COTS Games: An examination into the potential effectiveness and barriers to utilization in the K-12 education system

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Video games have long been viewed by most parents and youth to be nothing more than fun entertainment (Bourgonjon, Jeroen 2013; Charsky, Dennis 2008). However as video games have become widely popular amongst youths and adults (Sáez-López, José-Manuel 2015), researchers have developed an increased interest in using video games for educational purposes. This is because video games actually contain many gaming principles that translate into educational principles rather well (Thorn, Chris 2013). However despite significant research in the field of video games for education, uptake into the school system has been slow or non-existent (Bourgonjon, Jeroen 2013).

Before going any further, video games can be classified into a couple categories of games. The most common type of video games are known as COTS games. COTS is an acronym for Commercial over the Shelf. A COTS video game can therefore be any video game for any console (PlayStation, Xbox, Nintendo), PC (Personal Computer), Mac computer or mobile device that was developed for entertainment and play (Charsky, Dennis 2008). These types of games when used for educational purposes can also be classified as EIG (education in games).   A game developed solely to meet the specific curriculum or class based outcomes of a school can be classified as GIE (games in education) (Jong, Morris S.Y. 2015).

With research into video games being used for educational purposes, a term was quickly developed to describe this type of potential learning, Game-Based Learning (GBL). The idea behind GBL is to incorporate COTS games and/or educational games into the school classroom and curriculum (Gerber, Hannah R. 2013). Game-Based Learning and more noticeably COTS games have met with resistance when trying to incorporate them into a school classroom for many reasons. The goal of this paper is to examine the potential barriers and effectiveness of GBL and provide recommendations for implementing GBL in a school classroom. Firstly, what

is Game-Based Learning and its educational benefits? Secondly, is GBL as effective as traditional learning? Thirdly, what barriers are impeding the implementation of GBL in classrooms? Finally, how can these barriers be overcome to successfully implement a GBL environment in a school classroom?

Game-Based Learning is defined as using video games to enhance education instruction and deepen understanding of the content (Gerber, Hannah R. 2013). GBL is largely supported by the constructionist learning theory. The constructionist learning theory emphasizes that knowledge be actively built by students rather than consumed passively from teachers (Jong, Morris S.Y. 2015). In fact, twenty-first-century learning has largely supported the constructionist learning approach by the education system, even in British Columbia. GBL as mentioned before can be divided into two categories: EIG and GIE. EIG (Education in Games) defines those that use commercialized games and incorporate them into the school curricula in some fashion. GIE (Games in Education) defines those that custom build games to meet set criteria for their specific educational needs (Jong, Morris S.Y. 2015). Regardless of which category the game falls into, the notion of using video games in education remains the same.

Game-based learning has been subject to much research and as a result, many claims about the benefits of GBL have surfaced. GBL is purported to enhance literacy skills (Spires, Hiller A. 2015), increase student intrinsic motivation (Miller, David 2012), provide meaningful learning experiences including active inquiry, peer collaboration, and constructive reflection (Jong, Morris S.Y. 2015), enhance creativity and improve learning (Sáez-López, José-Manuel 2015) and increase student engagement with the curriculum content (Denham, André 2016). While some of these reported benefits may not have much empirical evidence behind them, more and more research being published in this field are confirming rather than refuting them (Spires,

Hiller A. 2015). A minor caveat to these claims is that more of the success and benefits of GBL involve games that fall in the GIE category rather than the EIG category. With that said, COTS games still provide the benefits of GIE games, but incorporating them into the curriculum successfully requires more preparation (Charsky, Dennis 2008).

With GBL and the reported benefits, one must ask, "Is GBL better than traditional learning?" The answer to that question is, "it depends." There are many factors to consider when implementing a GBL environment and just like with any teaching strategy, GBL isn't for everyone. With that said, GBL has been reported to be just as effective as or better in teaching literacy skills than traditional methods (Jong, Morris S.Y. 2015; Spires, Hiller A. 2015). GBL is also reported to be as effective as or better than traditional methods in subjects such as biology, mathematics, engineering, and languages (Spires, Hiller A. 2015), although GIE category games were used in these findings. Finally, GBL has been stated to being more effective at motivating and engaging students in the educational content (Bourgonjon, Jeroen 2013) than traditional methods. Clearly, GBL is a teaching strategy worth investigating and even piloting in school classrooms.

