GOING FOR THE WIN! AN ASSESSMENT OF GAMIFICATION IN EDUCATION

Paul J.A. van Vliet
Information Systems & Quantitative Analysis, College of Information Science & Technology, University of Nebraska at Omaha, Omaha, NE 68182, Phone: (402) 554-2814, E-mail: pvvliet@unomaha.edu

ABSTRACT

Designed to enhance motivation and engagement, gamification has been implemented in different ways in a variety of educational settings. This paper provides an assessment of the state of gamification in education through the review of arguments in favor and opposing, as well as a survey of existing implementations.

INTRODUCTION

In recent years, the concept of “gamification” has received a substantial amount of attention. This application of game-based practices – such as challenges, contests, and badges – offers potential benefits in making routine or dull tasks more fun and engaging. Gamification, it was argued, could get people more interested and engaged with these tasks and hence produce better outcomes. The interest from the educational community in gamification was almost immediate as the concept was seen as a means to bring effective innovations to both the classroom and the student learning process.

The author applied gamification principles to a traditional undergraduate Introduction to Information Systems course. While the content of the course was sound, student engagement and participation had become an issue in recent years. Because disengaged students commonly perform poorly or fail the course altogether, the author took the initiative to radically redesign the course in order to better engage students, enhance student learning, and improve overall course outcomes for the students as well as the university. The results of this gamification effort (Van Vliet, 2012) were quite promising, resulting in higher student scores, improved attendance, increased learning, and eventually very high student course evaluations.

While these initial results were encouraging, the author wondered if the benefits of gamification could be achieved in the longer term. Once the initial newness of the course wore off, would the gamification practices continue to engage students? Moreover, could such practices successfully be applied in a sequence of courses rather than in just a single one? In the long run, is gamification worth the investment in time and effort, or is it a short-lived concept? Initial longitudinal research efforts are now underway and will be reported on in due time. Meanwhile, other educators have applied gamification to their courses and have reported their findings and observations. In order to provide a well-rounded evaluation of the role gamification may play in education, this paper summarizes and integrates the findings of a variety of educators and gamification experts.
GAMIFICATION OVERVIEW

The Promise of Games

The potential of games as a means for enhancing participation, motivation, and engagement has received much interest in recent years. Several observers have noticed how many corporate employees lack sufficient motivation at work (Reeves & Read, 2009, p. 36) or how students dread doing homework (Young, 2010), resulting in poor efforts. The problem may just be that “reality doesn’t motivate us as effectively. Reality isn’t engineered to maximize our potential.” (McGonigal, 2011, p. 3) Yet these same workers and students – when playing video games – will “happily spend hours on difficult tasks, and actually learn quite a bit in the process.” (Young, 2010) It could even be argued that, given the thousands of hours that young people spend playing video games, students entering universities are often gaming experts above all else. (Penenberg, 2010; Shore, 2011) Prensky, in discussing the “new” students of today – whom he famously referred to as “digital natives” – mentioned that ‘They prefer games to “serious” work.’ (Prensky, 2001)

This observation, then, raises the possibility that the use of concepts and techniques obtained from games may positively alter the behavior of participants in an activity. Smith-Robbins refers to this as “gamification,” or “the application of game mechanics such as points, badges, and levels to non-game processes.” (Smith-Robbins, 2011) Indeed, Reeves and Read suggest that “the future of work is about engaging workers more than commanding them” (Reeves & Read, 2009, p. 6) and note that “gamers already perform every category of information work imaginable, from grind-it-out drudgery to sophisticated analysis and team building.” (Reeves & Read, 2009, p. 5)

Games Defined

McGonigal quotes Suits who stated that “playing a game is the voluntary attempt to overcome unnecessary obstacles.” (McGonigal, 2011, p. 22) According to McGonigal, games are made up of four defining characteristics: a goal which players attempt to achieve, rules which limit how players are able to achieve the goal, a feedback system which lets players know how much progress is made towards achieving the goal, and voluntary participation, which means that players knowingly and willingly accept the previous three characteristics when playing the game. (McGonigal, 2011, p. 21)

Dignan refers to Salen and Zimmerman who defined a game as “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome.” (Dignan, 2011, p. 35) Dignan then provides a detailed and actionable list of game characteristics. These include the player profile which highlights player traits relevant to the game, the objectives or goals of the game, the activity the players will perform in order to achieve the objectives, the resistance encountered by players in the form of chance or competition, the skills to be mastered by a player while performing the activities, the resources available to players as they perform the activities, the actions or moves permitted to the players in the game, the feedback provided by the game in response to a player’s actions, the black box or rules engine which observes the
player’s actions and provides the feedback, and the eventual outcome of the game, which may be positive or negative. (Dignan, 2011, pp. 88-96)

Gamification and its Potential

Gamification can be broadly defined as "the use of game design elements in non-game contexts." (Knewton.com, 2012) While most findings in the area of gamification are fairly recent, the original concept is not. As early as 1984, Coonradt envisioned “The Game of Work,” which he developed using a set of key principles which included clearly defined goals, better scorekeeping and scorecards, and frequent feedback. (Coonradt, 1984, p. 2) These key principles are clearly visible in the specific missions and instant scoring of modern video games. Indeed, while not required, computers are often at the heart of gamification efforts.

