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Plamen Miltenoff

St. Cloud State University, pmiltenoff@stcloudstate.edu

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Gaming, Gamification and BYOD in academic and library settings:

bibliographic overview

Keywords:

gaming, gamification, game-based learning, GBL, serious games, Bring Your Own Device, BYOD, mobile devices, Millennials, Generation Y, Generation Z, academic libraries, education, assessment, badges, leaderboards

Introduction

Lev Vygotsky's "Zone of proximal development" and his *Sociocultural Theory* opened new opportunities for interpretations of the learning process. Vygotsky's ideas overlapped Jean Piaget's and Erik Erickson's assertions that cooperative learning, added to experimental learning, enhances the learning process. Peer interaction, according to them, is quintessential in accelerating the learning process (Piaget, 1970; Erickson, 1977; Vygotsky, 1978). Robert Gagné, B.F. Skinner, Albert Bandura, and others contributed and constructivism established itself as a valid theory in learning. Further, an excellent chapter of social learning theories is presented by Anderson, & Dron (2014).

Games are type of cooperative learning. Games embody the essence of constructivism, which for students/gamers means constructing their own knowledge while they interact (learn cooperatively). Learning can happen without games, yet games accelerate the process. Games engage. Games, specifically digital ones, relate to the digital natives, those born after 1976-80, who are also known as Generation Y, or Millennials ([Howe & Strauss, 2000](#)).

Millennials in the United States, as per the recent *Programme for the International Assessment of Adult Competencies* (PIAAC), are performing rather poorly compared to their peers from 22 countries around the world (Schaffhauser, 2015b). While research is still tackling the reasons why, novel approaches to learning needs to be considered for a generation, which differs from previous generations in acquiring information and constructing knowledge.

Millennials are gradually leaving the educational field and entering the working force, to be replaced in school settings by Generation Z (Levine & Dean, 2012). Gen Z, the next digitally-native generation, seeks changes of the learning process; changes even more drastic than the ones sought by the Millennials (Hackschooling, 2013). Gaming for Generation Z is not an alternative, but rather expectance. Gaming for Generation Z is associated with creativity (Jackson, A., Witt, Games, Fitzgerald, von Eye, & Zhao, 2012). Creativity, next to collaborative learning and knowledge construction, is one of the prevalent characteristics of games. Using games increases learning, making games increases learning more and is "tantamount to project-based learning" (Shapiro, 2014b).

Games and gamifying of the learning process transforms from a cutting edge idea to a regular expectance. Beyond a fad or choice, it becomes, next to lecturing, an expected teaching method,

which we, the older generation of educators will have to consider as a feasible alternative to traditional “lecturing” type of teaching.

Games and Gamification: Definition and delineation

Games

Ralph Koster defines a game as a system of rules that, taken together, creates a simplified model of some aspect of reality (Koster, 2013).

Serous games

In the last decade the notion of “play” in education, as discussed by Vygotsky (1978), was ren[fr]amed to “games.” During the same decade when “game” replaced “play” in regard to learning practices, the term “serious games” was also introduced. Ulicsak and Wright (2010) define serious games as simulations and virtual worlds. They quote Sorensen and Meyer’s (2007, p. 559) definition of serious games as “digital games and equipment with an agenda of educational design and beyond entertainment” (Ulicsak and Wright, 2010p. 24). Further, Ulicsak and Wright (2010) provide a long and excellent selection of of definitions and literature regarding serious games.

Similarly, the European Alliance for Innovation (EAI) (<http://eai.eu/transaction/serious-games>) defines serious games as of “not designed for the sole purpose of entertainment but rather for training, educational, marketing or awareness raising objectives. These [serious] games are designed to create a skill development environment for the player while retaining the same focused motivation context of “fun” games. The player must perform tasks, analyze processes and draw conclusions in order to increase his/her productivity and knowledge following the game’s positive and negative feedback, sometimes after risks or events that, in real life, would be harmful or even fatal. Serious Games are used in numerous areas like engineering, health, education, defense, military, emergency management, and scientific exploration, among many others.”

Gamification

Gamification takes game elements (such as points, badges, leaderboards, competition, achievements) and applies them to a non-game setting. It has the potential to turn routine, mundane tasks into refreshing, motivating experiences (What is GBL (Game-Based Learning)?, n.d.).

Gamification is defined as the process of applying game mechanics and game thinking to the real world to solve problems and engage users (Phetteplace & Felker, 2014, p. 19; Becker, 2013, p. 199; Kapp, 2012). Gamification requires three sets of principles: 1. Empowered Learners, 2. Problem Solving, 3. Understanding (Gee, 2005).

