' past experience in trading card games. "Have you heard of trading card games?", "Have you played trading card games?", and "Have you seen others playing trading card games?" are the questions asked in the questionnaire. The research team also uses *t*-test to examine whether the past experience in trading card games will affect participants' intention of using ICER Moodle plugin in the future. The results show that there is no significant difference between participants with more trading card game experience and those who have less as Table 9 shows.

5 Findings

The analysis results in the previous section show that the two hypotheses are supported: participants who have perceived more positive on the importance of educational rewards or perceived more positive ease of use toward ICER Module have the higher intention of using ICER Moodle plugin in the future. The research team also discovers some important and unexpected findings.

5.1 Important Findings

Based on the analysis results in Sect. 4, more than half of the participants said they Agree or Strongly Agree with "I would like to use ICER Moodle plugin in all the courses." Only three participants (6.7%, one teacher and two students) Disagreed or Strongly Disagreed it. The results show that using ICER Moodle plugin in a course is attractive. Moreover, there is no significant difference between teachers' and students' responses to this question showing that both teachers and students agree using ICER Moodle plugin could help students in the learning process.

Even there is no significant difference between teachers and students for their intention of using ICER Moodle plugin, the researchers find out that teachers have stronger beliefs in educational rewards are important in engaging students' learning motivation, compared to students. The result indicates that teachers have higher intention of using reward mechanism in teaching. If we can persuade teachers that students can be engaged by getting cards as educational reward, teachers might have a higher intention of using ICER Moodle plugin in the future.

The results in Table 6 reveal another question: why students give lower score for the Perceived Importance of Educational Rewards factor than teachers. The possible reason is that the students might have got unattractive educational rewards like pencils and books before and they do not think those reward will increase their learning motivation. It matches Marinak's study that unattractive educational reward will have no effect for engaging students in learning (Marinak, 2007).

Based on this result, the suggestion to educators is to design a more attractive educational reward in their course is important. Integrating game elements is one of the methods to improve the awarding mechanism as our study result shows. Moreover, other studies indicating that responding positively (Dev, 1997) and applying awarding mechanism in individual competition instead of group competition (Michaels, 1977) could also be considered when designing awarding mechanism in the course.

5.2 Unexpected Findings

The past studies show that gender influences players' performance in game (Efrani et al., 2010). In this case, some people might believe boys have a higher intention of using games for learning. However, Table 7 shows that there is no significant gender difference on the intention of using ICER Moodle plugin in the future; female participants even give higher scores slightly.

The result is similar to Arbaugh's study in 2000 as well as Viber and Gronlund's study in 2013. The possible reason is females usually are more active in the learning process than males (Gonzalez-Gomez, Guardiola, Rodriguez, & Alonso, 2012). On the other hand, Table 7 shows that male participants have stronger belief that educational rewards are important for learning. If the rewards for learning activities are attractive enough, male students might spend more time in the activities in order to get rewards.

Our study results suggest that researchers and educators could design educational rewards for different gender in order to improve their learning motivation. Lucas and Sherry's (2004) study shows that there is gender difference in game preference. Take online Trading Card Game, for example, if the research team would like to attract more male students using cards in game as rewards, adding role-playing or fantasy elements might be useful to get male students engaged.

On the other hand, the analysis results in Tables 8 and 9 show that participants' past experience in Moodle and trading card games will not affect their intention of using ICER Moodle plugin in the future. The result consists with Bourgonjon and colleagues' study in 2010 and 2013 (Bourgonjon et al., 2013; Bourgonjon, Valcke, Soetaert, & Schellens, 2010). Teachers and students accept using games in learning even they have less gaming experience.

According to this finding, the research team suggests researchers to encourage teachers using game elements in teaching or rewarding because most of the students are digital natives (Prensky, 2001). Studies show that games could enhance students' learning motivation easier (Cheng, Kuo, Lou, & Shih, 2012; Yang, Chien, & Liu, 2012). There are also evidence showing that educational game could improve students' academic achievements in science (Sung & Hwang, 2013; Yien, Hung, Hwang, & Lin, 2011) and language courses (Yeh, Hung, & Hsu, 2017).

The research team also finds out another unexpected finding—students give lower scores in Perceived Ease of Use (EoU) factor which has significant difference than teachers' responses; moreover, participants who have played trading card games before also give lower scores in the EoU factor. The possible reason is that students were born in the digital age and they are already familiar with gaming interface in commercial games. When they play the games, they do not need to authorize another system to access their data from another game. However, in ICER Moodle plugin, to make sure the Online Trading Card Game will not know students' private data in Moodle, such as their student id, grades, or courses they took, and the authorization process is required.

The suggestion to the system developers of similar research is to simplify the authorization process and better instruction in the system design. Because students only need to do the authorization process once in the beginning, if the authorization process is simple and students understand they only need to do it once, they might have the higher intention of using the similar system in the future.

6 Conclusion

In-game Card as Educational Reward (ICER) Moodle plugin is designed for connecting Moodle and Online Trading Card Game, an existing educational reward system. This research conducted an experiment to find out what factors will affect teachers and students' intention of using ICER Moodle plugin in the future. The results show that both teachers and students are positive toward their intention of using the ICER Moodle plugin in the future. Moreover, participants' perceived importance of edu-

cational rewards and their perceived ease of use toward the system have a positive correlation to their intention of using the plugin in the future. On the contrary, the factors include gender, past experience in Moodle, and past experience in trading card games not influence a person's intention of using ICER Moodle plugin.

This study has some limitations. First of all, the sample size is small. Also, as the participants were recruited from a hands-on workshop in an educational technology conference, only one-fourth of participants have used Moodle before—they might have less intention of using ICER Moodle plugin because they have no needs to use the plugin in their courses. Another limitation is the limited time the research team has to allow participants having comprehensive idea of using the plugin and seeing the effect of giving students in-game card as an educational reward. The participants can only try on the ICER Moodle plugin and do not have opportunity to really use the ICER Moodle plugin in a real course. Furthermore, the limited time the research team has also hindered the researchers from interviewing participants regarding why they rate higher or lower scores for each factor.

To solve these issues, the research team would like to conduct one to two month's experiment in the future. Teachers will be able to use ICER Moodle plugin and set up rewarding criteria for learning activities of their classes and students will receive rewards based on their learning performance. Last but not least, what impact the ICER Moodle plugin would have on students' academic achievement is another research issue that should be further investigated in the future.

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