The “gamification [of] non-game processes” (Smith-Robbins, 2011) can be achieved by superimposing a “game layer” on top of real-world activities – modifying them using a “system of skills-based play.” (Dignan, 2011, p. 81) To show the great potential of gamification, Reeves and Read identify 40 specific work-like tasks – such as monitoring processes, categorizing and analyzing information, developing strategies, scheduling activities, communicating with supervisors and subordinates, negotiating, coordinating work among team members, and controlling resources – all of which are already being executed by players of digital games and which consequently can be gamified. (Reeves & Read, 2009, pp. 42-58) Applying game mechanics to the work environment would mean that “some people will soon do their jobs inside a game, and many more will thrive in information environments that have features borrowed from today’s best games.” (Reeves & Read, 2009, p. 4)

It is important to recognize that the most successful gamification implementations are not superficial but instead sophisticated process design efforts. While some “shallow” gamification efforts merely award points or badges to participants, the more effective efforts achieve success through the meaningful redesign of processes, incorporating game mechanics in the process rather than solely to measurement, in order to enhance both participation and outcomes. (Fiore-Silfvast, 2012; Hägglund, 2012) Paharia considers good gamification to be an "interaction design" task, one which focuses on guiding player behavior to satisfy player needs. Such interactions use user-activity data to provide visual feedback to players as a means of motivating certain constructive behaviors. (Paharia, 2012)

Recent research efforts suggest that the application of game mechanics improves the engagement of individuals in real-world tasks, such as school and work. Two specific characteristics of game play appear to drive this higher engagement: enhanced positive emotions during the process of game play, and a greater sense of individual accomplishment upon completion of game tasks.

The activities performed by players in a game can be specifically designed to be much more enjoyable than real-world tasks. By reducing players’ fear of failure, offering the potential for an “epic win” (McGonigal, 2011, p. 68), and strengthening social interactions through multi-player games (McGonigal, 2011, p. 82), games offer the potential for meaningful experiences for players (McGonigal, 2011, p. 98), as well as positive emotions and greater engagement. (McGonigal, 2011, p. 36) Consequently, players experience games to be “more inspiring, more
Van Vliet  Going For The Win!

exciting, and more equitable than reality.” (Dignan, 2011, p. 75) Gamification, then, aims to redesign real-world tasks through the application of game mechanics to elicit similar positive emotions. As a result, individuals are expected to engage with these real-world tasks more and perform them better. (McGonigal, 2011, p. 124)

In addition, games are generally designed to require a completion of a clear set of tasks which result in the accomplishment of a well-defined goal, such as the destruction of a specific number of green pigs in a game-level of Angry Birds. The game’s feedback system informs the players when such a goal has been successfully completed, resulting in a game win. Gamification transfers this “win” sensation into a real-world context, and consequently its participants experience a more clearly defined sense of accomplishment. Through gamification, participants in a real-world effort are provided with clear and focused missions to complete in which they can put their personal strengths to good use in pursuit of a “win.” (McGonigal, 2011, p. 22, p. 38, p. 55) As game designer Jesse Schell puts it: “a good game gives us meaningful accomplishment, clear achievement that we don’t necessarily get from real life.” (Penenberg, 2010) This is echoed by Amabile and Kramer who argue that “everyday progress – even a small win” provides significant boosts to an individual’s emotions, motivation and perceptions. Subsequently this sense of progress makes individuals more likely to be “creatively productive in the long run.” (Amabile & Kramer, 2011)

Once workers become more engaged with real-world tasks, the improved motivation to perform and successfully complete these tasks will provide direct benefits to the organizations the individuals work for. (Dignan, 2011, pp. 64-65) Reeves & Read argue that workers can “benefit from game ideas while they are making money for shareholders” (Reeves & Read, 2009, p. 4) and that transforming repetitive jobs and difficult collaboration in the workplace into compelling activities has the potential to improve organizational productivity and worker job satisfaction. (Reeves & Read, 2009, p. 7-8)

An individual’s heightened engagement with a real-world task and the enhanced motivation to complete it successfully also carry an economic benefit for the organization: game-based rewards for a task (such as points, recognition, badges, etc.) are much more economical than traditional compensation (such as money). By appealing to a player’s investment in the game itself, the intrinsic gratification the player receives from participating, and the in-game rewards awarded to a player, a gamified activity may become more economically sustainable for an organization. (McGonigal, 2011, p. 244) This aspect is particularly appealing in an academic setting where students can’t be awarded monetary benefits.