Some authors, e.g. Malykhina (2014), fail to make the distinction between games and gamification in the educational process and attribute gamification to the influx of games in the curricula, rather than to the application of game elements as defined above.

Game-based learning

Game based learning (GBL) is a type of game play that has defined learning outcomes. Generally, GBL is designed to balance subject matter with gameplay and the ability of the player to retain and apply subject matter to the real world. GBL describes an approach to teaching, where students explore relevant aspect of games in a learning context designed by teachers. Teachers and students collaborate in order to add depth and perspective to the experience of playing the game (What is GBL (Game-Based Learning)? (n.d.). Researchers are readily taking GBL to the next DGBL level (Digital Game Based learning) emphasizing on the fact that Millennials and Generation Z affinity to electronic and online games versus “in-person” games (Tsai et al. 2015).

In the past decade, the education-based definitions of “games’ is being deconstructed and changed: besides serious games, gamification and game-based learning, practical solutions by instructors in their attempt to introduce games as learning method spurs new “definitions. E.g. game-enhanced learning, portrayed as a misnomer of game-based learning by Barseghian (2014) can be safely harbored under “gamification.” One of the challenges, which immediately needs to be addressed is a standardized definition and classification of “educational games” and their subdivisions, such as game-based learning, serious games and gamification.

Debates regarding games and gamification in education

In the last decade, gaming is attracting negative publicity. Although Fournis, & Abou, (2014) admit that no study until this point can demonstrate that “exposure to violent digital games is associated with an increase in criminality, aggressiveness, or violent behavior,” they are more prone to acknowledge the possibility for negative impact and to endorse further research seeking such negative dependency. On the other hand, a team of psychologists, Granic, Lobel, & M. E. Engels, (2014), employing previous research, summarize the positive effects of gaming and outline those positive effects in four main domains: cognitive, motivational, emotional and social. Besides advantages to education, Granic et al. urge professionals to consider “strong enough evidence” to explore the mental health benefits of gaming. Kim, Park, & Baek, (2009) arrive to the same conclusions: “teachers and parents need to change their primary views regarding game-based learning. They need to focus less on the elements of violence and addiction which have been major obstacles for using games in the classroom and focus more on the educational potential of commercial games by adopting teaching strategies such as meta-cognitive strategies (p. 808). Shapiro (2014b) cites Keith Devlin’s *Mathematics Education For A New Era: Video Games As A Medium For Learning* and also stresses the inevitability of considering [video] games as part of intensive learning.

Further objection against gaming is the “infantisation” of the consumer (McCrea, 2011). Bogost (n.d.) goes even farther to proclaim gamification a “marketing bullshit,” an attempt by big business to “domesticate” gamification for its use. Further doubts against gamification include assertions that games and gamification are: 1. Nothing new at all; 2. They are superfluous; 3. They can be amoral; and 4. They can be dangerous. There is an ongoing debate on blogs and discussion forums regarding the pros and cons of gaming and gamification. Despite Ian Bogost’s

strong stand regarding gamification, his influence on forming the program for developing game-based learning in Britain is well recognized. E.g., his expertise in gamification is underlined in the work of the National Foundation for Educational Research (NFER) (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 6).

The debate, as noticed by Malykhina (2015), complicates the ultimate decision about how and when to embrace gaming and gamification as a rightful didactical approach in education and most probably will postpone wide acceptance of gaming and gamification in the near future, despite the predictions of the *Horizon Report* and the *New Media Consortium*. Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, (2013) present an excellent account of pros and cons of gaming and gamification in education as well as fitting examples when and how gaming can be utilized in the learning process. The debate if gaming and gamification has negative or positive impact on gamers and, respectively, their learning is now topped by new and, probably, more important issues, such as Big Data and its connection to privacy. Namely, the data about students (not necessarily only about their grades, test scores), which is collected during the learning process (including gaming) as well as during their stay at school. Kreindler (2014) draws a picture of a near future, when “Game-Based Learning tech companies teamed up with Project-Based Learning companies and warns that students must not feel their privacy threatened by the data gathered during that process.”

Games, gamification and BYOD

The definition of games and gamification is added by the important distinction of video games from other media (e.g. books, TV, movies etc.) by active participation, possibility for participation in singularity or cooperatively, online or in physical presence. Moreover, Granic et al (2012) as well as Fournis & Abou (2014) agree that game platforms are becoming increasingly diverse and easily accessible. Further, they consider a distinction between games, video games in particular, being played on consoles such as Sony, Nintendo, Xbox, etc. but also on computers and mobile devices. In a series of blog postings, Shapiro (2014a, 2014b) asks very same questions about GBL and its mobility.

