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Educational Reward Moodle Plug-In

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Abstract: *Reward is a common way to increase students' motivation in traditional classroom learning. The traditional rewards, such as stamps and stickers, are usually symbolic and valueless to students and may not get students motivated. The research team designed an educational reward plug-in which evaluates students' performance on learning activities in Moodle and delivers them in-game items as rewards. Whenever students complete learning activities (e.g., assignments, quizzes, and discussions), the reward plug-in decides whether or not an educational reward which they can use in the game should be given according to the predefined criteria their teacher set. When students have better performance in terms of doing learning activities, they will receive more powerful in-game items from the reward plug-in. With these powerful in-game items' help, students can have more fun in the game-play or even show-off the items that they have to other students. For this reason, students may put more efforts on doing their homework and may be actively participated in the discussions in the class for getting better rewards.*

Keywords: Motivation, Learning Management Systems, Trading Card Game, Educational Game

1. Introduction

Traditionally, teachers give students rewards according to the performance that students have shown in different learning activities. John, a science teacher, wants to encourage his students to learn. He may give pencils as rewards to the top three students who receive highest marks for the mid-term exam. He also plans to give rewards to different student groups based on the marks students received. He divides students into three groups (i.e., get marks higher than 80, get marks higher than 60 but less than 80, and get marks less than 60) and gives students in the group of higher-than-80 a notebook and gives students in the group of higher-than-60 a pen. He expects to see that students will have better performance for the next learning activities (e.g., final exam) if they receive rewards 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 learning settings, an educational reward system works with learning management systems needs to be designed and developed. The research team plans to design a reward plug-in within online learning environment. Teachers can use similar way to give students rewards as usual. With the reward plug-in's help, students' learning motivation and academic achievement may be improved. Besides, teachers can use the rewards to engage students to participate in online learning activities such as doing asynchronous discussions with peer students and teacher.

The next section introduces how educational reward influences students' learning performance and discusses the most popular learning management system – Moodle, which is the chosen platform for the implementation of the educational reward plug-in. In order to provide educational rewards that can motivate students in learning, the research team connects the plug-in to a trading card game for delivering in-game items (i.e., different level cards) of the game for students as rewards. The trading card game was developed by Chen and colleagues (2009, 2016) and its details can be

also found in Section 2. Section 3 describes the architecture of educational reward Moodle plug-in and its modules. The implementation of educational reward plug-in can be seen in Section 4 and Section 5 explains the evaluation plan the research has for verifying the usability of the plug-in and the effectiveness of the in-game items 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 (Tunstall & Gipps, 1996). Marinak (2007) points out that if rewards are not attractive to students, students' learning motivation will not be affected. With appropriate goal's setting, rewards can be valuable and more attractive to students (Ek, Miltenberger, & Valbuena, 2016). In addition, Woolley and Fishbach (2016) prove that bringing rewards into learning activities such as a course's assignments can increase the persistence of achieving the goal.

Winefield and Barnett (1984) argued that rewards positively affect students' learning performance. Another researcher, McNinch (1996), considered that cash can be used as reward to encourage students learning. Although this method is attractive for students, it is still criticized by others as giving cash to students that looks like a kind of suborning (Kohn, 1999). 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.

In online learning, learning management system plays an important role which helps teachers monitor students learning outcomes such as students' marks of assignments. Al-Ajlan (2012) chose ten learning management systems (i.e. LON-CAPA, Desire2Learn, ANGEL Learning, TeleTOP, Blackboard, Sakai, dotLRN/OpenACS, ATutor and Moodle) which meet the requirements of Qassim University. He compared the chosen learning management systems according to predefined criteria – the functionalities (e.g., discussion forums, video services, etc.) a system has (Al-Ajlan & Zedan, 2008). He found that Moodle has the most available features. Furthermore, Cavus and Zabadi (2014) compared another six popular learning management systems (i.e., ATutor, Claroline, Dokeos, Ilias, Moodle, and Sakai) by summarizing their functionalities. They also found that Moodle has the most completed communication tools (e.g., real-time chat and discussion forum) provided and has served over seventy millions users. Apparently, Moodle has become the most popular learning management system for online learning.