Gamification Implemented

In recent years, the concept of gamification has been broadly applied in corporate settings. Starbucks successfully gamified its customer loyalty program, motivating customers to register with the company and providing them with smartphone apps which track their rewards and reward-levels using a coffee-cup shaped progress bar. (Giovannoni, 2012) In 2011, the Marriott hotel chain developed a Facebook-based game called "My Marriott Hotel" to explain its inner operations through gameplay and simultaneously attract new employees through the social network. (Guadagno, 2011) Shoe manufacturer Nike successfully gamified running by
developing a sensor which attached to running shoes. Following a run the sensor could upload run statistics to a runner's iPod as well as the Nike+ website where the runs were visualized and compared to other runners' efforts. (Eckert, 2013)

Not all gamification implementations have resulted in successful outcomes. In 2011, republican presidential candidate Tim Pawlenty's campaign awarded points and badges for social media posts promoting his candidacy. However, he failed to win his party’s nomination. (Linkins, 2011) Shoe retailer Zappos' effort to gamify online shopping and review-writing failed to engage customers when earned badges were found to lack any meaningful value to customers. (Eckert, 2013) The website socialmediatoday.com developed a program for awarding points and badges for reading articles on its site and submitting comments to them. Once implemented, readers found the scoring mechanism confusing, did "fake things" to obtain points, and generally seemed disinterested in the game or felt it added no value to the site. The program was subsequently discontinued. (Goldstein, 2011)

Successes and failures are a natural part of the development process of what is still a young concept. Implementation developers are experimenting with game mechanics in various settings in order to discover what works and what does not. A strong vote of confidence in the concept comes from the broad range of corporations are making substantial investments in gamification applications. Gartner projects 50% of corporate innovation will involve gamification in the next two years. Deloitte consulting mentioned gamification as one of its top technology trends for 2012. (Anderson, 2012) The gamification industry is expected to grow to $2 billion by 2015. (Zichermann, 2013)

**GAMIFICATION IN EDUCATION**

Educators have long used games as part of their educational efforts, and the availability of personal computers in the 1980s resulted in the development of various educational computer games. A variety of sophisticated educational video games continue to provide a valuable addition to classroom teaching today. (Renaud & Wagoner, 2001) Gamification in education, however, is not about simply assigning students to play video games to accompany traditional pedagogical practices; instead it aims convert the overall educational process into a game-like experience.

As mentioned earlier, the author implemented gamification practices in a traditional undergraduate Introduction to Information Systems course. The objectives of the effort were to more effectively engage students, enhance student learning, and improve overall course outcomes for the students as well as the university. An assessment by the instructor and a survey of the students indicated that the gamification ideas were reasonably successful in this regard. The instructor appreciated the greater involvement of the students in the course and the amount and quality of the work performed by these students. The students appreciated the frequent and short assignments as well as the rapid and detailed feedback on their performance. (Van Vliet, 2012)

Encouraged by the mostly positive outcomes of his initial gamification endeavor, the author has embarked on a longer-term investigation of the use of gamification tactics. This effort includes
Virtually all findings summarized in this section are from online sources. Given that gamification is relatively new, not much formal research has been produced and published. A number of recent books have enthusiastically touted gamification as a solution strategy (particularly Dignan, 2011; McGonigal, 2011; Reeves & Read, 2009; and Sheldon, 2012) but these books are light on failures and drawbacks of the concept. Detailed results of implementations – particularly in education – can mostly be found in educator blog posts and technology-oriented online magazines. While such publications commonly lack the methodological rigor, sound data analysis, and sometimes even investigator objectivity of traditional research, taken together these findings provide useful insights in the use of gamification in education.

**Arguments in Favor of Gamification**

At first glance it seems obvious for gamification and education to connect, given how traditional education already incorporates game-like elements. In the classroom, students earn points for exhibiting the desired behavior or skill on assignments, and subsequently have the opportunity to "level up" to the next grade at the end of the school-year. (Lee & Hammer, 2011) Indeed, gamification tactics such as a clear goal, well-communicated rules, a useful feedback system, increased collaboration, and the voluntary participation of students, are nothing more than traditional components of basic course design. (Bourgault, 2012) However, a closer examination of this connection reveals more sophisticated arguments for deploying gamification in education. These arguments address student motivation and engagement, the development of appropriate challenges for each student, the acceptance of failure on the path to learning, and the continuous tracking of student achievement.

