Gamification strategies in a hybrid exemplary college course

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A B S T R A C T

Using technology in teaching and learning finds a wide adoption in recent years. 63.3% of chief academic leaders surveyed by the Babson Survey Research Group confirm that online education is critical to their long-term strategy. Modern engagement pedagogies, such as digital gamification, hold a promise of shaping student experience. While course builders and instructors investigate new technologies and teaching methods questions arise about the instructional quality of academic courses with online content or with gamification elements. In addition, students are not the digital natives many hoped them to be. 83% of millennials report sleeping with their smartphones, but 58% have poor skills in solving problems with technology. This paper reports on a gamefully designed course, delivered in a hybrid modality, which was selected through a peer review process as an exemplary course in consideration of instructional design. The course was evaluated according to the Blackboard Exemplary Course Program rubric. Gamification was introduced in three phases: player onboarding phase, player scaffolding phase, and player endgame. Various technologies involved in the course included: MyGame gamification mobile app, Blackboard Learn, Cengage Skills Assessment Manager, Kahoot, Amazon Alexa, Google Traveler, Twitter, and others. The course focused on gamification according to the short and long game theory to engage students during lectures (short game) and throughout the semester (long game).

Introduction

Almost half a century after the invention of the Internet and three decades after the development of the World Wide Web, online learning is no longer a field reserved for early adopters. 63.3% of chief academic leaders surveyed by the Babson Survey Research Group (Allen & Seaman, 2016) "agreed that online education was critical to the long-term strategy of the institution." Further, the number of students taking online courses has been growing for the last 13 years. However, only 29.1% of academic leaders agreed that their faculty accept the "value and legitimacy of online education." The instructional quality of online courses is a concern. Researchers agree that the quality of the online content may have significant impact on student satisfaction and success (Palloff & Pratt, 2011; Voigt & Hundrieser, 2008).

Another factor related to student success, such as graduation rates, is course engagement (Price & Tovar, 2014). While many pedagogical approaches aim to increase engagement, one of them is gamification. Gamification is the adoption of game elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011; Huotari & Hamari, 2012, Fitz-Walter, Wyeth, Tjondronegoro, & Scott-Parker, 2013). Games can create an immersive feedback environment and, while promoting making choices, they also ease the impact of failure (Gee, 2003). While gamification is a subject of much business and educational research, few studies consider the evaluation through peer review of the instructional design quality of gamified courses. Online components of gamefully designed courses may increase engagement in students, but are they sound from the instructional perspective?

A peer review process is of great value in evaluating academic courses as faculty views on instructional quality of courses can be subjective. For example, in the STEM academic area, while faculty were often focused on producing high-quality graduates, they also contributed to a high level of attrition in academically weaker students (Christe, 2013). Faculty sometimes viewed student withdrawal from STEM majors as a sign of successful instruction. The STEM introductory courses were viewed as a gatekeeping process to spare unfit students from the rigors of scientific work. Problems such as low achievement, student boredom, and alienation, along with high dropout rates were linked to engagement (Fredricks, Blumenfeld, & Paris, 2004; Swap & Walter, 2015).

Indiana University Professor Emeritus of Biology Dr. Craig Nelson is the author of "Dysfunctional Illusions of Rigor" (Nelson, 2010). These illustrate subjective and often erroneous faculty views about their own instruction. 1) Hard courses weed out weak students. When students fail it is primarily due to inability, weak preparation, or lack of effort. Finding: When students fail it is often due to inappropriate pedagogy. 2) Traditional methods of instruction offer effective ways of teaching content to undergraduates. Modes that pamper students teach less. Finding: While lectures teach something, alternative methods teach on average twice as much as traditional lectures.

The instructional effectiveness of courses may also depend on the course delivery mode. 42.3 % of chief academic officers were more favorable about courses that combine elements of online instruction with those of traditional face-to-face teaching (Allen & Seaman, 2016). Academic leaders rate the promise of blended or hybrid courses as superior to that of fully online courses.

Online courses are often categorized into fully online and hybrid courses. Allen & Seaman (2016) propose four categories: traditional courses, web facilitated courses, blended/hybrid courses, and fully online courses. Traditional courses contain 0% of content delivered online. The content is delivered in writing or orally. Web facilitated courses deliver from 1 to 29% of content online. Next, 30 to 79% of online content delivered online make it blended/hybrid courses. Such courses have a substantial proportion of content delivered online. Finally, courses with 80% of online content or above are considered fully online. Online courses deliver most or all content online without face to face meetings.

Todd et al. (2017) support the notion that hybrid courses deliver better results over face-to-face or fully online courses, especially in teaching complex content. As an example of such content, in teaching ethical decision-making skills as a process-based content, the hybrid modality was recommended. The researchers admitted, that the success of the hybrid delivery might have been due to the extensive development of the course over the effort in development of the traditional or fully online versions.

Another reason, why hybrid courses may be more effective than fully online courses are computer skills of students. As the academic world and the workplace slowly come to terms with the myth of the digital natives, studies warn about negative consequences in assuming students have digital skills simply because they are of a younger generation (Kirschner & Bruyckere, 2017). A global research in 33 developed countries reported that only 5% of general population possesses high computer-related skills and only 30% can address medium-complexity tasks (OECD, 2016). In another study, while 83% of millennials report sleeping with their smartphones, 58% have poor skills in solving problems with technology, and out of 19 countries examined in the study, the U.S. millennials ranked last.

The findings about advantages of hybrid courses are supported in the literature by considering the strengths and weaknesses of each modality. Fully online delivery features a self-paced nature, which may lead to rapid progression through key content without sufficient learning taking place (Daymont and Blau 2011; Kirschner, Sweller, & Clark, 2006). The advantage of such delivery, especially over face-to-face courses, is in the student's ability to pause, rewind, and otherwise consume content at their own rate (Osguthorpe and Graham 2003). Hybrid courses tend to capitalize on the benefits of both modes of delivery in keeping students more accountable for their knowledge of the online content leading to increased learning and course effectiveness (Sapp & Simon, 2005).