To make rewards more attractive for students, Chen and colleagues develop a Trading Card Game[3] (TCG) and want use the cards in the game as educational rewards (Chen, Kuo, Chang, &Heh, 2009; Chen, Chang, Kuo, & Heh, 2016). 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 (Chen, Kuo, Chang, & Heh, 2017). 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. Educational Reward Moodle Plug-In

[3] http://tcg.is-very-good.org/index.html

This research aims to design Educational Reward plug-in for Moodle to deliver cards of the TCG that Chen and colleagues developed. The plug-in 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 (i.e., ERIC API)(Chen, Chang & Chang, 2016), students' identities won't never be revealed to the game while the Moodle plug-in delivers in-game items as rewards according to the pre-defined award criteria..

Learning Management System like Moodle and the TCG are two systems that this research aims to integrate together so teachers can set some award criteria up for giving students in-game items as rewards according to their performances of particular learning activities. The plug-in at Moodle platform side needs to get student's permission in sending in-game items as rewards to the game side. By integrating ERIC API into the design of the plug-in, Moodle can work with the game and reach the goal and keep student's private data like student ID and identity remaining unknown for both of the game and its players.

In order to reach the goal, the plug-in should have three modules: criteria setup module, evaluation module and reward distribution module. Using an example to explain the architecture and workflow of the Moodle plug-in and the relationship between the plug-in and the TCG. A science teacher, John, who teaches Math and he creates a 10-question quiz for students to practice as step 1 in Figure 1 shows. The criteria setup module will get the quiz activity from Moodle's database (i.e., step 2 in Figure 1) for him to setting up the awarding criteria (e.g., for students who get more than 90 marks will be awarded one level 3 avatar card; for whom gets marks higher than 80 will be awarded one level 2 avatar card; and, for whom gets marks higher than 70 will be awarded one level 1 avatar card) for the quiz as step 3 in Figure 1 shows. The module will save all teacher predefined criteria to a Reward database as step 4 in Figure 1 shows. The second module, evaluation module, then will assess whether or not a student can be awarded against the predefined criteria as Step 5 shows.

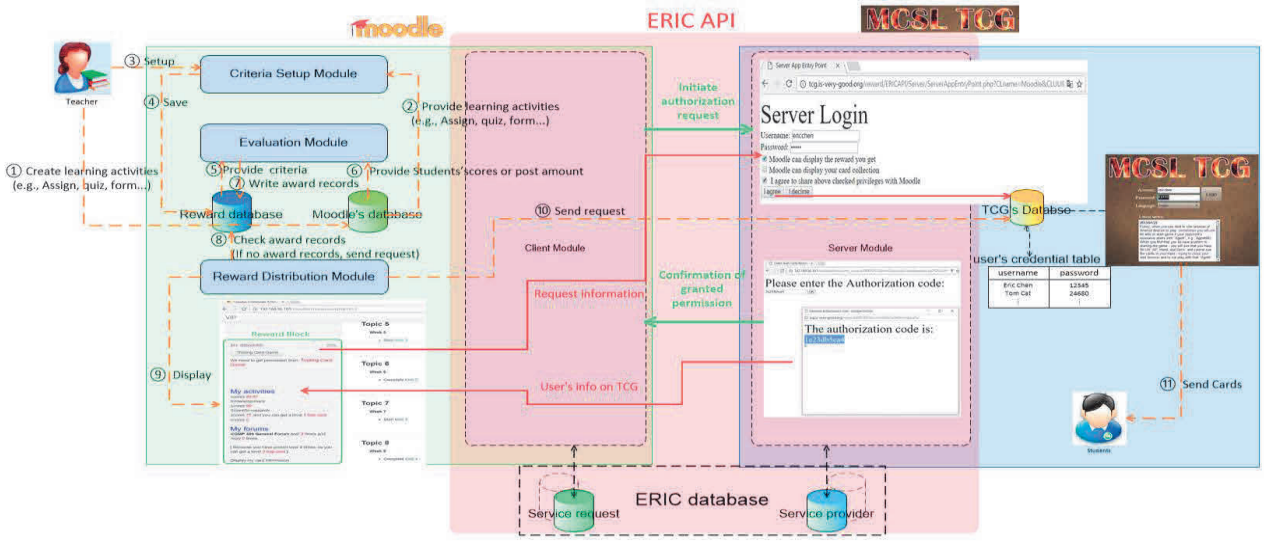


Figure 1. Reward Moodle plug-in's architecture and workflow.