Gamification proponents start their argument with the recognition that today’s students often appear to be bored, frustrated, disengaged, and poorly motivated. (McGonigal, 2011, p. 127.) Dignan attributes this to educational institutions having “poorly structured systems” which fail to engage students and thus prevent them from realizing their potential. (Dignan, 2011, p. 1.) What does engage young people are games, particularly video games, to the extent that “the average young person racks up 10,000 hours of gaming by the age of 21. That's almost exactly as much time as they spend in a classroom during all of middle school and high school if they have perfect attendance.” (McGonigal, 2011-b) Indeed, game players tend to exhibit "persistence, risk-taking, attention to detail and problem solving skills, all behaviors that ideally would be regularly demonstrated in school." (Klopfer et al, 2009)

Consequently the remedy for disengaged or poorly motivated students could be the inclusion of gaming techniques in the educational process. Highly engaged and motivated students – those who innately like to explore, build, or control their environment – will likely seek out educational challenges themselves. Gamification applications – through the use of instant
feedback, competitive challenges, and rewards for even small achievements—can be used to
target students lacking such internal motivation. This may help these students gain confidence,
ambition, and competitiveness. (Corcoran, 2010)

McGonigal’s recommendation is to go beyond merely including educational games—however
well-designed they may be—and instead gamify the overall educational experience: the “ideal
school is a game, from start to finish: every course, every activity, every assignment, every
moment of instruction and assessment would be designed by borrowing key mechanics and
participation strategies from the most engaging multiplayer games.” (McGonigal, 2011, p. 128.)
Such carefully designed educational environments would not only engage students but could also
lead to effective ways of learning. According to Dignan, game players hypothesize about and test
their virtual environment through gameplay, an experience that results in the process of learning
about the environment. He argues that this process can be directly applied to the educational
process. He summarizes this idea by stating “Play isn’t a way to make learning fun… play is
learning.” (Dignan, 2011, pp. 27-28.) Well-designed games turn play into learning by presenting
specific challenges tailored for a player's skill level and subsequently increasing the difficulty as
the player's skill and knowledge grow. This cleverly motivates the player to attempt increasingly
challenging tasks. Educational gamification efforts are often geared to replicate this strategy to
motivate student learning and development. (Lee & Hammer, 2011)

When a player attempts to complete these increasingly challenging game levels or tasks, failure
is a common outcome. Indeed, a common game characteristic is the player's ability to fail at
achieving an objective, and to subsequently try again and again, learning something with each
attempt, until success is achieved. Such repetition until mastery is rarely available in educational
settings where a single student assessment (such as an assignment or exam) creates a permanent
evaluation or score. A game's tolerance for failure encourages players to keep trying to complete
a task and encourages players to take on more difficult or challenging missions. Well-designed
gamification implementations in education aim to replicate this characteristic, permitting
students to gradually improve their skills and knowledge until a threshold level of performance
has been met. Such an implementation would not punish or stigmatize students for initial
failures, nor would it permanently bar students from proceeding through the educational process;
rather, the implementation would consistently reward the students for perseverance and effort
until educational objectives are achieved. Under these conditions the negative connotations of
failure diminish, and instead failure would be viewed as an integral part to the learning process.
(De Luna, 2012; Lee & Hammer, 2011; Shane, 2012)

In order to track a player’s progress or scores, virtually all games have a mechanism to track
player achievements and report these either individually or on a leaderboard. The desire to
obtain a higher score or improve the player's place on the leaderboard is an important motivator
in games. Such feedback must be available in real time so that the player can adjust their actions
and strategies in an attempt to improve the score. Tracking a student's achievements is also an
important activity in education, as it allows the student and educator the chance to assess the
student's learning. It is not surprising then that gamification applications in education have
focused much attention of creating rapid and sophisticated tracking and feedback mechanisms.
While critics of gamification find this focus on scoring a misplaced priority (see the discussion
on "pointsification" in the following section), any educational environment that allows students
to explore, experiment, fail, and try a task again must incorporate effective tracking and feedback systems. Even the most sophisticated and well-designed educational approaches need to measure student achievements. The key task for gamification designers then is to ensure that such tracking and feedback is precise, accurate, and relevant to the pedagogical objectives of the project. (Sinha, 2012)

