2014-05

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Most educational, exogenous video games present a drill and practice experience for learners. Ironically, commercial video games, endogenous games can elicit a more rigorous and in-depth learning experience (Gee, 2007b; Squire, 2006), as compared to their educational counterparts. The purpose of this paper is to explore and evaluate the literature that addresses the issues associated with educational, exogenous games and the potential role commercially produced endogenous games have for digital-aged learners. Commercial video games such as Civilization represent a more viable choice for teachers to ensure the game experience is aligned with the participatory needs of digital-aged learners.

SETTLING THE LANDSCAPE OF EDUCATIONAL VIDEO GAMES

Clip clop. Clip clop. Clip clop. Those are the sounds of your gallant oxen that guides your wagon along the Oregon Trial. As the sun sets each day, you wonder what struggles and travesties will transpire on the days to come. Will it be dysentery that will rapidly and curiously take the lives of those who are mounting this treacherous journey with you? Will it be the lack of bullets to be able to shoot the bison that cross your path? Or will it be an underhanded trade that depletes your rations to unsettling levels?

2014. In P. Preciado Babb (Ed.). *Proceedings of the IDEAS: Rising to Challenge Conference*, pp. 141-150. Calgary, Canada: Werklund School Education, University of Calgary.

These are common if not defining narratives of those who played *Oregon Trail* during their most formative years. In as early as 1981, the video game *Oregon Trail,* originally produced by the Minnesota Educational Computing Consortium (MECC), introduced young minds to the perils of traveling in the open country during the mid 19th century. However, playing *Oregon Trail* also construed a limited, if not misleading, reality that brought dysentery and wagon tongues into the forefront of children's vocabulary. In fact, with all the countless hours logged playing *Oregon Trail,* it brings to question what did these millions of children learn from playing the game*?* Beyond the simple graphics and narrative, the game does very little to actively engage or teach the player about the history and geography of this historic wagon route, and any learning that may occur is tangential at best. It is very possible that many of the students who played *Oregon Trail* struggle to actually define the very namesake of the video game.

The learning experiences derived from playing *Oregon Trail* are not unlike many of the educational video games that are still being made available to students in today's classrooms. Games such as *Math Blaster, Number Munchers* and *Castle of Dr. Brain* present a similar game narrative, in which learning is framed in a drill and practice, or perhaps more aptly termed, drill and kill learning paradigm. The concern associated with these drill and kill games frames the overarching purpose of this paper, to explore and evaluate the literature that poignantly addresses the issues associated with educational, exogenous games and the transformative potential commercially produced, endogenous games serve to the digital-aged learner.

Distinguishing Between Exogenous and Endogenous Games

Rieber (1996) identifies the differences between games found in the classroom and games found at home, through exogenous and endogenous games. Exogenous games, or educational video games are analogous to adding sugar to tea or cereal; it doesn't add any more additional nutritional value to the food, but it does make it taste a little bit better. Endogenous games, or good video games offer a

different reality from this sugar coating effect, as it is often “difficult to tell where the game stops and the content begins” (Rieber, 1996, p. 50). Consequently the context of an endogenous game is “inextricably linked” (Squire, 2006, p. 24) to the experience of the gamer. Squire (2006) clarified the different aspects of a game experience in both exogenous and endogenous games in Table 1.

Aspects	Exogenous Games	Endogenous Games
Learner is…	An empty receptacle. An example is *Math Blaster*, where the learner is "motivated" to learn a prescribed set of skills and facts.	An active, sense-making, social organism. An example is *Grand Theft Auto*, where the learner brings existing identities and experiences that color interpretations of the game experience.
Knowledge is…	Knowledge of discrete facts. The facts are "true" by authority (generally the authority of the game designer).	Tool set used to solve problems. The right answer in *Civilization* is that which is efficacious for solving problems in the game world.
Learning is…	Memorizing. Learners reproduce a set of prescribed facts, such as mathematics tables.	Doing, experimenting, discovering for the purposes of action in the world. Players learn in role-playing games for the purposes of acting within an identity.
Instruction is …	Transmission. The goal of a drill and practice game is to transmit information effectively and to "train" a set of desired responses.	Making meaning/construction, discovery, social negotiation process. Instruction in *Super Charged*! involves creating a set of well-designed experiences that elicit identities and encourage learners to confront existing beliefs, perform skills in context, and reflect on their understandings.

