

# Colorado Technical University



**Technical Report  
Computer Science**

## **Playing to Enhance Learning: Using Game Design in Our Online Course Rubrics**

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**Technical Report Number  
CTU-CS-2005-003**

# **Playing to Enhance Learning: Using Game Design in Our Online Course Rubrics**

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## **Abstract**

How do we encourage rich online collaboration and teamwork? The author designed, developed, delivered and assessed an online course and a hybrid course that used game-based rubrics to enhance learning. The results of this case study are described in this paper, including some recommendations for future research and course refinement.

This paper is part 3 in a research series that supports the individual assessment of collaborative work using game-based rubrics.

## **Keywords**

rubrics, games, interactivities, authentic assessment, activity-based learning, the Professional Learning Model (PLM), team projects, collaborative exams, measurements, goals, student assessment, learning assessment and course assessment

## **Game-Based Rubrics**

Designing game-based rubrics for online and hybrid course use sounds simple. After all, most students enjoy playing games. When they play games, they want to know how well they are doing and how to improve their score. While students may find games interesting, the game mechanics can intrude on the course goals if controls and clear requirements that tie to the course objectives are not defined.

Activity-based learning strategies are popular today. Educators, industry professionals, and students see the value in applying the concepts to solve real-world problems using interactive methods. These activities can range from crossword puzzles, mazes, word games, role playing, simulations, interactivities, and Flash animations (Bergstrom, 2004; Bray, 2004; Carbol, 2004; Corbett and Kearns, 2003).

At Colorado Technical University (CTU), we've developed the CTU Professional Learning Model to leverage the best practices of activity-based learning and authentic assessment (Leasure, 2004). Each course focuses on applying the concepts to solve real-world problems, demonstrating the core competencies and skills.

Rubrics are a natural way to define what quality means and to discuss how students can improve the quality of their work. A list of the measurements used in this case study is available in the first paper of this series, entitled "Assessment by Playing: Using Game Design in Our Online Course Rubrics" (Calongne, 2005).

In the case study rubrics, the measurements were not points or letter grades, but imaginary gold coins. A Treasure Hunter's Gold Coin Report was updated and published to advise students of their progress as they worked on collaborative activities.

Students were treasure hunters, earning gold coins with each discovery and accomplishment. Every collaborative activity had a gold coin award that signified the quality of the work. Bonus coins could be earned as students exceeded the course expectations. These earnings (rubrics) were defined in the Interactivities and Point Values document that detailed the Treasure Hunter Game.

### **What is Course Assessment?**

Before we discuss the results, let's define a few terms. Most instructors perform *student assessments*, identifying how students respond on a variety of assignments and measurement instruments. Not everyone tests well, as testing may involve some degree of memorization outside the context of problem solving.

A *learning assessment* takes the measurement process a step further, identifying how students can solve problems using the skills and competencies learned in the course. Authentic assessment strategies are used to measure these competencies. Authentic assessment involves the selection of problem-solving activities to measure a student's ability to synthesize and use the information. It places less emphasis on memorization and greater emphasis on higher order thinking and applied learning (On Purpose Associates, 2001).

A *course assessment* helps faculty and administrators identify the quality of a course. These assessments measure our ability to achieve the course objectives given the current set of activities, assignments and measurement instruments. The results of a course assessment help us to identify possible areas for improvement and to make course refinement decisions.

Even if the course assessment yields positive results, we may be interested in trying new techniques and evaluating their worth in a future course assessment.

When we select an alternative way of measuring learning, as noted by a collaborative exam, we want to understand if our choice is a good one and whether it supports the course objectives.

## **The Results of the Five Goals**

Here is discussion of the case study goals and the analysis of the results.

### **1. Increased participation**

With access to historical data from past offerings of the class to form a general comparison to the case study results, it was simple to observe the class accomplishments and note the results. It was hard to consistently measure the quality of past course content. Instead, it was a lot easier to observe an increase in posts and in the substantive quality of the quality.

