

# The Effectiveness of Giving Students In-game Cards as Rewards

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**Abstract.** Reward has become an important role to increase students' motivation in traditional classroom learning. The research team designed an In-game Card as Education Reward (ICER) web-based system which helps teachers give students reward while students have good performance in learning activities such as assignment, presentation, discussion, quiz, and exam. Whenever students complete a learning activity, their teacher can choose different type and rarity in-game cards and deliver the cards to the students by using ICER web-based management system. Students can redeem the reward on ICER website and receive in-game cards in the game. Students can have more fun in the game-play or even show-off the cards that they have to other students. For this reason, students may put more efforts on studying and doing learning activities and may be even actively participated in the discussions in the class for getting better rewards.

**Keywords:** In-game Card, Learning Performance, Trading Card Game, Educational Game, Educational Reward

## 1 Introduction

In traditional classroom learning, teachers usually award students while they have good performance in different learning activities. Taking a science teacher – Eric as an example, he wants to encourage students to study. He may choose to give pencils as rewards for the top three students who receive highest marks in the midterm exam. What he expects to see is that students will have better performance for the incoming

learning activities include final exam if they find themselves can receive rewards for their good performance from this one.

In the context of distance education and online learning, for instance, all students at Athabasca University are learning online in different time zones across Canada and worldwide, giving students real items as rewards is impractical and unrealistic. In order to make teachers still capable of awarding students just like how they did in traditional classroom learning situations, an educational reward system needs to be designed and developed. The research team developed In-game Card as Educational Reward (ICER) web-based system. Teachers can use similar way to give students rewards as usual. With the ICER web system's help, students' learning performance may be improved.

The next section introduces how educational reward influences students' learning performance. The research team integrated ICER web-based system with a trading card game (TCG) for delivering in-game cards for students as educational rewards. The trading card game was developed by Chen and colleagues [5] and its details can be found in Section 2. Section 3 describes the architecture of ICER web-based system. The implementation of ICER web-based system can be seen in Section 4 and Section 5 explains the evaluation plan the research has for verifying the usability of the ICER web-based system and the effectiveness of the use of in-game cards as rewards. Section 6 summarizes the research and discusses possible future works that we can do later.

## **2 Related Work**

Reward is a feedback that can encourage students to learn more [8]. With appropriate goal settings, rewards can be valuable and more attractive for students [6]. In addition, bringing rewards into learning activities such as a course's assignments can increase the persistence of achieving the goal [10]. Some researchers even believed that rewards positively affect students' learning performance [9]. According to the above studies, we can find out that only when students think the rewards they received are valuable or meaningful, the reward mechanism can be effective in terms of engaging students in learning.

To make rewards more attractive for students, Chen and colleagues develop a trading card game, namely TCG, and want to use the cards in the game as educational rewards. Teachers can give students higher-level or rarer cards if students did exercises well. Once students receive higher-level or rarer cards, they have higher chance to win the duels in the game. On the other hand, when students are not doing exercise well, they probably will not receive cards as rewards or only receive lower-level or common cards for what they have done.

They also conducted an experiment to find out whether or not the use of the trading cards as educational rewards affects students' motivations and academic achievements [4]. There were 172 fifth-grade students, 80 boys and 92 girls,

participated in the experiment and were separated into two groups. The 68 control group students only used a web-based vocabulary learning system for learning and practicing their English vocabularies, and the 104 experiment group students used the web-based learning system and received cards as rewards automatically every time after they practiced vocabularies with the system. Their research result showed that students who played the game more, they used the web-based learning system more often. The result suggested that students were study harder in order to receive higher-level or rarer cards.

### **3 The integration of ICER web-based system and TCG**

This research aims to design ICER web-based system which delivers cards of the TCG that Chen and colleagues developed. The system needs to support teachers awarding their students by giving particular cards according to students' performances on different learning activities. With the help of Educational Resource Information Communication API (ERIC API), students' identities won't never be revealed to the TCG and the game won't know anything about the student during the reward redemption process [3].

ICER web-based system and the TCG are two systems that this research aims to integrate together so teachers can choose in-game cards as rewards for the students to redeem according to students' performances of particular learning activities. Whenever a teacher wants to give a student reward, he or she just need to sign on the system and choose type and level of the in-game card. The system will generate an URL for the teacher so that he or she can give out the URL for the student to redeem the reward. Once the student has the URL, he or she needs to authorize ICER web-based system (for once) to access his or her TCG account by entering their credentials at TCG if it is the first time he or she redeem for the reward on TCG.