Gaming on mobile devices as a trend must be observed closely, considering the recent fact of mobile devices surpassing the sale of desktops and laptops (Bosomworth, D., n.d.). Respectively, studies regarding games and gamification, particularly in education, might have to refocus from consoles only and expand research to the Bring Your Own Device (BYOD) imitative, which is gaining strong momentum in middle and high school settings as well as in higher education.

NFER’s study on game-based learning is also focusing on a distinction between gaming and gamification. The authors of the study use Kapp’s definition of gamification as already cited in this research. They define gamification as a much newer concept than game-based learning. Gamification, according to them, is “about using ‘elements’ derived from video-game design, which are then deployed in a variety of contexts, rather than about using individual video games” (Perrotta, Featherstone, Aston, and Houghton, 2013, p. ii). The NFER report points out the lack of research, which evaluates the impact of gamification (being such a new trend) (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 10). An earlier study of the UK-based Futurelab

looks into “the relationship between games, serious games, simulations, educational simulations, and virtual worlds” and the “the underlying pedagogy in education games, and assessment within games” (Ulicsak and Wright, 2010, p. 2; p. 11). Further studies remind the importance about the dominance of multi-player online games (MMOGs) and, respectively the importance to study single-player online game strategies versus multi-player online games (Tsai, Tsai, Lin, 2015).

Board or in-person games and activities.

Board games or as per Margino (2013) “in-person games and activities” (p. 335) are not the focus of this research. Instead, this bibliographic overview concentrates on the rapidly burgeoning topic of online games, promoted through educational organizations such as Mindshift (<https://www.facebook.com/MindShift.KQED>, <http://blogs.kqed.org/mindshift/>). In-person games and activities do have and will keep their place in educational settings, academic libraries in particular. However, considering Millennials and Gen Z propensity toward electronic games, it is reasonable to focus efforts on providing them with a natural milieu where they can apply more easily their learning efforts.

Gaming in education

In the last two decades, there is a proliferation of literature on gaming in education. This bibliographic overview is limited to recent literature (last five to ten years). In view of the technological advancement of games, literature from the turn of the century (e.g. Griffith, 2002) is replaced by more recent studies (e.g. Granic et al, 2014).

Gaming in education is recognized with the potential to promote student motivation and problem-solving skills (Eseryel, Law, Ifenthaler, Ge, & Miller, 2014). Game-based learning (GBL) is attractive to Millennials and Generation Z with the opportunity to bring fun to learning. Malone and Lepper’s *taxonomy of intrinsic motivation* provides evidence to prove that games hold keys to improvement of learning, which other teaching methods might lack (Mozelius, 2014; Tsai, Tsai, & Lin, 2015). Gaming, according to Thomas Malone’s and Mark Lepper’s taxonomy, offers opportunity to stimulate students both on the level of internal motivation and on the level of interpersonal motivation (Ciampa, 2014; Mozelius, 2014). Motivation and other factors are laid out and discussed in length by Bellotti et al. (2013).

Gaming is a perfect complement to the constructivist approach as defined by Vygotsky (1978) and Bruner (Ratner & Bruner, 1978). Using online games, such as Minecraft EDU (<http://minecraftedu.com/>), furthers the advantages of constructivist methods in the teaching and learning process (Overby & Jones, 2015; Shapiro, 2014a; Games in the Classroom, n.d.; Hill, 2014). Minecraft and SimCity (http://www.simcity.com/en_US/simcityedu) are games, taken by an increasing numbers of users to their mobile devices and confirms the necessity to explore the connection between educational games and BYOD.

The popularity of Minecraft EDU and SimCity EDU should not leave the impression that games and gamification are applicable only to “exact” or “hard” sciences; art and humanities will no less benefit from “non-linear networked communication” (Shapiro, 2014b). The recent momentum around the formation of digital humanities will certainly consider strongly the

educational value of games and gamification (Editors' Choice: Digital Humanities and Game Studies Round-Up | Digital Humanities Now, n.d.).

Minecraft EDU and SimCity EDU popularity with young generations inevitably raises acceptance among educators (<http://blog.stcloudstate.edu/ims/?s=mincraft>) (Malykhina, 2014). Ulicsak and Wright (2010) identify the lack of uniform pedagogical research of educational games and note the discrepancy between earlier educational games, based on behaviorist model and the recent attempt to shift educational games to experiential, situated and socio-cultural pedagogical models.