Assuming a student, Eric, gets 90% marks for the quiz, the evaluation module will assess his performance (i.e., step 6) and write the award record to Reward database every time when the main page of the course is loaded or refreshed (i.e., step 7).The reward distribution module will check the award record(s) for the student and make a card delivery request to the TCG every time when the main page of the course is loaded or refreshed as step 8 in Figure 1 shows. Moreover, the reward distribution module will not only show the student what reward he or she received due to what reason (as step 9 shows), but also make a card delivery request through ERIC API as step 10 shows. ERIC API works as the bridge of the Moodle plug-in and the TCG. After receiving and confirming the authenticity of the request, the

TCG will randomly choose an avatar card at requested level and assign it to Eric's account in the TCG as step 11 in Figure 1 shows.

4. The implementation of Reward Management Module

Teachers usually have different criteria for awarding students according to their performance on different learning activities. The criteria setup module needs to allow teachers to set their own awarding criteria for individual learning activity so the evaluation module can check whether or not a student should be awarded and the reward distribution module can deliver students proper items as rewards accordingly.

When a teacher signs in Moodle, he or she can see the "Reward Module Block" on the left-hand side of course's main page as Figure 2 shows. The criteria setup module can retrieve all of the learning activities (i.e., Assignment, Assign, Quiz etc.) that the course has from Moodle's database. The teacher can choose any of the learning activities that he or she wants to give students rewards based on their performance.

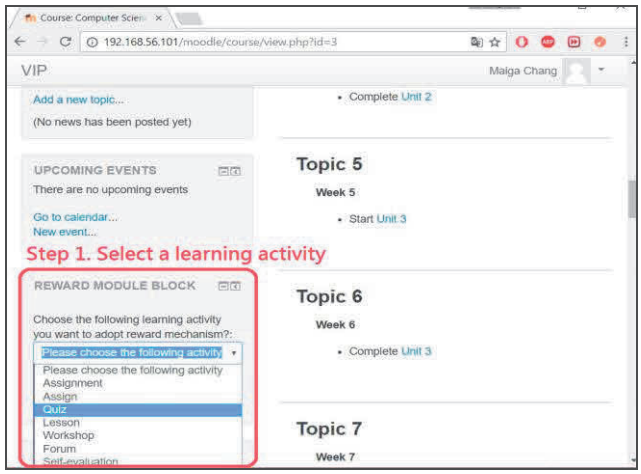


Figure 2. Reward Module block for teachers to setup awarding criteria.

After the teacher selects a learning activity, the criteria setup module will provide him or her a default awarding criteria. He or she can also freely edit the criteria based on his or her preference and plan. As Figure 3 shows, the teacher sets that students can get a level 3 avatar card if they receive marks between 91 to 100; a level 3 trap card for the marks between 81 to 90; and, a level 1 magic card for marks between 76 to 80 for the chosen learning activity "Math" which is one of the quizzes the course has. When the teacher completes the criteria setup for the learning activity, he or she can click "save" button and a "Successful saved!" message will be showing up at the bottom of the block.

Before the Moodle plug-in can deliver a student the card of the TCG as his or her reward, Moodle needs to have permission to access the student's TCG account while his or her identity in both of Moodle and the TCG should remain anonymous for both systems. Here we use a student case to explain how a student grants Moodle to access and show the card collection information that he or she has in the TCG via ERIC API. As Figure 4 shows, when a student sign in Moodle, he or she can see "My Reward" block on the left-hand side of course's main page. The student can see his or her performance for the Math quiz and can know whether or not he or she can be awarded for that performance. In this case, Student A has completed the quiz and gets marks 90. The evaluation module assess that his or her performance makes him or her get a level 3 trap card according to the criteria set by the teacher.