ICER web-based system has two modules: reward setup module and reward distribution module. Using an example to explain the architecture and workflow of relationship between the ICER system and the TCG. A science teacher, Eric, who teaches Math and he wants to give out his students a three-star avatar card when the student gets A+ for the midterm exam. He needs to setup the reward as the Step 1 in Fig. 1 shows. The reward setup module will check reward database (i.e., Step 2 in Fig. 1) to remind him if the student has been awarded before (i.e., Step 3 in Fig. 1). The reward distribution module will generate an URL and write a record into the reward database as Steps 4 and 5 in Fig. 1 show. Eric then will send the specific URL to the students as Step 6 shows.

Assuming a student – Chris who has recieved the URL, he can copy and past it into any browser like Chrome, Firefox, Safari or IE to redeem the reward. ERIC API will redirect him to the TCG and ask him to sign on the TCG to grant the permission(s) for ICER web-based system to deliver card to the TCG as Step 7 shows. Chris then will be asked to enter the corrent authorization code to make sure

that communication has not been hacked (i.e., Step 8 in Fig. 1). After entering the authorization code, Chris can see what kind of cards has been delivered to his account in the TCG as Step 9 in Fig. 1 shows.

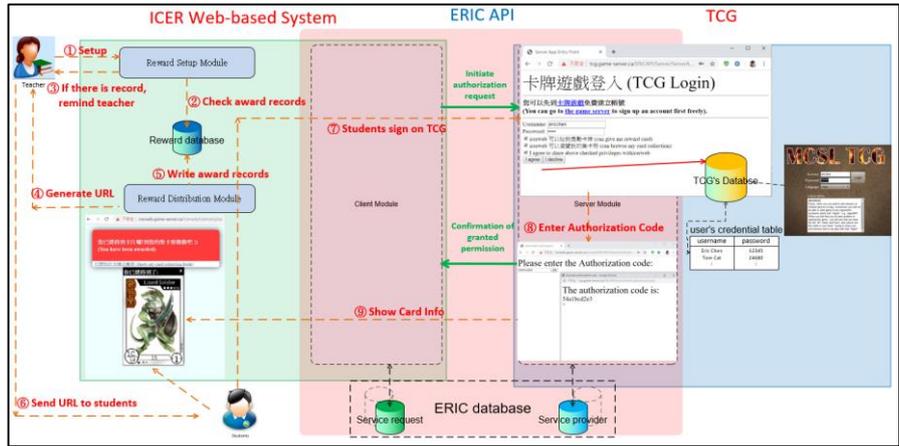


Fig. 1. Architecture of integrating ICER web-based system and TCG with ERIC API.

## 4 The implementation of ICER

### 4.1 ICER Web-based System

When a teacher signs in ICER web-based system, he or she can see the “Give card as educational reward” and “Manage all given rewards” hyperlink on the main page as Fig. 2 shows.



Fig. 2. Main page of ICER Web-based System.



Fig. 3. Reward setup module.

After the teacher clicks “Give card as educational rewards”, he or she can enter the student’s unique ID or username, select the drop-down card type and level. As Fig. 3 shows, the teacher wants to award Chris a three-star avatar card. As Fig. 4 shows once the teacher clicks “Give and Generate URL”, he or she can see a URL generated for student to redeem the reward in the TCG. She or he can then send the URL to Chris by any means.

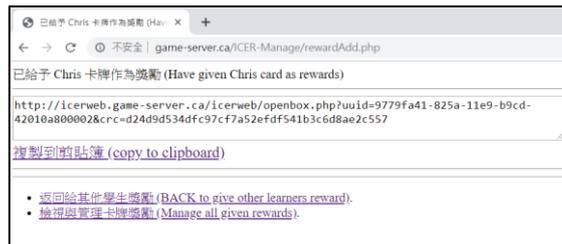


Fig. 4. URL generated for student to redeem the reward on the TCG.

By clicking the link of “Manage all given rewards” shown on the main page, the teacher can also see all of the rewards that he or she has given as well as knows who have redeemed the given rewards and who haven’t as Fig. 5 shows. If Chris loses the given URL, the teacher can also retrieve the link here from this page.