Regrettably, this growing academic interest toward games and gamification in education remains confined within research, but has difficulty being applied broadly in practice. There is a dichotomy between the research asserting the usefulness and necessity to embrace gaming and gamification and the need of conceptualizing it from different theoretical learning perspectives (Turkay, Hoffman, Kinzer, Chantes, & Vicari, 2014; Vrasidas, & Solomou, 2013). There is also the important factor of the overall instructor's hesitation to embrace gaming and gamification in their curriculum (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 18).

According to their comprehensive literature review on gaming in education, researchers demonstrate that gaming as educational method is built on sound learning principles, such as continued practice, clear goals and immediate feedback. It is demonstrated that games provide opportunity for personalized learning and 21st century skills. It is not only what students need to learn that is shifting, but also how and when they learn (McClarty, Orr, Frey, Dolan, Vassileva, & McVay, 2012).

The above-mentioned NFER report reflects the effort of the British-based National Foundation for Education Research (NFER) Program to determine the role of game-based learning in the educational process and, respectively, to map the activities and efforts to integrate game-based learning in the current educational practices. Another British-based organization, the *Serious Games Institute* (<http://www.seriousgamesinstitute.co.uk/>), aims to provide practical solutions, guidance and literature. The European Alliance for Innovation (EAI) is also enabling research regarding "serious games" (<http://eai.eu/transaction/serious-games>). The Wilson Center in the United States is supporting exploration of serious games (<http://www.wilsoncenter.org/publication-series/serious-games>). Educational institutions such as Arizona State University host the *Center for Games & Impact* (<http://gamesandimpact.org/>) with wide area of theoretical and practical expertise. University of California is sponsoring the *Center for Digital Games Research*, which is focusing on digital media and games from a multidisciplinary approach (Bolkan, 2015). Such centers at educational institutions are indispensable for bridging the aforementioned dichotomy between games' potential on one side and theoretical perspectives on the other, as well as the dichotomy between theoretical research and the lack of wide-spread practical application.

Organizing and developing educational gaming is moving beyond government and academic support; organizations such as E-Line Media (<http://elinemedia.com/>), the Institute of Play (<http://www.instituteofplay.org/>) and the MacArthur Foundation (<http://www.macfound.org/>) are

backing enterprises such as *Gamestar Mechanic* (<https://gamestarmechanic.com/>), which focus on gaming and how-to-make-games in educational settings (Shapiro, 2014b). With opportunities like Gamestar Mechanic, the educational world is moving from client-based (Scratch, <http://scratch.mit.edu/> and Alice, <http://www.alice.org>) to the next, cloud-based / social level of game creation such as MineCraft and SimCity. The cloud-based transition in gaming evolution resembles the shift from “one-to-one” to “many-to-many and multi-way interaction” and parallels the opportunities offered by social media, as eloquently explained by Anderson, & Dron in their first chapter of their book (2014, p. 10).

As Ulicsak and Wright (2010) rightfully observe “[j]ust because some players learn these skills playing the game, that does not mean either that most players are also learning these skills or that it should be adopted in a leadership development program. Conversely, a purely educational simulation may not be very much fun. The program may have the three-dimensional graphics and motion capture animations of a computer game, but the content may be frustrating” (p. 19). And vice versa, a fundamental difficulty with transitioning games from the entertainment world in education is related by Granic et al (2014, p. 74) as the “chocolate-covered broccoli” problem— “the games look great, they are good for you, but they ultimately fail to work because the creative game dynamics that induce transportation and immersion are missing, making them simply not fun (Granic, Lobel, & M. E. Engels, 2014, p. 74).

Game-based learning and libraries

The academic library has an important role in establishing gaming and gamification as a legitimate learning approach. The following factors determine the library as the developmental hub for game-based activities in education: 1. The academic library serves [and reaches] the entire campus. 2. Academic librarians teach mostly short (credit-wise) sessions, which is an advantage to start and complete a rather complex implementation of game-based activities in the curriculum process. 3. The development of sound pedagogical gaming by librarians can enable them to service and consult departments across campus in replicating the pedagogical success of applying gaming and gamification in the curriculum process.

As reflected in the NFER initiative, teachers’ attitudes toward gaming is decisive for the success of gaming practices (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 18). Therefore, a limited and controlled endeavor to gamify learning process on a small scale, e.g. bibliographic instruction for undergraduate classes in different disciplines, can steer faculty’s attitude in the right direction and affirm the value of gaming in learning.