Arguments Opposing Gamification

The most prominent criticism of gamification is that its emphasis on awarding points and badges is simply poor pedagogy. Such “shallow” implementations merely award points and badges to its participants without also introducing a meaningful redesign of the activity or process. (Fiore-Silfvast, 2012) A widely quoted article by Robertson argues that gamification efforts tend to take "the thing that is least essential to games" and represent it "as the core of the experience." Robertson refers to the paired processes of awarding and collecting points and badges that occur in so many gamification efforts as "pointsification" and argues that this approach offers meaningless choices to players as point-levels only go up in such implementations. (Robertson, 2010) Merely awarding points and badges may not only be indicative of poor game design, it may even have unintended consequences: players may adjust their behavior specifically towards the metric or could attempt to "cheat" their way to a high score. (Anderson, 2012) Well-designed games provide more substantial and consequential choices to a player, and include the possibility of loss and failure. In such games, the experience of playing becomes the true motivating factor, rather than the mere collecting of points; instead, points are merely a means for keeping score. (Temple, 2012) It must be noted that in making her argument regarding pointsification, Robertson points to gamification examples used by marketing campaigns from Coca-Cola and Nike, but does not address efforts in education. (Robertson, 2010) Yet the argument does apply in this setting. In fact, a classroom teacher summed up the proper place of points and badges quite well: “I don’t think just because you offer an award, like a badge, it will motivate students intrinsically or help them at all. But, tying it into your classroom to make the overall experience fun, meaningful and a challenge can help.” (Ely, 2011)

The Gartner research company agrees with the shortcomings of a points-only approach and argues that gamification applications which focus on "obvious game mechanics, such as points, badges and leader boards," rather than on "the competitive and collaborative elements of gamification" will fail. Gartner does believe that gamification can be beneficial in a myriad of settings, but argues that better application designs are needed to create engaging "player-centric applications that focus on the motivations and rewards." (ComputerWeekly.com, 2012)

Basic practical arguments can be made against gamification. Any innovative educational approach such as gamification must overcome a number of substantial barriers to adoption such as the curricular requirements of a course, the time-limits of individual courses, the need for student assessment through testing, and the limited time and resources of individual teachers. Gamification efforts require substantial time and resources to implement, which can be difficult when limited resources are available for education in general, and these investments need to be sustained over a substantial amount of time in order to obtain long-term benefits and data. (Klopfer et al, 2009)
Finally, even proponents of gamification admit that knowledge and skills in certain areas or of certain depth may be impossible to gamify. While discrete and easily measured skills such as math problems can be easily gamified, more complex or abstract concepts might not. Wagone, an educator who has written in support of gamification (Renaud & Wagone, 2001), admits that if all educational content were gamified, the students would be "getting stuff at a pretty surface level and individual students may be missing things that are core and are not appropriate to gamify." (Shein, 2013) Indeed, while games may teach educators about how to develop dynamic, engaging, and motivating learning environments, in the end gamification is simply not a quick and easy solution to the complex problems faced by educators. (Bourgault, 2012)

Gamification in Practice: Epic Wins in Education

Games and gamification appear in education in various ways, and some form of classification of these efforts is useful in their assessment. A helpful organization is provided by Corcoran who distinguishes three categories of games in education. The first category consists of basic video games which teach a specific skill followed by a "drill" to measure student comprehension. The second category consists of game platforms which allow students to build their own simple games, solving development-related problems in the process. The third category is gamification of the courses, incorporating not only game-like challenges but also collaborative and competitive features borrowed from multiplayer games and social networks. (Corcoran, 2010) Lee and Hammer propose a fourth category: the development of a "game layer" for a complete curriculum or school. This "game layer" consists of individual modules and tools for instructors to deploy and implement in various courses to guide or motivate students on particular tasks. They indicate a prototype of this game layer is currently being tested. (Lee & Hammer, 2011)

Corcoran’s first category of games in education consists of stand-alone video games which focus on a specific skill or educational objective. The relatively narrow focus of these games does not make them useless in the classroom. Good games - whether they are specifically designed for educational purposes or not - can incorporate important learning principles such the discovery of identity, interaction with an environment, collaboration with others, and various aspects of problem-solving (systems thinking, goal setting, risk taking and decision making). (Gee, 2005) For example, game designer Ladley describes an elementary-school level collaborative game called Sustainaville. This game teaches sustainable development practices using an animated simulation of a small city and touches of economic, social, and environmental issues. Implementations of this game did not only result in fully engaged students but also in improvements in student collaboration, decision-making skills, and subject knowledge. (Ladley, 2011)

Corcoran's second category - student game creation - permits educators to address a broad variety of skills. Game creation requires students to solve problems, write, design, program, and - when working in teams - collaborate and communicate. In addition the students develop a deep mastery of the game's subject matter due to them having to analyze and model it, whether the material is about ecology, math, or social studies. This combination permits educators to incorporate elements of STEM education in a broad range of courses. Platforms such as E-Line Media's Gamestar Mechanic, the AMD' Foundation's Activate!, and WorldWide Workshop's Globaloria can be incorporated into curricula to engage students with design and construction
Van Vliet  Going For The Win!