In addition to the course delivery mode, other factors contribute to course quality. Peer review of the online course content and the evidence of classroom activities tends to be a primary tool in promoting course quality (Chao, Saj, & Tessier, 2006; Feldman, McElroy, & LaCour, 2000; Little 2009; McGahan, Jackson, & Premer, 2015). In a paper dedicated to the review of national and statewide evaluation instruments of online courses, Baldwin, Ching, and Hsu (2017) list the following course quality improvement programs:

1. Blackboard's Exemplary Course Program Rubric (2017a)
2. California Community Colleges' Online Education Initiative (OEI) Course Design Rubric (2017)
3. The Open SUNY Course Quality Review Rubric (OSCQR) (State University of New York, 2016).
4. Quality Matters (QM) Higher Education Rubric (2017)
5. Illinois Online Network's Quality Online Course Initiative (QOCI) (2017)
6. California State University Quality Online Learning and Teaching (QOLT) (2017)

Blackboard Exemplary Course Rubric

The Blackboard Exemplary Course Program was designed to recognize courses that "demonstrate best practices in four major areas: Course Design, Interaction & Collaboration, Assessment, and Learner Support" (Blackboard, 2017b). Each category was evaluated quantitatively within five levels of mastery: exemplary (5-6), accomplished (3-4), promising (2), incomplete (1), not evident (0). Reviewers were instructed to apply lower ratings when within a category some sub-categories were accomplished in an exemplary manner, but others appeared below that mastery level.

The rubric was distributed publically with a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. This meant that course builders were allowed to use the rubric privately or within their organizations. They could also modify the rubric and institutionalize it as long as it was for non-commercial purposes and contained a note of Blackboard's authorship.

The rubric contained the following categories and sub-categories with their weight:

Category: Course Design
Goals and Objectives (x3)
Content Presentation (x3)
Learner Engagement (x2)
Technology Use (x1)

Category: Interaction and Collaboration
Communication Strategies (x3)
Development of Learning Community (x3)
Interaction Logistics (x2)

Category: Assessment
Expectations (x3)
Assessment Design (x3)
Self-Assessment (x1)

Category: Learner Support
Orientation to Course and LMS (x0.5)
Supportive Technologies (x0.5)
Instructor Role and Information (x1)
Course/Institutional Policies & Support (x0.5)
Technical Accessibility Issues (x0.5)
Accommodations for Disabilities (x1)
Feedback (x1)

Findings

Course Design

The course "Introduction to Computing" (CIS150) at Grand Valley State University was awarded the Blackboard Exemplary Course award in 2017 (Blackboard, 2017c). The course was offered to a range of students from freshmen to seniors in a variety of majors of study. Over time, a steady growth of enrollment in the course was recorded with 1561 students in 2013, 1616 in 2014, 1697 in 2015, and 1740 in 2016. The Blackboard course, which was peer-reviewed by the Blackboard Exemplary Course Program (ECP) reviewers (Blackboard, 2017a), was utilized by 874 students between Fall 2013 and Winter 2017 semesters. A case study exploring the phenomenon of engagement with gamification in this course was conducted between 2015 and 2017. The case study investigated 501 students in 15 sections over 4 semesters (Machajewski, 2017a).

The course "Introduction to Computing" was a coordinated course with approximately 30 sections each semester. The content of the course was centrally managed. This content included the course objectives, textbooks, exams, quizzes, Cengage SAM tutorials, and Cengage SAM projects. All graded assignments were standardized across the course sections. The course consisted of 49 graded assignments, 3 performance exams, 2 summative exams, and a self-paced project. The content of the course was broad including over 700 computing terms in the theory section along with hands-on skills in Microsoft Word, Excel, and Access. The course was delivered in a hybrid approach with 6 hours a week of online, self-guided work, in addition to 2 hours of lecture, and 1 hour of hands-on lab.

Course Peer Review Details

The course was evaluated according to the Blackboard Exemplary Course Rubric. In addition to the specific levels of mastery, anonymous reviewers also provided qualitative commentary for each category of the rubric. The reviewers were able to login as students and instructors to the course. They were also provided evidence of learner activity through anonymized content extracts, screenshots, and videos. Table 1 contains the levels of mastery assessed by the program reviewers.

Table 1. Course Reviewer Ratings per Rubric Category

Categories and Sub-categories	Reviewer A	Reviewer B	Reviewer C
Course Design			
Goals and Objectives	accomplished	accomplished	incomplete
Content Presentation	exemplary	accomplished	exemplary
Learner Engagement	exemplary	exemplary	exemplary
Technology Use	exemplary	exemplary	exemplary
Interaction and Collaboration			
Communication Strategies	exemplary	exemplary	exemplary
Development of a Learning Community	exemplary	exemplary	exemplary
Interaction Logistics	accomplished	exemplary	exemplary
Assessment			
Expectations	accomplished	accomplished	exemplary
Assessment Design	exemplary	exemplary	exemplary
Self-assessment	exemplary	exemplary	exemplary
Learner Support			
Orientation to Course and CMS	accomplished	exemplary	accomplished
Supportive Software (Plug-ins)	accomplished	exemplary	exemplary
Instructor Role and Information	exemplary	exemplary	exemplary
Course/Institutional Policies and Support	exemplary	exemplary	exemplary
Technical Accessibility Issues	exemplary	exemplary	exemplary
Accommodations for Disabilities	exemplary	exemplary	accomplished
Feedback	exemplary	exemplary	exemplary

Some of the rubric categories evaluated at the exemplary level were Learner Engagement, Technology Use, Development of a Learning Community, and Technical Accessibility Issues. These categories apply to the gamification design of the course. Three phases of the gamification strategy were player onboarding phase, player scaffolding phase, and player endgame.