Gaming in the libraries can be divided in two broad categories: physical (also board, or in-person) and electronic/digital/online games. Both categories deserve consideration in the educational efforts of the library, yet considering the interests of Millennials and Generation Z, preference must be paid to the second category. There is no shortage of literature on how to approach both in-person and online games at the library. Nicholson (2013) presents a comprehensive historical overview of the application of tangible games in the American libraries. Margino (2013) presents an anthology of library games; in-person, virtual and hybrid. Similarly, Kirsch (2014) published essays with a comprehensive approach toward in-person,

virtual and hybrid games. University of Minnesota Libraries' practical guide to video games is an example for the electronic/digital/online category (Rauber, Farrell, & Neeser, 2014). So is the Web site for the Library Technology Conference 2015 (<https://sites.google.com/a/umn.edu/learninggame/home>).

The support to develop elaborate educational games is incomparably minuscule to the funding for gaming entertainment industry. The lack of finances makes it only logical for academic institutions to combine their resources across campus in an effort to enable gaming and gamification as a recognized approach to learning and teaching. In that sense, in the beginning of this paragraph was proposed the logical solution to use the academic library as the hub of such combined efforts.

Within the campus setting, the library can prove to be the preferable sandbox for possible testing and implementation of game-like activities and projects. Academic libraries are well-known as early adopters of new practices across campus. Using games for fostering information literacy skills among students has been underway for a long while (Smith, 2007; Walker, 2008; Markey, Swanson, Jenkins, Jennings, Jean, Rosenberg, & Frost, 2009; Nicholson, 2010; Buchanan, & Elzen, 2012; Forsyth, 2012; Porter, 2012; Becker, 2013; Brown & Kaspar, 2013; Margino, 2013; Thomas, & Clyde, 2013; Phetteplace & Felker, 2014; Walsh, 2014a).

Regrettably, information literacy skills remain the focus of most academic libraries in 21st century. Skills taught through digital literacy elude academic librarians. Considering the importance of gaming in education, Alan Gerschenfield, a publisher of computer games, underlines the connection between games in education and the importance of teaching digital literacy (Fletcher, 2014); a literacy, which academic libraries often neglect on account of information literacy. Not surprisingly, such discrepancy regarding the importance of digital literacy determines the attitude toward the leadership role of the academic library in the game-based learning practices on campus. Buchanan & Elzen (2012) are on the opinion that librarians do not have to be experts in the "gaming" area. In their opinion, librarians need to only understand the place video games could have in libraries and adjust their services accordingly. In the same fashion, Phetteplace & Felker (2014) fail to see the grand responsibility of the academic library on campus as early adopters and in terms of video games, they advocate only engagement of patrons and outreach programs. On the other hand, Becker's (2013) study of gaming in libraries takes him to Shapiro's (2014b) conclusion, namely, the necessity to level up students to the learning challenges by creating their own games and/or supporting students in co-designing and manipulating games.

It is important to note, though, researchers' emphasis on traditional library services turning obsolete and the necessity to promote reinvented library services such as game-based learning (Felker, 2014; Phetteplace & Felker, 2014).

Academic librarians' most suitable contribution toward game-based learning is library instruction. Margino (2013) recognizes the stagnation of the existing library instruction, which "primarily exhibits lecture-style teaching and consequently results in students' roles as passive observers rather than active participants," (p. 334) whereas the Millennials' expectations are for

“service, immediacy, interactivity and group activity” (Oblinger, 2003, p. 45). As recommended by Schiller (2008), “instruction librarians who wish to teach information literacy to upcoming generations can benefit from looking at video games...because they are an emerging media that play a central role in the development of the current generation of college students” (p. 351). Similar attitude toward the reversal of lecture-based library instruction toward a game-based one is shared by other advocates for game-based library instruction (Broussard, 2012; Martin, & Steinkuehler, 2010; Porter, 2012; Smale, 2011; Walker, 2008). In addition to library instruction, Phetteplace & Felker (2014) identify library orientation and resource usage as potential fertile ground for turning library services from “traditional” to gaming. Porter (2012) confirms Walker (2008) and Schiller (2008) findings about the use of gaming and gamification in the library.

The traditional services of library instruction and library orientation overshadow the relatively young role of online/distance/mobile education services, which the academic library is part of on campus. Porter (2012) emphasizes that library instruction for online education need to include synchronous and asynchronous demonstration of “proficiency in the use of current information and communication technologies” (p. 68). Game-based learning, per previously mentioned didactic advantages can be the fitting environment to deliver the expected proficiency for online and distance learning (Nielsen, 2014).