Student Name	Time	Card Type	Level	Status
已於 2018-12-17 08:10:01 領取. Has already claimed at 2018-12-17 08:10:01.				
chiyu	2018-12-17 08:05:24	角色卡 (Avatar Card)	一星卡牌 (1-Star card)	已領取 (Claimed)
已於 2018-12-17 08:09:44 領取. Has already claimed at 2018-12-17 08:09:44.				
chiyu	2018-12-10 07:56:43	角色卡 (Avatar Card)	三星卡牌 (3-Star card)	已領取 (Claimed)
已於 2018-12-10 08:29:43 領取. Has already claimed at 2018-12-10 08:29:43.				
Chris	2019-05-29 21:41:59	角色卡 (Avatar Card)	三星卡牌 (3-Star card)	回收 (Revoke)
<a href="http://icerweb.game-server.ca/icerweb/openbox.php?uuiid=9779fa41-825a-11e9-b9cd-42010a800002&amp;crc=d24d9d534dfc97cf7a52efdf541b3c6d8ae2c557">http://icerweb.game-server.ca/icerweb/openbox.php?uuiid=9779fa41-825a-11e9-b9cd-42010a800002&amp;crc=d24d9d534dfc97cf7a52efdf541b3c6d8ae2c557</a> 複製到剪貼簿 (copy to clipboard)				
eric	2019-05-29 16:57:31	角色卡 (Avatar Card)	一星卡牌 (1-Star card)	已領取 (Claimed)
已於 2019-05-29 16:59:04 領取. Has already claimed at 2019-05-29 16:59:04.				

Fig. 5. List of rewards that have been given.

#### 4.2 Reward Redemption on ICER Web-based System

When a student receives the URL from the teacher, he or she can copy and paste the URL into any browser to start his or her reward redemption. Take Chris as example

again. As soon as Chris starts the redemption process as Fig. 6 shows, he needs to enter his unique ID or username and click “Open Now!” button to redeem the reward.

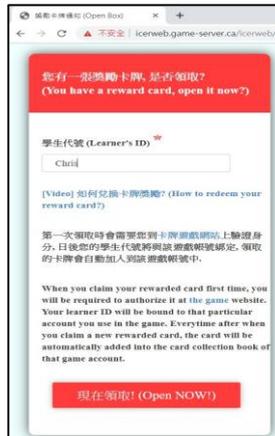


Fig. 6. Reward redemption page.



Fig. 7. Permission granting page at TCG.

After Chris clicks “Open Now!” button, he will be redirected to the TCG Login page as Figure 7 shows. Since he is on the TCG’s website, he would be feel comfortable to grant the permission(s) that allow the ICER web-based system to deliver the reward card to the TCG as well as retrieve his card collection information from the TCG by entering his credentials of TCG.

Fig. 8 shows that ICER web-based system delivered the reward card to the TCG via sending requests to the TCG with client side of ERIC API.



Fig. 8. ICER web-based system has delivered an in-game card as reward.

## 5 Experiment and Discussion

### 5.1 Experiment Design

To understand whether or not the ICER web-based system can help students improve their learning performance, the research team had recruited two classes from different departments, Department of Information Management (DIM) and Graduate School of Education (GSE), at Chung Yuan Christian University, Taiwan after midterm exam. There were twenty-five students in the DIM class and sixteen students in the GSE course. For the DIM class, the research team only introduced the TCG and the ICER web-based system for them but not gave anyone any in-game card as reward later. On the other hand, the research team not only introduced both of the TCG and the ICER web-based system but also gave them in-game cards as rewards for the learning activities after.

In the beginning both classes of students were asked to fill out a pre-survey questionnaire that includes Computer Game Attitude Scale (CGAS) and Diffusion of Innovation (DoI) parts [2][7]. After the two classes of students completed their final exams, they were also asked to complete the post-survey questionnaire regarding their perceptions toward the usability of the ICER web-based system [1].

Despite of the students' computer game attitude and diffusion of innovation are collected, this paper mainly focuses on answering three questions: (1) "would the ICER web-based system has impact on their usage of the TCG?" (2) "how they perceived the usability of ICER web-based system?" and (3) "whether or not the ICER web-based system helps students engage into the learning and have better learning performance?"

The research team proposed the following hypotheses and verified them with the data analysis results.

- H1: GSE students play TCG more often than DIM students.
- H2: GSE students give higher System Usability Scale score for the ICER web-based system than DIM students.
- H3: GSE students' improvement from midterm to final exam is higher than DIM students'.

### 5.2 Evaluation

In order to compare two classes of students, the research team used t-test to verify whether or not the two classes have differences in terms of the times of playing the TCG, the score of System Usability Scale, and the improvement from midterm to final. The t-test results listed in Table 1 show that GSE students has no significance difference on playing the TCG from DIM students. However, the Hedges'  $g$  value reach to medium effect size 0.5 which means GSE students'

behaviour still different from DIM students – they played the game more. Therefore H1 can be said partially supported.