Despite the many reported benefits to GBL, teachers and schools have been slow to implement this relatively new learning strategy (Denham, André 2016). GBL involves using video games commonly associated with play and fun but not for educational value. So one barrier to implementing GBL is student, teacher, and parent perceptions. Students who are used to studying texts and finding the answers for an upcoming test consider GBL as ineffective at providing the content they need to know (Jong, Morris S.Y. 2015). Students typically believe that games are just for fun (Spires, Hiller A. 2015) and would never have imagined using games for learning. Parent perceptions are biased as well citing commercial advertising of video games

as part of the reason they find it hard to believe video games can be of educational value (Bourgonjon, Jeroen 2011). This negative view is based on the fact that most parents have had little experience with video games and they views are also negatively affected as they think of their own child's video gaming habits (Bourgonjon, Jeroen 2011). Teacher perceptions about video games and even their perceptions of how their colleagues perceive them using video games in the classroom are also causing issues with implementing GBL (Chee, Yam San 2015). Teachers have a hard time connecting curricula to video games, especially when the teachers are inexperienced with GBL and video gaming (Turkay, Selen 2014). Even if a school is open to GBL, implementing from the top down any strategy will meet with resistance, since they often ignore the views of teachers (Bourgonjon, Jeroen 2013). Finally, teachers will often perceive a lack of support both financially and from their administration (Gerber, Hannah R. 2014).

Two other barriers to implementing GBL in the classroom are budgetary concerns and a lack of information about GBL and implementation of GBL (Denham, André 2016). School districts as of late seem to be constantly battling their annual operating budget, especially in the province of British Columbia. School boards have had to make many cuts to programs and funding for schools just to continue running at a non-deficit budget. While the arguments flow about who is to blame for the underfunding, the issue here is that funding for innovative ideas and projects is scarce. The funding problem is not limited to British Columbian school districts either(Gerber, Hannah R. 2014; Denham, André 2016; Bourgonjon, Jeroen 2013). As a result, technology could be too far behind to even facilitate the games a teacher may wish to employ and/or purchase the game for the class when administration is trying to cut back on their spending.

However, if a school district could afford to try out GBL for a classroom or even for a school, the other more important barrier that will impede GBL implementation is the lack of staff training and education about GBL to all interested parties (Denham, André 2016). Without proper education to parents and teachers about the benefits and legitimacy of GBL there will be significant resistance to the implementation of GBL (Gerber, Hannah R. 2014; Denham, André 2016). Part of this lack of information is the lack of professional development opportunities regarding the subject (Denham, André 2016). Assuming that teachers are willing to try GBL, they can be easily frustrated or fail at successfully implementing GBL in their classroom, if they themselves don't fully understand or grasp the game they are using (Denham, André 2016; Chee, Yam San 2015). As all video games are different in complexity and type, teachers will still need to master each and every game they utilize if they wish to use them educationally (Denham, André 2016; Chee, Yam San 2015).

Implementing GBL can be a significant challenge in overcoming the many barriers presented. It can be done however, as Sweden has begun the process to making the use of Minecraft an official tool for the curriculum and even a mandatory class (Sáez-López, José-Manuel 2015). However, there are some recommendations and strategies that can be employed to overcome the issues and barriers that can lead to a smoother and more effective establishment of a GBL environment. One important strategy, in fact possibly the most important one, is to educate teachers, administration, and parents about GBL (Denham, André 2016). Some research found that educating parents about video games and GBL led to increased acceptance of the idea (Bourgonjon, Jeroen 2011). Educating administration could also drop the stigmatism towards video games in school and may even be more likely to help fund the program (Charsky, Dennis 2008). Running professional development workshops and sharing information with teacher

colleagues can also help reduce negative perceptions about GBL (Charsky, Dennis 2008; Denham, André 2016). Denham (2016) goes further and states that for professional development to be successful, it needs to be sustained, active, focus on specific academic curricula, and be coherent between training and daily teacher activities.

Assuming one gets the approval to go ahead with incorporating GBL into their classroom, the teacher will need to get their game on. The teacher will need to play the game extensively, that he/she has chosen to utilize for their course (Charsky, Dennis 2008). Doing so will give the teacher increased knowledge of how to play the game, learn most of the content, and give the teacher the power to assist students when they encounter problems. Next, the teacher will need to learn about the game extensively (Charsky, Dennis 2008). Almost every game has many hidden secrets and cheats that players will inevitably discover. To save time, the teacher should purchase a strategy guide or find a Wiki article that covers these hidden secrets. Utilizing these guides, the teacher can master all aspects of the game faster and help to provide a more concrete vision of how this game can be used in class (Charsky, Dennis 2008). At this point, consider if this game will fit one's overall goals for the course. A teacher should consider the following questions:

1. What is my instructional goal and how well does the game being considered match?
2. Does the game match my instructional philosophy and incorporate learning theories consistent with my goals?
3. Does the game match my instructional philosophy regarding appropriate feedback?
4. Does the game match my instructional philosophy regarding the availability of learner choice?
5. Does the interface match my instructional context? (Turkay, Selen 2014 p. 15)

Assuming the teacher answers these questions in the affirmative, then it is time to apply for funding and/or find ways of acquiring the software for a discount or free (Charsky, Dennis 2008). Depending on the game, cost will vary from free to potentially $50 per licence. Games rapidly decrease in value as time passes and waiting for that cost decrease will help keep that budget down (Charsky, Dennis 2008). Another strategy would be to pair students per game purchased to save costs. The next almost shared step is to get IT (Information Technology) on board and make sure the equipment is capable of playing the game in question. Depending on funding and the state of current technology, this could be a bit of a hurdle and may limit the game pool somewhat (Charsky, Dennis 2008). Since GBL is a fairly new and potentially controversial learning strategy, it would behoove the teacher to inform the parents and be ready to provide alternative assignments. As well, planning an appropriate amount of time for gaming so as to not be too stingy or too generous with the play time in class. Finally, designing appropriate assignments and projects for the game that will work alongside the game and meet the course outcomes (Charsky, Dennis 2008).

These assignments/activities can be divided into three categories based on what they do. "Type 1 activities provide students the opportunity to record, chart/graph, and take notes on what happens in the game" (Charsky, Dennis 2008 p. 41). These activities will allow the teacher to assess their progression in the game and garner what they have learned. A Type 2 activity's main goal is to bridge "...the gap between playing a game and playing a game while studying it and learning from and with it as an instructional resource" (Charsky, Dennis 2008 p. 41). For the most part these activities can be group discussions and/or debriefings that compare the game world to the real world to discover and learn from the errors presented in the game. Type 3 activities should be similar many culminating assignments except they should require students to

critique the entire game as a theory or model of the content being studied (Charsky, Dennis 2008). A potential assignment in this category could be writing a critique of the game similar in nature to writing a critique of a movie. In terms of evaluating the student's knowledge, matching, multiple choice tests are good measures for type 1 activities. Short answer questions or compare and contrast assessment models are fair assessment tools for type 2 activities and research papers or document-based questions are good ways to measure knowledge from type 3 activities (Charsky, Dennis 2008). These guidelines and recommendations should get any starting teacher on the right track and staying true to the curriculum and outcomes set by administration.

Games based learning is still a fairly young field and research into this area is constantly pouring out. While researchers can't all agree on the particular benefits of GBL (Bourgonjon, Jeroen 2013), researchers do agree that GBL is here and will continue to develop as new research is produced. GBL, when employed properly, can be a viable teaching method and great way to engage students in the content (Sáez-López, José-Manuel 2015). Since video games are becoming an increasingly big part of student's lives, it becomes harder to justify denying students that part of their lives. Big changes have always met with some resistance such as women in the workplace, gender equality, Obamacare, and implementing new teaching methodologies. The point is that the sooner the education system and its participants pilot GBL and incorporate into their curriculum the sooner new research and new ideas can be created from it. GBL has a place in the education system and overcoming the barriers to implementing GBL is possible. Education and professional development will need to occur en masse to achieve a higher percentage take up of GBL (Denham, André 2016). Teachers/educators that lead the GBL movement in their schools/institutions will no doubt face some stigmatism (Chee, Yam San

2015), but if they can persevere and incorporate GBL into their classes with success, they will be the best proponents for seeing GBL being accepted as a legitimate teaching strategy. With the initial seeds into the system, those seeds will sprout and spread new seed as GBL takes hold in those institutions. GBL using COTS games or using educational games can provide students with new and alternative learning experiences for students as long as teachers practice and refine their methodology in using GBL strategies.

With GBL, many researchers have claimed a variety of benefits, however empirical evidence is somewhat lacking (Bourgonjon, Jeroen 2013). Most of the research utilized educational games that were custom made for a specific purpose (Barzilai, Sarit 2014; Chee, Yam San 2015; Jong, Morris S.Y. 2015; Sáez-López, José-Manuel 2015). While research does point to better connections with custom made games to the curriculum, research also suggests that incorporating COTS games can also be successful as well (Charsky, Dennis 2008; Denham, André 2016). Further GBL research would be beneficial, especially more longitudinal studies that compare student learning using GBL compared to other forms of teaching methodologies. Despite the rather infant stage of GBL research and evidence base, it is the opinion of the author that GBL is a viable and legitimate teaching methodology and that further research will affirm it and provide the empirical evidence to support it.

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