Corcoran’s third category – redesigning an entire course so that it resembles a comprehensive game – is what is most commonly referred to as gamification. This is a relatively recent development in education, but implementations have already been tried at all educational levels.

Khan Academy has quickly gained a reputation in the field of MOOCs (Massive Open Online Courses), but it has also deployed gamification techniques to motivate its students. Students achieving various levels of proficiency can earn increasing levels of badges, and all aspects of student participation - time spent, points earned, achievements obtained over time - are reported in digital dashboards reminiscent of game character statistics. (Khan Academy, 2011; Sinha, 2012) Khan Academy’s approach, which combines free educational videos and online tests with gamification techniques for motivating and engaging students, has resulted in millions of users as well as recognition from educators and funding from large donors. Measurements of student achievement noted both improvements in student achievements, as well as in engagement, confidence, and motivation. (Donaldson, 2011) Khan Academy’s educational materials are used not only by individual students learning at home, but also by elementary, middle, and high schools as an extension of their curriculum. (Dunn, 2012)

At the high school level, math teacher Kate Fanelli gamified a math course for at-risk students. Fanelli used student avatars, leveling techniques so that students would master the course content, and graphic visualizations of student achievements. As a result of these efforts, both student attendance and state-based assessment improved significantly. (Ross, 2011)

College-level applications of game-based techniques to augment student learning are popular in the field of computer science, particularly to teach the practice of software engineering, deploying both stand-alone educational games and broader attempts at gamification. Topics such as loops, arrays, testing, and debugging are often challenging for novice students. (Eagle & Barnes 2009) These challenges have been successfully addressed using game-based implementations. A graphics-based role-playing game called Wu's Castle was developed at the University of North Carolina at Charlotte to specifically teach students about loops and arrays. Following the use of this game for training, students not only performed better on a programming task, but they also found the task itself more pleasant. (Eagle & Barnes 2009) A multiplayer game-like platform called HALO ("Highly Addictive SocialLly Optimized software engineering) allows students to test their program code using a series of coding-related quests. Students using this platform appear to perform better than those who do not. (Sheth et al, 2012) In a study at the Leibniz University in Hannover, digital games and social media mechanisms were used to motivate students to follow proper software version control practices during a bug-fixing process. While some students did not like the large number of messages sent out by this system and found one of the key metrics too simplistic (the metric measured the number of inputs per participant but not their value to the project), the overall review was positive. The students were able to see the project progress in real time and even competed on how many software bugs they could fix. (Singer & Schneider, 2012) Finally, an interesting approach to teaching programming to freshmen students first divided an assignment into levels for students
to conquer and then added a game-like currency in the form of tokens. Student teams could use these tokens to submit their work to the game master/instructor for review; once a team used up all tokens, their work could no longer be reviewed. The use of tokens was designed to motivate the students to pursue quality in their work at all stages. Through student surveys the developers of this approach found out that the game-oriented approach to programming assignments resulted in an improved clarity of the assignment descriptions and objectives, a quality that was highly appreciated by the students. (Thamvichai & Supanakorn-Davila 2012)

A study of two undergraduate gamified courses (“Game Design & Logic” and “Animation”) at Bond University in Australia found strong positive student responses to game-like elements. While it is tempting to associate these results directly with the needs of "digital natives," (Prensky, 2001), De Byl cautions that "gamification works because it addresses fundamental human desires such as reward, achievement, status and altruism." This study found the impact of gamification on performance to be relatively weak, which may be due to a limitation in the course design by which the students were not permitted to fail and repeat assignments until they achieved mastery. (De Byl, 2012)