Once the game dynamics were introduced, student posts increased. Initial posts asked questions about the team project, the goals, and later, the collaborative exam process. Due to these excellent questions early in the course, students posted better information and adopted ownership of each activity earlier in the process.

About 88% of the hybrid class openly embraced the game concept and participated earlier than noted in past course offerings. There were 25 students in the hybrid class. The remaining three students joined in the fun midway in the course, once their professional and personal needs were satisfied.

The online class had seven students who completed the course. Two additional students enrolled, but did not participate in the course or game activities. Of the seven participants, 71% of them exceeded the volume of posts with substantive content when compared to past course offerings.

Students in the online course used a variety of communication methods in addition to the online course tool and discussion board. Some students traveled to meet and complete project activities early to earn more gold coins. This certainly was not a course requirement, but it worked very well for those teams. During two of these meetings, the teams contacted the instructor over a teleconference to discuss the results!

### **2. Better participation**

Each team forum was analyzed, using the number of posts per student and the amount of information conveyed as quality attributes. Not only did students post more often, but also they had more to say about each project section and activity.

The volume of posts increased 29-45% when compared to prior hybrid courses that offered a comparable team project. The information was posted a week earlier than noted in all but one of the courses used in the comparisons. The course offering with similar results had one team of software professionals who completed the project activities early.

### **3. Improved collaboration and communication**

Project status reports were requested in past classes, but only a handful of students did them in each of the former course offerings. Every student in both the hybrid and the online course completed at least two of the project status reports. Many completed a third status report and all of the bonus activities, receiving recognition for superior work.

### **4. Individual assessment of the team project activities**

The game-based rubrics made it easy to measure, record and track the gold coin earnings for each student. This reduced student fears and helped them to address the project goals, worrying less about their performance.

In the online course, two students needed additional feedback and guidance as they completed their project activities. The course subject was foreign to them and with no prior experience, project examples were helpful, but not enough information. They did not know why certain sections were completed in a particular manner until we held detailed discussions over the online chat facility in addition to the threaded discussions.

The instructor added information to the course on why we perform certain practices and when we do them differently in a series of Fireside Chats that were effective in the online course.

Fear is always present, as students develop trust and accept the instructor as a mentor, facilitator and guide (instead of someone who wields a very big stick). The most notable fear in the hybrid course came from one student who was nearly unable to proceed without a project example from a past class to serve as a guide.

One of the textbooks offered detailed instructions and examples of how to approach the project, describing the logic behind each activity. Despite this detailed information, students prefer to see examples from past classes so they can visualize the level of quality that is desired by the instructor.

The Treasure Hunter Gold Report was published every 4-5 days once a sufficient amount of activity had been completed. During the last week, reports were published every day or two. This was not fast enough for some students, as their excitement grew and they wanted to know their current gold coin earnings.

Why did we not publish the report daily? When activity is low, it is hard to preserve student and grade anonymity if only a few students have contributed that day. A high volume of posts often comes from a small number of students, so the report was posted when the volume of students posting was sufficient to maintain anonymity.

The instructor also felt challenged to keep up with the volume of posts, respond to them, and record the gold coin earnings each day. With 19 forums and up to 149 posts per forum, activity increased every few days. At CTU, we try to respond to students within

24 hours. For most of these courses, instructor feedback is available several times throughout the day, offering fast feedback to students.

The timeliness of our feedback encourages students to respond and continue the discussion as if the conversation were currently in progress. This energy is hard to maintain if our responses are delayed.

The other problem noted is that the game-based rubrics for each course had 25-27 possible measurements. Each activity, demonstration of leadership and bonus activity was harder to evaluate. Students do not always make effective use of the subject line in their discussion posts, making evaluation a slow process.

The rubrics made grading easier, yet the volume of activity and depth of content made giving detailed and targeted feedback a challenge. Since the goal is to stimulate collaboration, interactive feedback came first before gold coin reporting.