Student engagement in the course was designed into short-term activities, such as lecture peer-instruction activities, and long-term activities such as earning XP points through participation and completion of missions between lectures to use later as a course currency. The short-term activates were no longer independent events. The long-term design helped students to experience the hero's journey (Rank, Raglan, Dundes, & Segal, 1990) leading to the boss level activity and completion of the course. This design reflected the short and long game theory for academic courses (Machajewski, 2017d).

Player Onboarding Phase

Game Discovery and Introduction

The course adopted the MyGame platform from game.dataii.com and established the CIS150 mobile app (Machajewski, 2013). The game operated as an experience point (XP) ledger. Each game code became a deposit or a withdrawal from the ledger. Students joined the game at different times during the semester. The game was presented as autonomous and not required for any of the graded activities.

The game was introduced during the first meeting of the class. A text game code was provided, which students could enter after downloading the mobile app for iOS and Android. The first step, within the mobile app, was to type in student's email address. Next, a verification link was activated in the email message. This method made usernames or passwords unnecessary and the validation link tied a mobile phone to the email account. A player could always sign out and allow another user to sign in with a new email on the device.

The initial rules of the game shared with students included only basic game mechanics as text mission codes that were entered into the app (Figure 1). A list of available missions was shared with students. Some initial missions included locating hallway maps that contained QR codes, a campus bus stop, textbook question, syllabus question, exploration of the Blackboard course, and others.

Figure 1. The CIS150 mobile app: Game code entry screen
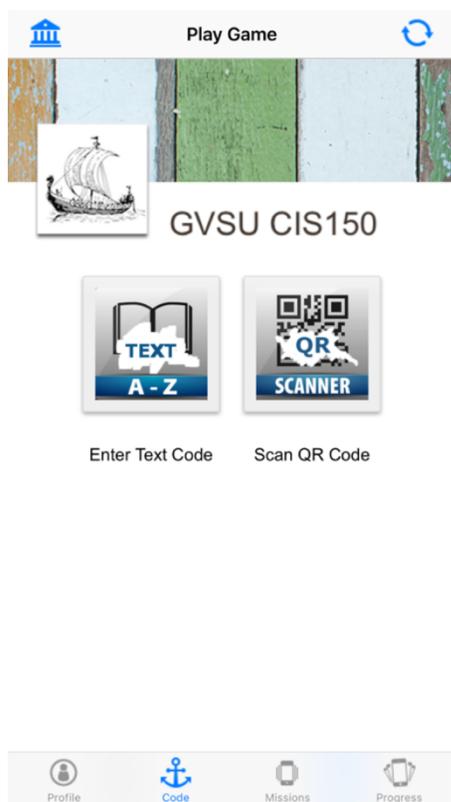
The game functionality was shared with students gradually as the semester progressed. Halfway through the semester attendance codes were introduced to remove XP when students missed classes. Major achievements and advanced game functions were introduced in varied intervals. This allowed for a measure of unpredictability in the class and mystery, which were necessary to maintain excitement and interest in the game.

The MyGame platform was also adopted by the Department of Germanic Studies at the University of Illinois at Chicago (Ryder & Machajewski, 2017). Since the game is based on collecting game challenges and using XP as a course currency, it is independent of the course content. In teaching the German language, the app was integrated with Duolingo. This allowed for language vocabulary practice and remediation of introductory knowledge.

Mobile App

The course game was operated through a mobile app deployed to the Apple App Store and the Google Play Store (Machajewski, 2013). The app and the associated gamified process was submitted for U.S. patent as Educational Gamification System and Gameful Teaching Process (Machajewski, 2015). The app provided access to classroom activities such as lecture participation through Kahoot, encryption cipher tools, exam reviews with Quizlet Live, and lecture slides (Figure 2). Among other course resources, the mobile app provided access to the assignment schedule.

The game tools in the app included the player profile with gravatar image, a display of achievements, total earned XP, list of available missions, the

leaderboard called experience ranking, and history of all submitted missions. The interfaces for claiming game codes allowed for typing in mission codes or scanning QR codes with the mobile phone camera.

*Figure 2. The CIS150 mobile app: Classroom activities on the Home screen*

Optimized Electronic Leaderboard

One of the mobile app navigation tabs was called Progress (Figure 3). This tab lead to a dynamic list of recently completed missions and most popular missions, which scrolled in a short list. The leaderboard, called experience ranking, was available as a link in the Progress screen. It displayed a list of players in a descending order by XP. The list displayed player avatar picture, student-selected avatar name, number of missions completed, total XP, and a name of the game level matching the total XP range. However, the leaderboard did not display all players at the same time. The list displayed the authenticated player and 5 players above and below the ranking. It also allowed for displaying the top 30 players in addition to the current player.

The list included 5 game winners from each of the previous semesters. This meant that for some time during the game onboarding process and scaffolding, the top 30 players were primarily past game winners. Not all top winners in a specific semester were the highest XP scoring players. Only a small group of past winners had a very high XP total. Such players chose not to cash in on the end-of-semester options like Peace of Mind Points, LinkedIn recommendations, or others. They chose to stay on the leaderboard sometimes with relatively low XP total.