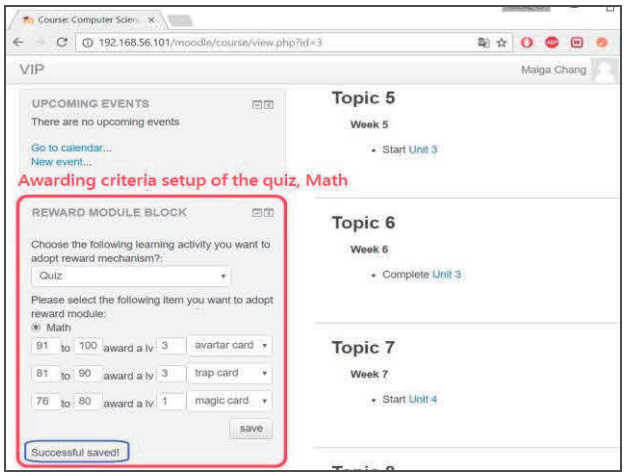


Figure 3. Setting awarding criteria for the "Math" quiz.

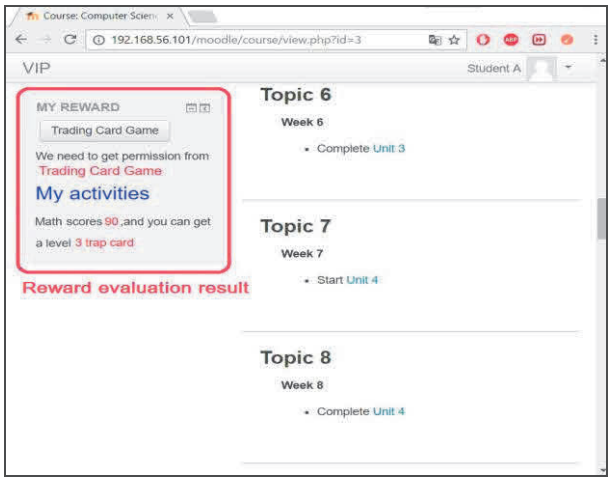


Figure 4. My Reward block for students seeing the in-game cards they are awarded.

Whenever the course's main page is refreshed or the student signs in Moodle again, the block reward distribution module shows that he or she has been awarded by the evaluation module as Figure 5 shows. Before the student grants Moodle permission to access his or her TCG account, any reward record will be stored into the Reward database so the reward distribution module can make reward delivery request to the TCG later.

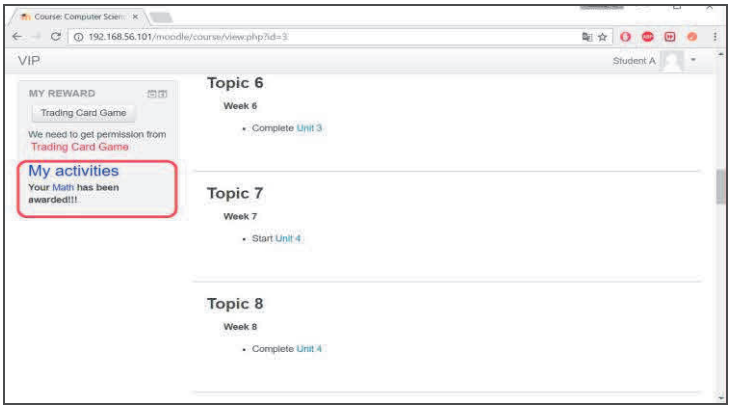


Figure 5. The student has been awarded for his or her performance on the Math quiz.

When the student clicks the "Trading Card Game" button, he or she can choose which permission(s) he or she want to grant Moodle to access. Figure 6 shows the student only allows Moodle to send the reward he or she gets to his or her TCG account.