Table 1: Exogenous and Endogenous Games (Squire, 2006)

Exogenous games, drill and kill games have also been referred to as edutainment, “which refers to electronic games that use entertainment in the service of education” (Egenfeldt-Nielsen, Smith & Tosca, 2012, p. 233). Edutainment offers little intrinsic motivation to the learner as they simply “feed the player information rather than encouraging curiosity and exploration” (Egenfeldt-Nielsen et al., 2012, p. 234). Consequently, edutainment games facilitate a relatively poor learning experience (Chee & Tan, 2012; Egenfeldt-Nielsen, 2007; Egenfeldt-Nielsen et al., 2012; Foster, 2008; Gaydos & Squire, 2012; Gee 2005, 2007b), which counters the reality often experienced from playing commercially produced video games.

As ironic as it may seem, commercially produced video games such as *BioShock* or *The Legend of Zelda* produce more rigorous and higher-order learning experiences when compared to games designed for education (Gee, 2005, 2007b; Egenfeldt-Nielsen, 2007; Egenfeldt-Nielsen et al., 2012; McGonigal, 2011; Papert, 1980, 1993; Prensky, 2007; Salen, 2007; Salen & Zimmerman, Shaffer, 2006; Squire, 2006, 2011). Gee (2005, 2007b) identifies these commercial video games, as "good video games" as they distribute learning in a well-ordered, personalized and just-in-time format (Gee, 2007a), which can facilitate a performance before competence experience (Gee, 2007b). Gee (2007b) suggests, "in a good video game you have to try lots of different things and then you have to think about the result you get and try to make sense of what they mean for you and your progress through the virtual world of the game." (p. 88)

A Curricular Disconnection with Exogenous Games

If good, endogenous video games firmly establish good learning experiences, the obvious question is why are they not more common in today's classrooms? The problem partly resides in the fact that very few educators understand that there is a contextual difference from the games that are purchased from an educational catalogue and the games that are purchased from a gaming store. This problem also identifies the fact that educators don't play video games on a regular basis (Kenny & McDaniel, 2011), which creates difficulties when integrating games into the curriculum. How will an educator devise a unit plan around a game, if they have never played the game before? This would be analogous to a Language Arts teacher who hasn't read the text for an upcoming book chosen for study. A lack of situated knowledge generally equates to an unsubstantiated curricula.

This problem continues to become complex, as the structure and pedagogy located in many of today's classroom is more aligned with the drill and practice reality found in most educational video games (Cuban, Kirkpatrick & Peck, 2001; Kenny & Gunter, 2011; Kynigos, 2004; Lim, 2008). Some classrooms continue to be designed to support a more structured, black box learning environment that

disseminates knowledge to the students. In fact, Papert (1993) suggests this behavioristic model only locates the teacher as the active subject in the classroom, "as the teacher is in control and is therefore the one who needs skill; the learner simply has to obey instructions" (p. 83).

A Curricular Connection with Endogenous Games

This disparity between good video games and traditional classroom systems suggests that many educators not only lack the pedagogical understanding of how to integrate endogenous games into the classroom, but also the support and guidance. Educators generally have access to a repository of tools and guides that allow them to locate effective and useful learning resources. For example, Alberta Learning (2005) has created an authorized resource list for English Language Arts, in which a group of specialists gathered together to select titles that further enhance the study of English. This authorized resource list is selected through the following process:

All short-listed titles were read, reviewed and validated by a minimum of three readers. As the teacher review teams read the texts, they looked for and selected titles that:

- offered a variety of human experiences
- provided an interesting and challenging reading experience suitable for the age, ability and social maturity of the students
- elicited thoughtful responses and a critical appreciation of literature. (Alberta Learning, 2005, p. xiv)

This selection process facilitates a thoughtful integration of significant novels and nonfiction resources, but it also brings to question the disparity that exists in guiding educators in selecting good video games. Rice (2007) is one of the few researchers' who has developed an evaluative measure to support educators in locating good video games into the classroom. The evaluative gaming measure, known as the *Video Game Higher Order Thinking Evaluation Rubric*, asks educators to place a value next to

specific gaming criteria. The value of the entire game is then "weighted against lower scoring games" (Rice, 2007, p. 92), and thus a high score will suggest a high cognitive viability and a low score will suggest a low cognitive viability.

Although this evaluative measure begins to support educators in exploring and selecting good video games, the results of this measure can be misleading and inaccurate, particularly as video games continue to evolve at a rapid pace. In fact, *Minecraft* and *Minecraft Edu* scored relatively low on this rubric, even though game construction programs such as Minecraft have produced higher-level thinking (Salen, 2007), analytic and conceptual thinking (Clark & Sheridan, 2010), and reflection and evaluation (Dickey, 2006).

The best advice that can be given to teachers in exploring and integrating endogenous games, is to first close the teacher catalogues that sell educational video games, and instead look to commercial video games that are readily available on the market. Commercial, good video games will produce higher-order thinking and Squire (2011) suggests games such as *Civilization* or *Sid Meier's Pirates!* are excellent representations of commercial games that have become effective tools in the classroom. Beyond locating commercial games, educational versions of commercial games offer an additional resource. Two particular examples are *Minecraft* and *Minecraft Edu* and *Kerbal Space Program* and *Kerbal Edu*. *Minecraft* is based on the premise of building and breaking blocks to create and interact with varying structures, while *Kerbral Space Program* allows users to build and manage their own space station. These constructionist game experiences are extended through an educational version allowing students to play and build together in a closed virtual environment, while maintaining the overall integrity of the game experience.

In addition to exploring educational versions of commercially produced video games there is a fledgling library of learning opportunities that has emerged on-line. Mini games or not-games potentially represent an additional entry-level good game experience for students. These games are

short and relatively accessible that can be integrated effectively into a lesson. They are often an artistic representation of a particular idea, designed to provoke thought or to question existing ideas and generally ask the gamer to take a reflective stance. For example, a self-proclaimed not-game, *The Killer* (Magnuson, 2011) presents a very rudimentary graphic representation of being a guard that is marching a prisoner to his death in Cambodia. Upon playing the game, the students were then asked to reflect on the game through questions and discussions. Another not-game, *Every Day the Same Dream* (Pedercini, 2010) explores the repetitive nature of human existence. Again the students explored this game through questions and made further connections to the classic play *Death of a Salesman* or perhaps the popular film *Groundhog Day*. These not-games are excellent, manageable game experiences, however they do require the educator to frame the experience by making direct connections to the curriculum to ensure the game is a valuable and useful contribution.

CONCLUSION

Integrating good, endogenous games into the classroom often goes against the overarching drill and practice reality that is located in today's classroom. Although educational video games are relatively easy to integrate, they produce relatively low-order thinking skills. In looking to ensure good, endogenous video games are effectively integrated into the classroom, commercial video games seem to be the best fit. Although some of these games are relatively expansive in nature and take a considerable amount of time, mini games or not-games can be an excellent place to begin to integrate good video games into the classroom. Good video games have the potential to play an important role in the learning experiences of digital-aged learners, however as a collective community it is important we strive to locate and integrate games that strengthen the overarching experiences of the participatory learner. Perhaps in the future, we may come to fully understand what in fact transpired for 19th century settlers who travelled along the historic Oregon Trail. It is very possible an endogenous version of the *Oregon Trail* is on the horizon.

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