Figure 3. The CIS150 mobile app: Progress screen with a link to Experience Ranking leaderboard
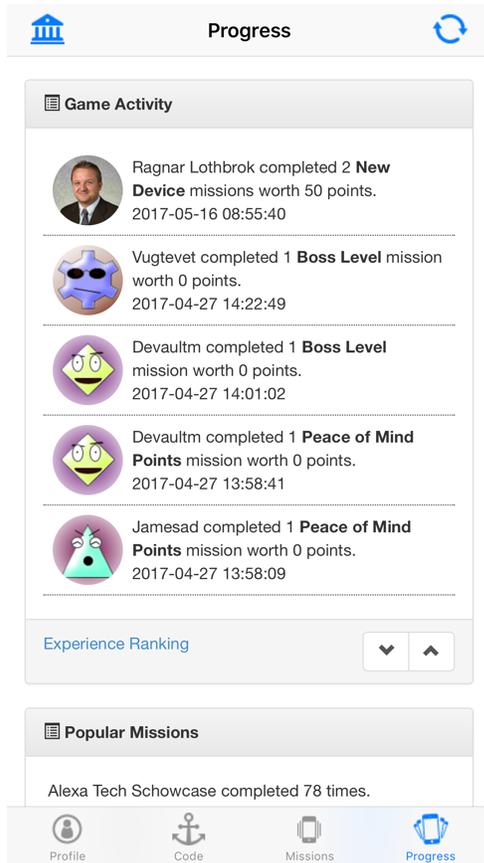
Player Scaffolding Phase

Blackboard Learn

The Blackboard Learn application provided the official interface for grades and all graded assignments in the class (Figure 4). It became the main communication platform for course and game activities. The gamification activities in Blackboard Learn for this course were described in more detail at the BbWorld Conference in New Orleans in July of 2017 (Machajewski, 2017b).

Within the Blackboard Learn Grade Center, missed assignments were marked with a zero score immediately after the due date. The electronic gradebook was carefully crafted to provide a detailed sequence of events in the class by employing an indexing system. The first number of a grade referred to the week and the second to the event number within that week. For example, an exam may be indexed as 16.1 meaning the first event in week 16. This system allowed for accurate matching of events in external vendor systems and the grade book itself.

Further, a projected grade, along with the final grade, were always available to students in self-service view called My Progress. The default My Grades menu in Blackboard was renamed to My Progress to reflect the mindfulness principles of "not yet" based on research in the growth mindset (Yeager & Dweck, 2012). Within Blackboard Learn course, the Marked Reviewed feature, along with adoptive release, allowed for game codes to be distributed to students who have explored the online portion of the course or students who have completed certain required actions in Blackboard. This encouraged students to explore all areas of Blackboard Learn course at the start of the semester. Blackboard Learn course could be the source of game codes, a host for mission activities, and it was the repository of the overall graded data.

Blackboard Inc offered mobile apps, which allowed students to view their current grade and interact with the course content. The course featured two grade displays: Projected Grade and Final Grade. The Projected Grade was the running total for the class, which showed the total grade for all assignments already turned in. This meant that if the initial assignment was completed at the A grade, Projected Grade showed an A. The description of the grade stated: "This grade shows your running total. If you keep up the same quality of work you've been delivering so far, this will be your final grade."

The Final Grade column displayed an F for most of the semester for all students. Both grades met after completion of the last assignment. The description of the Final Grade column stated: "This grade calculates all empty grades as zero. If you stopped completing assignments right now, this would be your final grade."

Figure 4. Blackboard Learn course
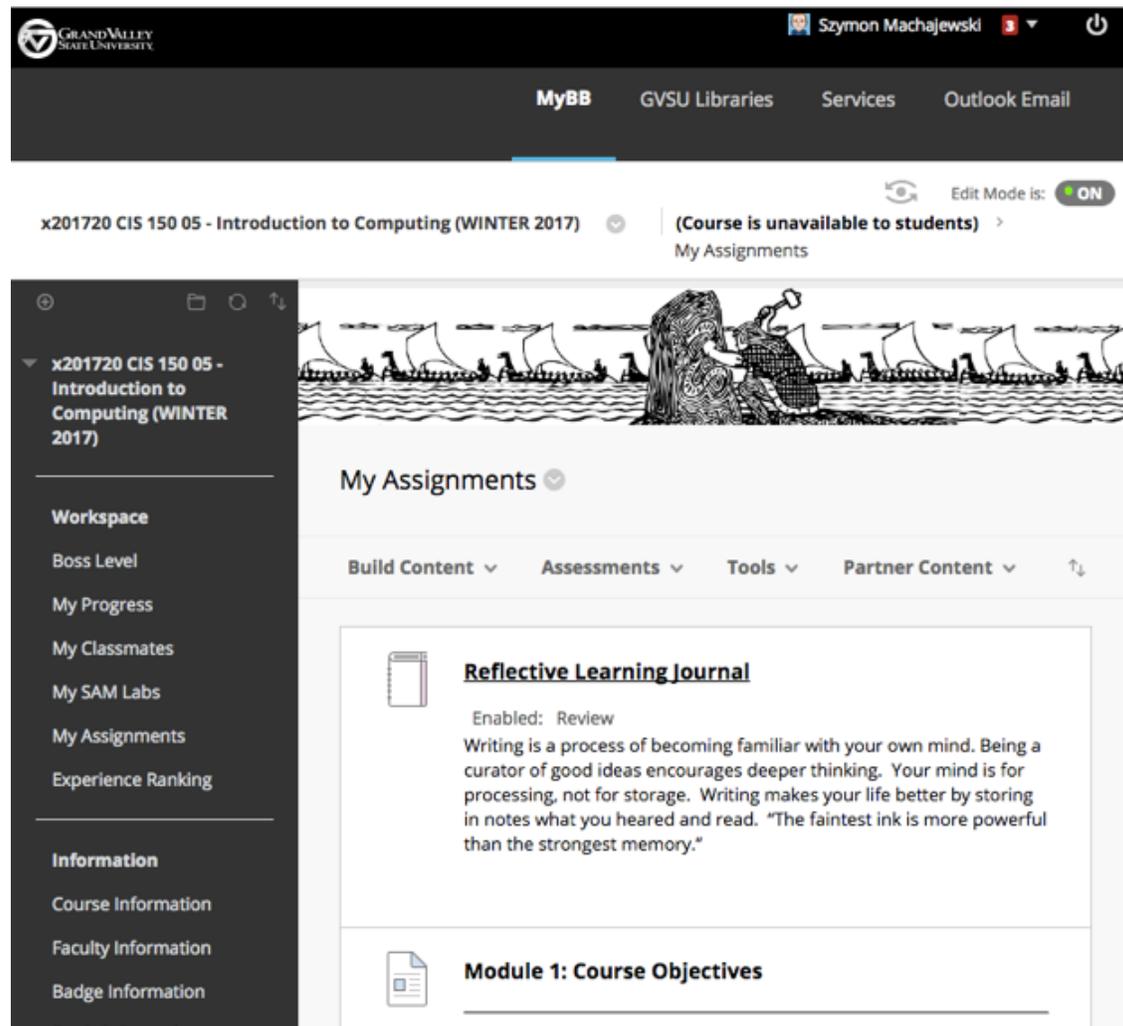
Cengage Skills Assessment Manager