There is no singular approach to game-based learning in the academic libraries when it comes to the selection of gaming environments. E.g., Vrasidas, & Solomou (2013) propose the use of Quest Atlantis (www.questatlantis.org). Walker (2008) suggests simpler approach utilizing a Jeopardy-like game. The authors of this study has accommodated Brandel Library’s game-based library orientation for students’ mobile devices (<http://web.stcloudstate.edu/pmiltenoff/bi/>); an inexpensive and replicable approach to gamifyng library orientation. Among the advanced and elaborate endeavors for game-based library services is the University of Michigan’ *Bibliobouts*. With their shrinking budgets and overworked staff, few academic libraries can afford allocating an entire team to accomplish a product such as *Bibliobouts*. Step-by-step instructions on how to utilize *Bibliobouts* in library instructions sessions are already made available by librarians (Hofer, 2013).

Creating in-house games such as *Bibliobouts* can be an expensive endeavor and most institutions do not have the organizational support or financial ability as, e.g. University of Michigan, to embark on such projects (Spina, 2014). Building a game-based learning experience in the academic library and, respectively for campus classes, can be accomplished using newly emerging platforms, such as Koondis (Schaffhauser, 2015a). The advantage of Koondis, described as "social homework system," to existing LMS, such as Blackboard and Moodle, is a better management of the discussion forums and a better organization of students into groups, where they can themselves gamify the learning experience and, as already mentioned, students creating games learn better then students just playing games. It seems that products like Koondis epitomize the best of the old world of LMS and the new world of social media to provide students with opportunity for new type of learning, which includes game-based learning.

In addition to the examples listed above, the following Web page offers a conspicuous account of examples for games in libraries:

<http://gamemakinginterestgroup.wikispaces.com/Library+Game+Examples>. The authors of the Web page list games to enable learning in libraries. The Web page also offers sources for building games in the libraries and, as previously mentioned, per Shapiro (2014b), “with game design students take metacognition to the next level, learning how ideas are constructed.” Further, University of Alabama’s Project Velius, provides an opportunity to engage students in library orientation by involving them in a sort of online mystery scenario. Spina (2013) recommends SCVNGR platform and Walsh (2014b) recommends Lemontree (<https://library.hud.ac.uk/lemontree/>). However, SCVNGR is pulled from the market (by 2015, Google had retired SCVNGR) and Lemontree seems to have remained a locally-used platform.

The literature on gaming and gamification inevitably and rightfully focuses on student learning. However, with the increasing influx of technology in professional duties, library staff and faculty themselves can benefit from gaming and gamification for updating and upgrading their skills. Stephens and Johns (2015) propose “utilizing concepts such as self-directed learning, play, and an emphasis on lifelong learning, these programs have been offered for individual libraries as well as consortial and state level iterations to reach thousands of library staff. Benefits to staff include increased comfort with emerging technologies and an increased desire to continue learning (p. 348). The best way for the academic library to become the hub and leader for game-based education is to practice games and gamification (play) itself.

Goal of a gaming initiative at an academic library must be a long-term research on how to bridge “leisure time experiences and practices and practices into the formal educational domain” (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 25). Hayman, & Smith, (2015) leave wide open the decision about adoption of emerging technologies, such as games and gamification: “Educators, practitioners and researchers must be willing to consider whether our own libraries and institutions can and should support these trending technologies” (p. 8). They draw attention to the fact that it is not only the hardware and software to consider but the staffing of such positions. The concept of flow, introduced by Csikszentmihalyi (1990) constitutes a state of mind when they have completely focused on a task; a task which has a purpose. Academic library, only hosting games for leisure, is a welcoming but insufficient endeavor, considering the opportunities described by Csikszentmihalyi’s “flow” concept and supported by the literature presented in this research. At any moment, the goal of the academic library should be how to elevate the foundations entertainment element of leisure when gaming and bring it to the higher purpose of connecting with the respective discipline of the student as well as enticing the student in participation at the game-based learning process.

For informal assessment of information literacy, McCulley (2009) suggests “active-learning library sessions” (p. 175). Games and gamification of the instructional sessions is one of the best approaches for active learning, since it involves student actively in the acquisition of the content and allows building skills. Gaming using electronic means, such as the library instruction session tailored for mobile devices (<http://web.stcloudstate.edu/pmiltenoff/bi/>) replaces McCulley’s (2009) classroom assessment techniques such as 3x5 cards, bypasses unnecessary data entry and integrates the assessment process into all electronic streamlined data, which can be readily exported for further analysis by Excel, SPSS or any other statistical mean.