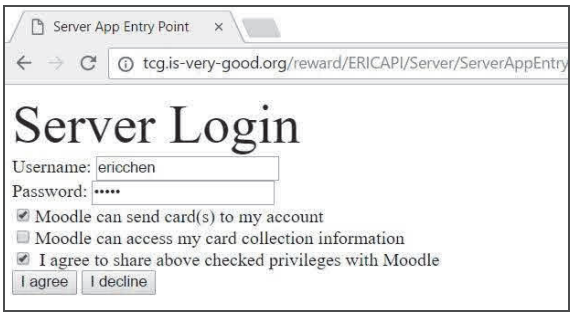


Figure 6. Permission granting page at the TCG

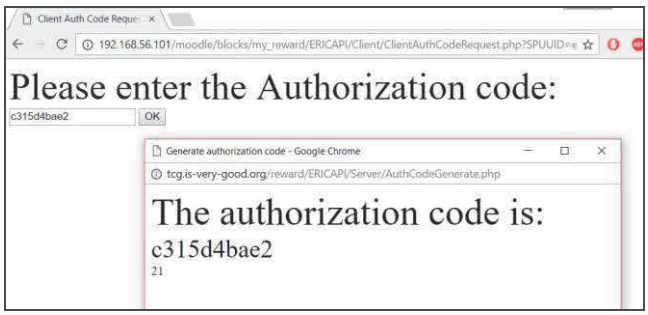


Figure 7. Authorization code generated by the TCG and the student needs to enter the code on Moodle.

Since the student only needs to enter his or her TCG username and password at the TCG server, Moodle never has his or her credentials of the TCG. On the other hand, since the permission granting request made by Moodle only sent a 128-bit Universally Unique Identifier (UUID) to represent the student in Moodle, the TCG never knows which student the TCG username is. For more details of ERIC API workflow, please see (Chen et al., 2016). The TCG will randomly generate an authorization code as Figure 7 shows for the student entering back on Moodle within 30 seconds to make the permission granting request valid. Figure 8 shows that the block now can show the reward the student received on the TCG when the reward distribution module sends card delivery request to the TCG via ERIC API. In this case, Student A has already got a level 3 trap card.

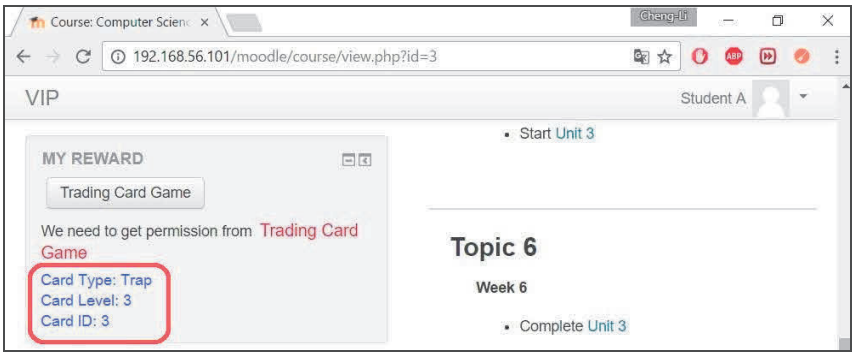


Figure 8. The reward distribution module can now deliver cards as rewards to the student's TCG account.

After the student receives the reward from the plug-in, he or she can sign into the game to check whether or not he or she received the card. As Figure 9 (in the end of Section 5) shows, the student has received a trap card, Graft. His or her card has been updated as the screenshot on the top-left corner in Figure 9 shows that he or she doesn't have the card before the reward is delivered and the screenshot on the bottom-right corner shows he or she has the card.

5. Evaluation Plan

The research team plans to look for primary school or secondary school students who are taking their courses on Moodle. Two classes will be chosen from the school, one class is the control group, and the other is the experiment group. A Moodle course can be arranged with some learning activities such as assignments, quizzes and discussion forums in the beginning, the middle, and the end of the first two stages in the semester. Before the course starts, all students will be asked to complete a questionnaire regarding their demographic information and their computer game attitude. The experiment includes three stages:

Stage 1: In the first one month of the course, all students are simply learning as usual and complete planned learning activities on Moodle without receiving any rewards for their efforts. All of the learning performance such as their assignment or quiz marks and discussion forum postings will be collected.

Stage 2: The rest of the semester will be the second stage which may have two or more months. The teacher will introduce the TCG and start to use the Educational Reward Moodle plug-in to the experiment group students. Students can play the game with computer players or other students at any time they want as long as their teachers and parents allow. The experiment group students can also receive cards as rewards when their works on learning activities meet the criteria set by the teacher. Students' learning performance in both groups will still be collected for comparison purpose. Moreover, experiment group students' awarding history (e.g., how many times they received cards and what kind of cards they received) and their game-play statistics (e.g., how many times they sign in the game for checking their card collection; how many time they played the game and whom they played with, computer or human players) are also collected in order to verify the effectiveness of the educational reward Moodle plug-in later after the experiment.