The Cengage Skills Assessment Manager (SAM) system was facilitated by the textbook publisher, Cengage Learning (Figure 5). The online system was intended for self-paced learning and practice of Microsoft Office applications (Cengage, 2014). This system was used for graded activities, projects, and exams. In addition to the graded elements, some activities were in SAM were optional. These activities included post-exams, exam practice activities, and some sample projects. Such activities were counted toward XP in the game instead of course grade. The activity was transferred to the game by downloading CSV files from Cengage and importing them into the game. This encouraged students to complete optional activities even when they were not officially graded. A significant amount of XP (about 80%) could be collected by participating in the optional, hands-on Microsoft Office activities.

Figure 5. Cengage SAM Excel simulation activity
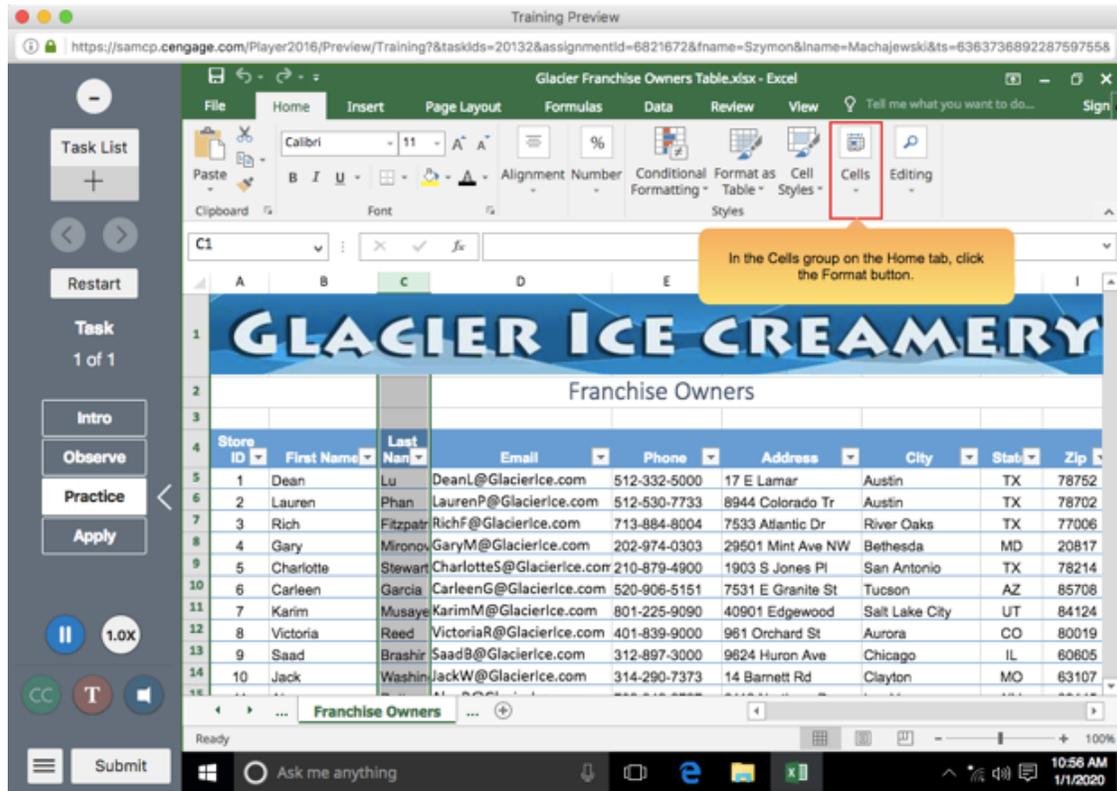
ArtPrize & Campus Art

One of the game missions based on QR codes was dedicated to a local art event called ArtPrize. This is an annual art competition event in Grand Rapids, Michigan. Many art pieces were displayed in public spaces. Such art was often accompanied by QR codes, which were integrated into the game and offered XP points. Since the course content covered QR code technology as well as the use of mobile devices, the collection of QR codes aligned with the class. The first 5 QR codes claimed 5 XP, each additional one was worth 1 point.
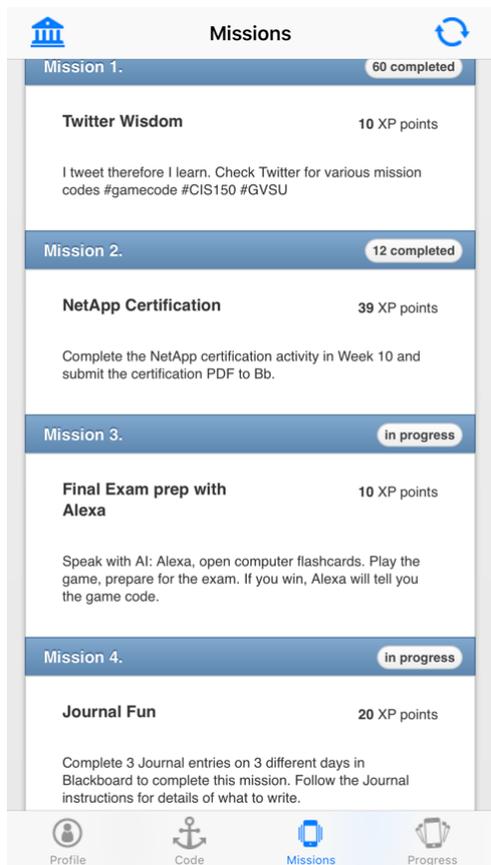
A similar integration was built for the Grand Valley State University artwork. At the campus library and other campus locations drawings and paintings, along with sculptures, had associated QR codes. Students could scan the codes to claim XP in the game. This type of a mission especially appeals to explorer player personality type according to Bartle player types (1996). Eventually a maximum total allowed had to be established at 200 XP in the mission.