A comprehensive approach to gamification at the college level was undertaken by Sheldon, who describes in great detail the transformation of four game design courses (“Theory & Practice of Game Design,” “Multiplayer Game Design,” “Introduction to Game Design,” and “Designing Interactive Characters for Digital Games”) and the lessons learned from each implementation. Sheldon approached each course as a multiplayer game, with students designing and naming personal avatars, fighting monsters (exams), completing quests (presentations), and crafting (writing term papers). Students performed individually and in guilds (teams), to earn experience points that would lead to incremental levels (letter grades). While students provided positive feedback to the course redesign from the start, Sheldon used experiences from the earliest implementations to fine-tune and improve his gamification techniques. What is unique about Sheldon’s gamification approach is that it is not implemented in a computer-based format, despite the subject matter of the courses involved. Instead he redesigned the classroom itself into a role-playing game, with students participating in classroom-based exercises, interactions, and experiences. As a result, Sheldon observed increased student participation, motivation, collaboration, communication, and achievement. (Sheldon, 2012)

At this time, very few gamification implementations cross the boundaries separating individual courses. A notable exception is a fully gamified educational institution called Quest to Learn, a New York City charter school serving students in grades six through twelve. While the school’s curriculum covers traditional college preparatory content, the ways in which students learn and interact with this content is radically different from traditional schools. Each day the students engage in educational quests (creating player profiles, unlocking codes, exchanging messages, uncovering secret assignments, and leveling up), all to prepare for “boss level” units during which students apply obtained skills and knowledge to solve complex problems. While a full assessment of this effort – which started in 2009 – won’t be available for a few more years, it did attract favorable attention and funding from various educational foundations. (McGonigal, 2011, pp. 128-132; Sheldon, 2012, pp. 17-18)
Finally, gamification has also been applied in corporate training settings. Deloitte Consulting's training programs have seen a 37% increase in user retention since it started to include game mechanics - such as missions, badges, and leaderboards - to its video lectures, tests, and quizzes. The gamification implementation includes social features which permit achievement badges to be visible on an employee's LinkedIn profile. It has also taken an innovative approach to its use of leaderboards: instead of a permanent overall leaderboard, each training level and weekly training period have their own leaderboards, thereby avoiding dominance by a few permanent high-scoring employees and instead encouraging broader competition. (Meister, 2013)

LESSONS LEARNED

Institutions of higher education are facing a significant number of challenges, including budget cutbacks, affordability of tuition costs for students, a changing workforce, disengaged or distracted students, competition from online educational options such as MOOCs, and many more. These issues have created the impetus for many universities to investigate innovative approaches and technologies to improve operations, efficiencies, and student outcomes. Some of these innovations originate outside of academia: “examples from other institutions — entertainment media, book publishing, and content delivery — point toward a future in which higher education will mutate into a wide array of options, alternatives, technologies, and practices driven by the needs and choices of the learner.” (Bujak et al, 2012)

One of the options being explored is the use of gamification as a means to reinvigorate courses and better engage students. At first glance, the use of game-based techniques to motivate and engage appears intuitively obvious. This may explain its rapid adoption in business and the substantial commercial investments made in gamification applications and systems. In recent years hundreds of corporations - many of them large Fortune 500 companies - have developed or acquired gamified applications. These applications are used internally (to motivate or train employees) and externally (to enhance customer engagement and loyalty). The gamification industry itself is expected to grow rapidly in both applications and revenue. (Anderson, 2012; Zichermann, 2013) Meanwhile educators have taken a more cautious approach, experimenting with game mechanics thoughtfully in a variety of settings. Most of these implementations are relatively small, addressing a single course or a specific set of course assignments. More ambitious efforts, such as the aforementioned Quest to Learn charter school, are quite rare.

So what have these educators learned about gamification? Do they believe it is an effective approach? While arguments have been made supporting and opposing gamification by various authors, virtually all educators who have reported on actual implementations of the concept have been supportive. Part of this may be attributable to educators not being eager to report on failed experiments; after all, most of the examples cited above are internet-published, often on educational blogs, rather than the results of carefully designed comparative studies found in research journals. Such research is likely to be forthcoming, but at this time gamification is simply too young a concept to have produced expansive, longitudinal experiments based on careful research design. Nevertheless, such research may wish to incorporate the initial findings of the early implementations. While these implementations vary considerably in their approach, rendering clear comparisons and generalizations difficult, three key findings stand out:

668973-12
The motivation goes both ways: The use of gamification in educational settings is primarily intended to motivate and engage students. Most implementations reviewed above did indeed find increased student interest and engagement. Most – though not all – students appear to be effectively motivated by cleverly designed assignments, sometimes disguised as missions or quests, as well as by the competitive elements found in some implementations. An unexpected benefit uncovered by the educators involved is the higher level of engagement of the educators themselves. These educators, when implementing gamification techniques, are required to take a fresh look at their courses and assignments. Gamification, particularly when implemented throughout an entire course, requires the instructor to redesign course syllabi, lectures, hand-outs, assignments, student assessment practices, and student interaction methods. Such course redesign efforts encourage instructors to reassess course assumptions while applying their expertise and creativity as they redesign course elements. The instructors who commented on their own engagement reported a renewed enthusiasm for their educational efforts. (Ross, 2011; Sheldon, 2012; Van Vliet, 2012)