Stage 3: At the end of the course, experiment group students would be provided informed consent for the project on the cover page of the online questionnaire. If they don't agree, then they don't need to fill out the questionnaire and their data include their demographic information, computer game attitude, course performance, awarding histories, and the game-play statistics will not be used for further data analysis. If they agree to take the online questionnaire, then their perceptions toward the game could be known and the relationships among their computer game attitudes, perceptions toward the games, awarding history and the game-play statistics can be analyzed and discovered after the experiment. The teacher will also be interviewed to get his/her perceptions and comments on the criteria setup module of the educational reward Moodle plug-in.

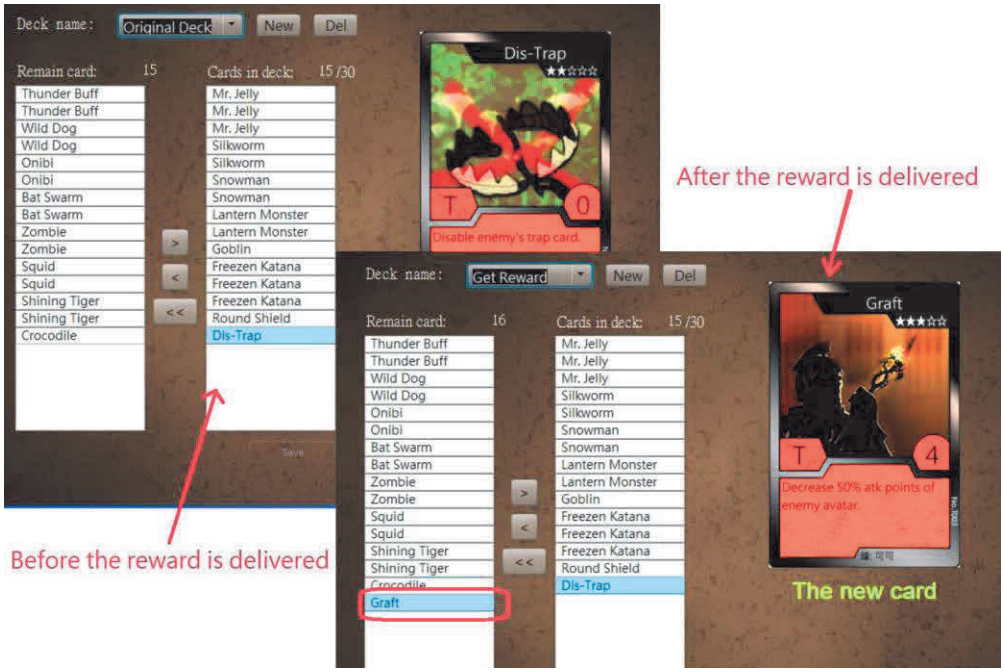


Figure 9. The student has received a level 3 trap card, "Graft", as reward.

6. Conclusion

The research team developed an Educational Reward Moodle plug-in which includes criteria setup module, evaluation module, and reward distribution module. The criteria setup module allows teachers to pre-define different criteria for different learning activities their courses have. The evaluation module can assess whether or not a student should be awarded by checking if the student's performance meets the criteria set by the teachers. Last the reward distribution module makes reward delivery requests according to the evaluation results made by the evaluation module. In this research we use cards of the TCG as rewards so the reward distribution module makes card delivery request to the TCG through ERIC API. The use of ERIC API makes the two systems, Moodle and the TCG, capable of working

together without asking students to keep authorizing Moodle to access his or her TCG account and keep students' identities anonymous to both of the system.

The research team would like to conduct a pilot to evaluate the usability of the Educational Reward Moodle plug-in and the effectiveness of the in-game items as rewards by collaborating with teachers and schools. The research team expects the Educational Reward Moodle plug-in and the in-game items as rewards can get students motivated in learning; students can put more efforts on doing their learning activities. For teachers, they can easily use the plug-in and rewards to encourage students actively participating in online learning activities.

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