The MyGame platform allowed for identifying a QR code pattern, such as a repeating URL string. This is how event QR codes could be identified and linked to a specific game mission. Scanning any other QR codes would not activate the mission completion.

NetApp University

One of the game missions was to complete a course with NetApp University. This mission was released during the discussion of enterprise computer storage. NetApp collaborated with the course instructor on an integration that allowed students to complete any of their professional courses offered to NetApp clients. The game mission required completion of one-hour course called Storage Fundamentals. The course completion PDF certificate was then uploaded to Blackboard Learn, where adaptive release displayed the game code to the student.

Figure 6. The CIS150 mobile app: List of available missions including NetApp Certification

Kahoot

The Kahoot active learning system was used during lectures to stimulate interest and participation. Students used their Blackboard Learn user names to sign into Kahoot, which then allowed the instructor to import XP from Kahoot into the course game for each correct answer given during the lecture. While tracking class attendance, the integration allowed for rewarding participation.

In addition to earning XP, performing well during Kahoot activities appealed to students in other ways. After completion of each question the student who answered correctly in the shortest amount of time was recognized by name. This helped the instructor to learn student names and created a social element during lectures.

Storification

Storification was applied in the course to leverage epic meaning as a game design principle (Chou, 2015). This introduced a measure of unpredictability and allowed for capturing the imagination through a narrative. Historical events and Viking folk stories were used to introduce certain computer principles during lectures. For example, computer hacking was likened to Viking raids, the Internet was explained in terms of river and sea connectivity for the Vikings in medieval world. A compilation of these stories is available through the Amazon Alexa skill prepared for the course called "Computers Storified in Viking History by Floki."

The game mobile app as well as the Blackboard Learn course contained a number of visual cues that related to the Vikings (Figure 4). They included the app icon as a Viking long ship, the mission entry screen containing a rune carving scene, the game splash screen with a slogan "Access the Inner Viking & Excel. Rune Word", which was hinting at the Microsoft applications covered in the course.

In parallel to the development of the course, the History Channel was running a show, called the Vikings, which allowed students to immerse themselves in the Viking story and concepts. This entertainment element was a way to recall story elements from the class. The show was adopted by Amazon Prime and Hulu for viewing in later semesters.

Another feature of storification was the game avatar and the story students told by their own participation. The course game allowed players to select an avatar name, which was displayed in the leaderboard along with the gravatar picture. The use of student names was further aided by implementation of the Open Photo Roster in Blackboard Learn (Machajewski, 2016). The use of student names in the classroom allowed for an inclusive learning environment, while the avatar in the game allowed for anonymity.

The game rules were being shared with students in form of a story. Instead of sharing all elements through a multi-page manual, the various rules and opportunities were unveiled throughout the course during in-class sessions. This created a perception of mystery and unpredictability, a key concept in games.

Amazon Alexa

Audio assistants are devices, which allow users to interface with computer artificial intelligence through voice (Machajewski, 2017c). An Amazon Alexa skill developed for the course allowed students to practice course terminology. Alexa skill would describe a glossary entry, then it would wait for a response. Five correct answers by the user opened up a game code spoken back by Alexa to the user. This allowed students to claimed the game mission in the mobile app. The Alexa skill was named: "Introduction to Computing Flashcards Game".

Figure 7. Amazon Alexa service on Echo speaker

A second Amazon Alexa skill with an activation word of Floki was developed to support the storification of the game. When activated on any of the Alexa devices, such as the Amazon Echo, Echo Dot, Echo Tap, Amazon Shopping app for iOS, or FireTV the skill spoke a Viking story that connected with the world of computers (Figure 7). This following was a sample conversation a student could carry on with Floki:

User: Alexa, ask Floki to tell me a story.
Floki: The Internet and the World Wide Web are different. The Internet is a network, the web is a system of documents. Oceans and rivers were like the Internet for Vikings. The ships were like the world wide web documents.
User: Alexa, ask Floki to tell me a story.
Floki: Harald Bluetooth was a Viking king with terribly decayed teeth and that's where he got his name. He united quarrelling Danish tribes and the wireless technology was to unite the same way wireless communication

protocols.