Bluemle, Makula, & Rogal, (2013) study the effectiveness of information literacy among first-year students. Their research stresses the importance of moving from a quantitative form of

assessment to performance assessment using Gilchrist and Zald's model for instruction design through assessment. There is a large volume of research on changing assessment tactics in regard to learning in academic libraries (e.g. McCulley, 2009; Mullins, 2014), which awaits being placed in the context of gaming and gamification. In that sense, Frederickson (2013) "micro-credentialing" through digital badges is an excellent start in the library field. Gaming and gamification as new learning approach is tightly connected to the need for new ways of assessment. Efforts such as the Library Impact Data Project (<http://crl.acrl.org/content/74/6/546.abstract>) can include in their future projects assessment of the gaming in the library and how it correlates with the students' attainment and library usage.

Gaming, Gamification and Assessment

The academic library experience in assessment overlaps with the teaching efforts across campus. Kapp (2014) and Shwartz (2014b) argue that gamification of the learning process can apply for students of all ages, who, instead of re-read and re-listen to learning material to improve content recall and retention. Tsai et al. (2015), who present an empirical study on game-based formative assessment in an online environment deliver a solid overview of the increasing number of researchers working in that direction.

Game-based learning presents a possibility to move beyond traditional forms of standards-based assessments and consider the "alternative dimensions of performance and achievement" (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 24). One of the recent developments in assessment, accompanying the advent of gaming, is the use of badges, ledgers etc. A digital badge, as per Gibson, Ostashewski, Flintoff, Grant, & Knight (2013) definition is "a representation of an accomplishment, interest or affiliation that is visual, available online, and contains metadata including links that help explain the context, meaning, process and result of activity" (p. 2). Assessment is an integral part of the re-valuation process how learning is conducted and if gaming is to be the new approach, the evaluation and assessment systems need to be changed accordingly to gaming.

A team of psychologists advocating for return to Vygotskian and post-Vygotskian models asserts the inability of current assessments to evaluate games as part of the learning process (Bodrova, Germeroth, & Leong, 2013). This team offers their own instrument, but since they focus on early childhood games, the notion of a comprehensive assessment approach toward gaming in the learning process remains open for further research and practice.

Badges and badge-earning activities such as Mozilla Open Badges (<http://www.openbadges.org>), Credly (<https://credly.com>) and Badgestack (<http://demo.badgestack.net>) herald a reconsideration of the current evaluation system and reflects the expectations of a new generation of learners, who grew up in a gaming environment (Schwartz, 2014; Gibson et al, 2013).

The application of badges as an alternative assessment in education is not a simple process. As Abramovich, Schunn, & Higashi (2013) and Gibson et al (2013) point out, fine-tuning the use of badges as a reward and assessment tool will take time and efforts.

Amidst the raging debates regarding the merit of testing as a valid assessment tool, game developers, learning specialists and psychometricians find potential for new way to assess, using games such as SimCityEDU (Schwartz, 2014a). Schwartz further quotes Anya Kamenetz comparing game designers to teachers in their effort to secure for students the zone of proximal

development (as per Vygotsky), namely the “sweet spot” where the material isn’t too easy or too hard” an providing engaging experience, different from the frustrating student quiz (Schwartz, 2014a).

Next to badges, leaderboards are the alternative assessment technique used in social learning, gaming in particular. A rapidly increasing literature on leaderboard use, e.g. Bellotti, Kapralos, Lee, Moreno-Ger, & Berta, (2013), Seaborn, Pennefather, & Fels (2013 and Landers, & Landers (2015) deliver thorough empirical research and valuable suggestions on the use of leaderboards for gamification and assessment

McClarty, et al (2012) deliver an extensive literature review with evidence that gaming provides an environment for authentic and relevant assessment. Games’ immediate feedback contributes to good formative assessment process

There is a myriad of discussion forums, blogs, etc., which offer information on badges and similar as assessment. E.g., following the discussion on Malone and Lepper’s taxonomy of intrinsic and extrinsic motivation, a German blog offers information on gamification toolkits (“Motivation und Engagement – Der Unterschied zwischen dummer und intelligenter Gamification | intelligent gamification,” n.d.). Connolly (2014) and Ifenthaler, Eseryel and Ge (2012) are among pedagogues and psychologists who explore the issues surrounding badges as formative assessment and games as a combination of formative and summative assessment.

BYOD, gaming and gamification

Recent report by McGraw-Hill Education Research claims that over 80 percent of students use mobile technology to study (Belardri, 2015). A St. Cloud State University campus technology survey yields similar results. While numbers can be argued, the tendency of students to use mobile devices, being those their own (BYOD) or school-issued is on the rise. Predictions that the rapid growth of mobile devices purchases will slow down (Kokalitcheva, 2014; Hanblen, 2014) does not change the paradigm shift of how Millennials and Gen Z are acquiring their information and building their knowledge, namely using mobile devices at the moment and wearables in the near future (Levine, 2013). In addition, the proliferation of online education, next to digital games embraced by Millennials and Generation Z, is a factor, which calls for reconsideration of pedagogical approach (Tsai et al. 2015).