**Table 1.** Independent t-test result for TCG login times

	Descriptive Statistics			t-test			
	N	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i>	Hedges' <i>g</i>
DIM	25	2.72	1.487	-1.573	39	.124	0.50249
GSE	16	3.81	2.949				

The t-test is also applied on the given SUS scores from both groups and the result is listed in Table 2. The result shows the given SUS scores for the ICER web-based system from both groups are remaining at poor level (i.e., 51 to 68) [1] and there is no significance difference between the two classes. Therefore, H2 is not supported.

**Table 2.** Independent t-test result for SUS scores

	Descriptive Statistics			t-test		
	N	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i>
DIM	25	57.4	7.2701	-.122	39	.903
GSE	16	57.8	14.3142			

In order to compare whether or not GSE students have better performance improvement from midterm exam, the research team applied t-test to compare the two classes of students' improvement (i.e., the difference from midterm to final) and the result is listed in as Table 3. The result shows both classes have positive improvement from midterm to final; however the GSE students' improvement is significantly different from DIM students. Therefore H3 is supported.

**Table 3.** Independent t-test result for improvement

	Descriptive Statistics			t-test		
	N	Mean	SD	<i>t</i>	<i>Df</i>	<i>p</i>
DIM	25	3.2	8.367	-2.967	39	.005**
GSE	16	11.56	9.458			

\*:  $p < 0.05$  \*\*:  $p < 0.01$

### 5.3 Findings and Discussions

Based on the above data analysis results, the research team have concluded the following findings:

- GSE group of students are more likely to play TCG.

The result is a kind of evidence that shows giving students in-game cards as rewards can stimulate and engage them to play the game. On the other hand, the research team raised a question from the data analysis result and this finding – “why both groups are not playing the TCG as often as the research team expected?” The simplest explanations might be (1) the TCG is not fun or (2) the TCG is difficult to play. However, this finding might also have causal relation with the next finding.

- Both groups of students give low scores on the usability of the ICER web-based system.

The research team was expecting to see that GSE group will have more positive perception toward the system due to they received in-game cards as rewards and did use the system. The unexpected results show that both groups of students think the usability of the ICER web-based system is low. One possible reason is that the students may feel the process of getting in-game cards with ICER web-based system is different from or more complicated than they usually did in commercial trading card games.

It is acceptable as in the commercial games players actually purchase and redeem/open cards inside the game so no further permission granted step/process needed; but the extra redemption/open and permission grant steps outside of the game are necessarily from the viewpoint of educational reward as well as the privacy issue and the dependency between games and awarding system.

Last but not the least, this finding also explains the potential answer for the question, “why both groups are not playing the TCG as often as the research team expected?” Perhaps the difficulty of redeeming the cards makes them have less motivation to play the game.

- Give students reward can improve their learning performance.

This finding is the research team looks for and proves the effectiveness of adopting the in-game cards as rewards mechanism and the ICER web-based system do get students motivated to learn. Although the finding is what the research team is looking for, the experiment and its data collection still need to improve. First of all, the current two groups of students in the experiment were coming from two different departments or even say different disciplines. In such case, not only the learning subjects and activities as well as their teachers are different but also their gaming experience, backgrounds, and attitude towards gaming might be different and may have influence on the results. Second, the research goal is not only seeing the improvements on the academic achievement but also wants to see the students will work hard on learning activities for getting in-game cards as rewards.

## **6 Conclusion**

The research team developed In-game Card as Educational Reward (ICER) web-based system which is connected to TCG by using ERIC API. The ICER web-based system helps teachers give students reward in very few steps easily. Students can redeem in-game cards quickly after they received a specific URL given by their teacher. The research team has conducted a pilot to understand whether or not giving students in-game cards as rewards can improve their learning performance. The data analysis results show that giving students in-game cards as rewards with the ICER web-based system can improve their learning performance.

However, from the findings and discussions, the research team also identifies some limitations and correspondent future works may need to be planned and done further. First of all, the research has to at least recruit two classes from the same department or disciplines to get rid of the potential influences. Second, the experiment should be a longer term one that involves many different learning activities and students' performances of each activity should be recorded. In such case, the research team can investigate whether or not the ICER mechanism and system can really get students motivated. Moreover, using ICER system longer may eliminate or educate students the difference between commercial games and educational awarding.

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