Google Traveler

The Google Traveler was a beta service from Google created to help people share stories associated with locations. Through the use of a world map along with photos, videos, and text the designer could share experiences in connection with specific places. This technology landed itself to a historical exploration and building the storification theme for the class game.
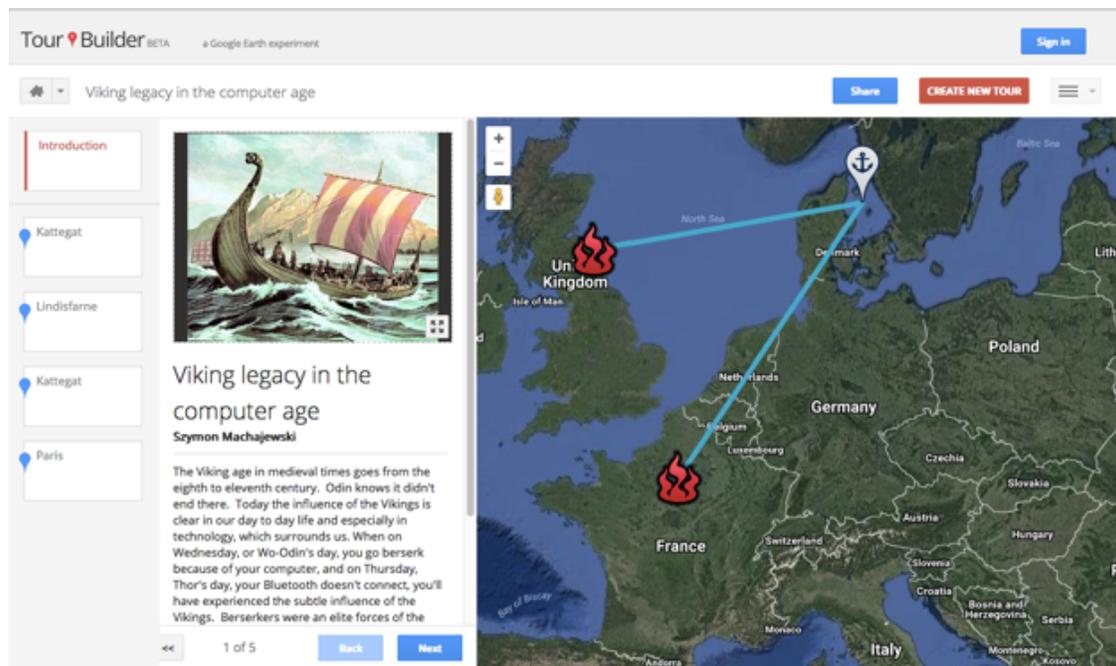
Music

Music was used throughout the gamified course. Before the start of a lecture music was played in the classroom. After 30 minutes of lecture, music was played again with students standing up for 60 seconds and being encouraged to participate in a guided dance in place to increase blood circulation. Music was also used for background during certain game events such as the Quizlet Live exam review. The selected music was typically dance or pop music from current performers, largely based on the Amazon playlist called Student Favorites.

Attendance Tracking

Attendance in the course was tracked in a variety of ways. Kahoot activities showed evidence of participation. Specific game codes shared in class, often in forms of a question, riddle, or assignment, marked student activity in the class. However, after the Midterm exam, when attendance in class was likely to start declining, a new storified feature of the game was introduced. The instructor shared a story of Scandinavian trolls, who were recently spotted in the nearby ravine. Unless the player came to class during scheduled time and collected the protection code, the trolls would steal some of their XP. Each absence was worth about 10% of total average collected points. This feature applied the loss and avoidance core game drive as well as scarcity and ownership from the Octalysis gamification framework (Chou, 2015).

Twitter

The Twitter social network was used throughout the course in various activities such as creation of memes during an ice breaking activity, or identifying computer parts through posting photos under class hash tag. An ongoing game mission included challenges posted on Twitter, which resulted in game codes. The game tweets could include a QR code as an attached picture or require the viewing of a YouTube video in search of the game code.

Player endgame phase

Game Boss Level

The Boss Level mission was scheduled for the end of the semester. This mission allowed for a reduction of Peace of Mind Points exchange rate, which was intentionally set high throughout the semester. The Boss Level mission was executed in code.org or codecombat.com, which helped students to learn visual commands, JavaScript code, or Python programming (Figure 8). The assignment was to sign up for the specific class through a custom URL and complete a certain section of the programming assignment. The results were available in the grade book of the external site for verification. The completion of the Boss Level mission was submitted as a screenshot to Blackboard Learn assignment, which triggered adaptive release to display a game code.

The code allowed for either a discount in Peace of Mind Points (PofM), or in gathering additional XP, in which case Peace of Mind Point exchange was blocked. The second option was used by students who determined that PofM would not give them a significant improvement in grades, but completing late assignments would. Therefore, the math of the XP points made it evident, that completing late assignments, and therefore practicing and learning, would positively affect the grade in a more significant way than PofM exchange.

Figure 8. Boss Level: JavaScript lesson in codecombat.com
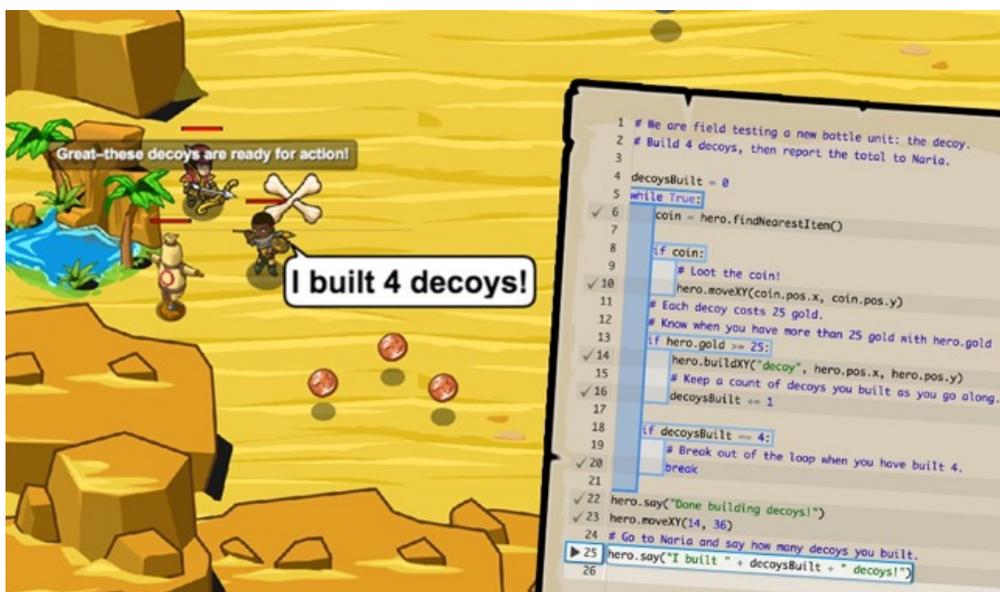
Quizlet Live

The midterm and final exams were based on computer theory, which required a review of technical terms and definitions. The exams were coordinated across all sections of the course. This terminology was available in the textbook, publisher Power Point slides, and glossary lists.