## **5. Successful projects**

As the teams worked on their projects, the instructor was able to evaluate their process, their activities, their opportunities to provide leadership, and their accomplishments. Evaluating the final project was a simpler task due to its familiarity. We made the journey of discovery as a community.

The other teams had access to the each team forum and the ability to "peep" and see what their classmates were doing. Some students felt delicate about this process until we discussed the advantages of sharing strategies across the teams.

The final projects in each class were excellent and compared favorably with past projects. Students had fewer time challenges and seemed to have greater satisfaction afterwards.

The hybrid students noted that the course was a lot of work. In hindsight, they did do the work comparable in an online class. They did not have additional discussion questions that we cover in the online course, but the addition of a face-to-face discussion increased their overall workload.

## **Lessons Learned -- Successes**

Students loved the gold coins report and looked for it eagerly each day. They were responsive, contributing a week earlier in project activities when compared to the results of three years of comparable online project activity.

The spirit of competition was effective and helped students achieve the course goals. Most felt less competition with other students and focused on achieving the overall coins required to do an excellent job in the course.

The Treasure Report identified problems with missing assignments and provided the stimulus to motivate students who were slow to respond to course activities. One student did not understand the course requirements, but we did not discover it until the third week of the course when the student asked about the missing gold coins. No gold coin updates were provided until an activity was posted for collaboration and discussion.

Rotating the list of aliases and gold coins helped to preserve anonymity of students. It also had students hunting for their names and asking better questions about how their accomplishments were evaluated.

Participation increased and the quality of the contributions improved early in the term. Most students procrastinate, so this early activity was a mixed blessing. The instructor had to scramble to provide feedback to a greater amount of posts. To ensure the quality of the feedback in the discussion forum, the gold coin report was published less frequently than desired.

### **Room for Improvement -- Course Refinement Recommendations**

There were too many categories in the course rubrics. With over 25 activities and opportunities for bonus points, it was both easy and difficult to maintain daily updates.

The rubrics made it easy to award gold coins, but the large number of categories made it harder for students to clearly understand the source of their gold earnings. The gold coin report did not detail where the coins originated, only that the sum of that day's activity was added to the total.

It also made it challenging to categorize and evaluate the type of activity when students used subject lines that were incorrect or vague. While a list of possible subjects was provided, greater emphasis needs to be placed on how to use them effectively.

Providing daily updates became unrealistic. On the days when the course activity was minimal, it was unsuitable to post the gold coin report. With a small number of contributors, anonymity and privacy is lost. It is possible that we could do it if we included a random number of gold coin values for generic participants, in addition to those of our students. This sounds like more work than desired. It helps if the report is an accurate reflection of the current course accomplishments.

Students missed the detailed feedback that they had received in past classes. While feedback was offered for the discussion posts, team project contributions were first reviewed by the team members. When feedback was desired from the instructor, the instructor's name was added to the subject line.

Why not respond to every team post? The teams need the opportunity to collaborate and discuss their ideas and alternatives freely, without interference from the instructor (who tends to be too helpful sometimes). It is the opportunity to struggle, to try out poor

alternatives, and then select good choices that helps students learn. Yet, in a 5.5-week course, that struggle can only last a short time. The instructor provided guidance, mentoring, and stepped in to provide feedback when requested or to get a team back on track.

### **Areas for Future Research**

First, we need to modify the game-based rubrics to simplify them. Secondly, a set of guidelines for how to label project activities would help streamline the measurement and feedback process.

Now that we have a game-based measurement method, we need to evaluate the use of interactivities and games that capture and maintain the attention of our students. Future studies will investigate the use of interactivities in our graduate courses. In particular, we'll be measuring how they enhance or detract from the development of skills and core competencies in our computer science classes.

Accommodating the diverse needs of students while making the course requirements clear and easy to understand can be challenging. We have preserved the traditional course requirements, expectations, and rubrics to support students who do not understand or enjoy games.

Please feel welcome to contact C. Calongne at [calongne@pcisys.net](mailto:calongne@pcisys.net) for more information about this case study or future research activities.

See you online!

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