Points and badges are not enough: The prevalence of superficial gamification implementations – those that focus merely on points and badges - was mentioned earlier as a prominent critique of the concept. This misplaced focus on “pointsification” is likely to result in poor educational design and limited student learning. (Robertson, 2010) Two additional drawbacks may occur over time when educators focus on competition and rewards using points. First, player competition and standings on a leaderboard may not engage or motivate all players over time, especially those players who realize they are likely not to win the competition. Second, the addition of rewards to an activity - be they points, badges, or actual prizes - can focus players' attention to the incentive structure rather than the activity itself. When a gamification process ends and the reward is taken away, the perception of the activity is likely to be diminished. (Temple, 2012)

It takes quite a bit of work: A key observation from educators using gamification is the continuous game-management effort required. Gamified lessons and practices need to be carefully thought through and planned in advance. Once a gamified course is being taught the instructor need to constantly assess, score, track, and report student achievements. Consequently, gamification practices often take greater effort and more time than traditional teaching approaches. Instructors and administrators should assess whether the potential benefits of gamification are worth the additional time and effort. (Ross, 2011; Sheldon, 2012; Van Vliet, 2012)

Future Directions

Gamification is still a relatively new concept, and so it is likely that its practice will be developed and fine-tuned as these educational experiments progress and longer-term effects of the practice become known. Gamification’s assumptions, practices, and promises need to be investigated methodically, so that the cumulative findings of these studies can help this pedagogical approach develop and improve. The outcomes of these gamification studies may over time result in exciting new approaches for redesigning educational experiences to better engage and educate students.
A particularly promising aspect of gamification in education that deserves the attention of researchers is the incorporation of failure as a step towards success. This involves the opportunity for students to attempt a task multiple times in order to learn from failure, as well as a changed approach towards recording the results of these attempts.

The practical incorporation of failure can be viewed as a means to improve eventual student performance. In most traditional educational settings, students are not permitted to redo their work and incorporate the feedback they receive following an assignment submission. Digital games, on the other hand, are often specifically designed for players to repeat a task until they successfully complete it, which in turn encourages players to undertake more difficult challenges. (De Luna, 2012) Gamification implementations therefore should not only have a feedback mechanism which permits students to compare their own performance with a target level of performance; they should also permit students to move towards that target through repeated attempts. (De Byl, 2012)

In addition, McGar notes that games generally don't leave a record of a player's failed tries once a player achieves a goal or reaches a new level. Failures are simply steps on the path to success. Yet in education low or failing grades are often recorded and incorporated in a student's final grade or grade point average. The resulting preference to avoid such failures moves students towards safe choices rather than academic risk-taking. McGar recommends that rather than punishing a student for such imperfections by including them on a permanent record, gamified education implementations should encourage failure as a natural portion of achieving success and focus on recording the eventual outcome of this process. (McGar 2012)

In practical terms, gamification support systems need to be developed for educators. Such systems would reduce the effort required by educators who wish to incorporate game mechanics and would allow for the consistent implementation of best practices. At this time, a number of systems exist to support business-oriented gamification efforts (web-based examples of such systems include Badgeville, BigDoor, Bunchball, IActionable, PunchTab, and many more), but these systems merely assist in the tracking of points, badges, and leaderboards. Systems designed for the educational community would need to support a broader array of educational processes and gamification techniques, provide more extensive feedback than mere points and badges, and ensure the confidentiality of student grades. Components of such systems already exist. Many educational software applications permit students to master content through exploration and repeated attempts at problem solving. In addition, the dashboards and visualizations used by Khan Academy show innovative and comprehensive assessments of student activities and achievements. (Khan Academy, 2011)

Concluding Comments

Gamification is an attempt by educators to adapt to changes in society, the workplace, information and communications technologies, and particularly in the students themselves. Gamification has the potential to be a new way to engage today’s students – viewed as digital natives – by dynamically connecting and motivating students to draw on their strengths. (Bujak et al, 2012)
Lee and Hammer sum up the need for research and assessment of educational gamification efforts quite succinctly: "We must know what problems we are trying to fix, design systems that fix those specific problems, develop ways of evaluating whether those fixes work, and sustain those fixes over time. Gamification can only provide tools, and those tools must produce results that are worth the investment."  (Lee & Hammer, 2011)

REFERENCES