In his blog, Terry Heick claims that the shortest path to student-centered learning is BYOD (Heick, 2015). He further affirms that “[B]y allowing students to bring in their own devices for learning—rather than insisting that they learn both content and device in school—there is an important opportunity to connect with not just their personal lives, but their natural way of doing things” (Heick, 2015). Mobile devices are in the heart of the recent wave of gamification in “many industries, including business, marketing, and education,” as well as the “evidence that game elements, if used properly, can increase engagement and motivation (Spina, 2013, p. 7). As recognized by Mozelius (2014), Minecraft and SimCity are games, with an increasing number of users shifting their game to their mobile devices. Respectively, Minecraft EDU and SimCity EDU acquire increasing popularity among educators

(<http://blog.stcloudstate.edu/ims/?s=minecraft>)

Last but not least, teaching needs to evolve to the didactic point, of recent technological developments and opportunities. It is in the hands of teachers now to figure out how the opportunities of gaming and mobility can translate into a different type of pedagogy, which takes advantage of BYOD, gaming and gamification and turn learning into an engaging process for students.

There is a constantly increasing amount of evidence that BYOD must be considered when contemplating gaming and gamification as part of the learning process (Kruglyak, 2014). Gaming on BYOD enables personalized instruction (Saponaro, 2014) and inquiry learning (Schwartz, 2014c), among other benefits.

The BYOD movement is young and still needs time to polish policies and break barriers; only several years ago, smart phones were kept out of K12 and to a great degree from higher education. While tablets and smart phones are enabling the BYOD movement, gaming consoles are still remaining taboo (Hockley, 2012). Similarly to the need of recognizing games and gamification as legitimate learning practice, the use of mobile hardware will continue to struggle for recognition in and out of the classroom.

Conclusions

Learning must not be confined in “educational” games and involve “leisure-use” games (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 6). Yet learning is also an effort well beyond just offering learning the games, those being either “educational” or “leisure-use” ones. The success of the gaming industry, besides enormous financial support, which education lack, is determined by absent restrains of educational content. Gaming and gamification of education is and will not be an easy process: game with fun but poor content is not a wishful product (Ulicsak and Wright, 2010) and vice-versa, game with robust content, which does not engage student is equally impotent to achieve learning goals. In other words, the “chocolate-covered broccoli” problem—the games look great, they are good for you, but they ultimately fail to work because the creative game dynamics that induce transportation and immersion are missing, making them simply not fun (Granic, Lobel, & M. E. Engels, 2014, p. 74). “Thus, the question for psychological research on gaming is not what games are “good” or “bad” for us; rather, it seems important to start by acknowledging the growing complexity and interactivity and, from there, to develop equally complex models to explain how gaming influences players in relevant cognitive, social, and emotional domains” (Granic, Lobel, & M. E. Engels, 2014, p. 74).

Gaming for educational purposes should not be constrained only within consoles (e.g. Sony, Xbox, Nintendo), but also online games such as SimCiy ‘EDU’ and MinCraft ‘EDU’ must be considered (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 7). A comprehensive approach to games and gamification is needed, which includes not only games with consoles and online games, but deep understanding of the BYOD movement and how to adapt the use of personal mobile devices toward game-based learning. In addition this comprehensive approach must understand and connect the new opportunities for assessment in the gamification process and in the game-based learning process. Last but not least, the consideration of game-based learning process must plan the participation and ability of students to create learning games. As outlined by Kapp (2014), incorporating gamification into learning strategy should not be simply “a bolt on” of meaningless, superficial game elements” (p. 52).

The movement around game-based learning can be expensive and time consuming process. Few are the educational institutions, which can afford to devote time and resources. It is good planning to consider entities, such as the academic library as the forefront and, consequently, the hub of such activities as well as to support and affirm cooperation between departments and pooling resources to jump start game-based education.

Gaming goes to the core of constructivism as defined by Vygotsky, Piage and other last-century scholars. A rapidly emerging centers and organizations around government and educational institutions put an effort in streamlining the enormous task of connecting the vast area of vast are of gaming and complex environment of education to bring game-based learning. Adoption of rules and guidance such as the principles and mechanisms of game-based learning from those organizations, such as NFER Research Programme, can provide useful framework (Perrotta, Featherstone, Aston, and Houghton, 2013, p. 8) and the necessary start to develop and implement GBL in education.

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