Some definitions were uploaded as Quizlet Sets. The Quizlet Live game was executed in the classroom as an exam review (Figure 9). During the activity, teams of students worked on answering specific questions and competing with each other. The teams raced to answer questions with game status for each team being displayed on the projector screen. Collaboration and discussion was necessary to participate in the activity.

Figure 9. Students playing Quizlet Live

Late Assignments

The course included 49 graded assignments, with majority executed through the Cengage SAM system. Such assignments included tutorial activities, projects, and other performance based items. All assignments had strict due dates.

The game established a process for submitting late assignments for grading by paying for them with XP. Late assignments could be completed without limitations, but moving of the grades from Cengage SAM to Blackboard Learn required the game XP transaction.

Before completing any late assignments, students needed to find a course mentor, who would sponsor their delinquency. A mentor could be a student who played the game in previous semesters, or a student who scored 500 XP or more in the current class. Once recommended, a student could trade their XP for late assignments.

Once recommended in the game, the student needed to have enough XP to pay for each late assignment. The cost in XP currency was initially high, with discount sales occurring toward the end of the semester. The amount of late assignment opportunities was limited by the amount of XP a student was able to collect and then defend through good attendance. This feature applied the core game drives of social influence and relatedness, as well as development and achievement (Chou, 2015).

Peace of Mind Points

A few weeks into the semester, the Peace of Mind points were introduced. The points were meant to provide some peace of mind for the midterm and final exams. Instead of calling it extra credit, the points were directly connected with the amount of wrong answers on the exams. So, instead of offering 5 extra credit points, a student could answer 5 questions incorrectly on the exam, which was 5 Peace of Mind points. Focusing on student experience during exams instead of the grade promoted intrinsic motivation.

There were four achievements in the course game. A specific game code shared in class opened up the late assignments achievement. This achievement allowed for trading XP points for PofM points. PofM points were then imported into the official Blackboard Learn grade book. The amount of PofM was controlled by the XP exchange rate and never exceeded 2% of the total points in the Blackboard course.

Game Achievements

Four game achievements were available in the class and they were indicated in the game profile with specific graphics (Figure 10). The achievements were: Late Assignment Mentorship, Exam Peace of Mind Points, Recommend Friends, and Boss Level. The achievements marked course milestones and reminded students of their options in the course game.

Figure 10. The CIS150 mobile app: Game achievements
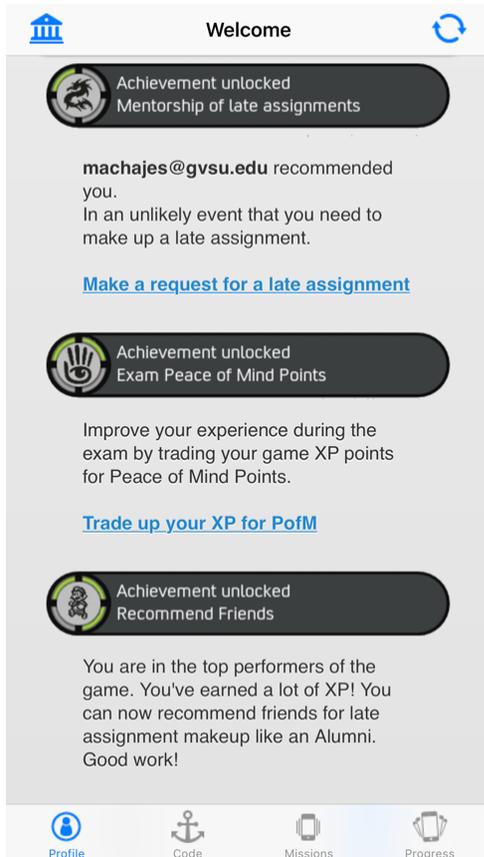
Game Bolt-on Design

The game was designed as a bolt-on, which meant that it was optional for students and it did not modify any of the coordinated curriculum assignments or exams. The game could be stopped at any time during the semester by the instructor or by any student without affecting the official course grade. All required course elements were retained and if necessary the course could be successfully completed without participation in the game. This fulfilled a compliance requirement of content and assessments in the academic program and coordinated course approach.

Conclusion

A complex game requires clear instructions. Effective instructional design is a foundation for gamification of academic courses. When applying gamification to academic courses, it is natural to focus on student engagement and intrinsic motivation. However, it is also important to validate the instructional design approaches to maintain high quality of instruction.

The Blackboard Exemplary Course Program allows faculty to incrementally improve the instructional quality of their online or hybrid courses. Faculty receive confidential, quantitative, and qualitative feedback from anonymous reviewers. The course content and evidence of student activity can be resubmitted to the program multiple times for additional feedback.

The design of the course, "Introduction to Computing" at Grand Valley State University demonstrates an application of the short and long game theory for academic courses (Machajewski, 2017d). The use of technology and gamification methods during lectures provides a short-term engagement mechanism. At the same time, long-term methods of XP tracking and XP trading allows for creating a player journey and experience shaping mechanism.

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