How Might Web-Based Educational Games Support Student Success?

An Annotated Bibliography

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"How might web-based educational games support student success?"

Teachers often engage a variety of support materials to support student learning. Since many students are attracted to web-based games, educators are now looking for online games to supplement their teachings. A company may exaggerate the educational effectiveness of the game in order to sell their product. Can a teacher justify integrating educational games in the classroom? What research has been done to show that games help with student success?

Blunt, Richard. (2009, December*). Do Serious Games Work? Results from Three Studies.
**	*eLearn Magazine*. Retrieved from**
**	http://elearnmag.acm.org/featured.cfm?aid=1661378**
	This article by Richard Blunt cites three studies using a video game with university economic, business, and management students. Some students were given a video game to support their learning while others were not. Both groups were given the same tests. The study, which started in 2005, was considered to be the first study of its kind. The results of the three studies showed significantly higher scores for those who played the video game over those who did not.

British Columbia. Ministry of Education. BC'S New Curriculum: Core Competencies.
**	(2015). Retrieved from https://curriculum.gov.bc.ca/competencies**
	Core Competencies are redesigning the curriculum in British Columbia. Students will still learn the foundation skills in literacy and numeracy. In addition the new curriculum also adds communication skills, creative and critical thinking, personal and social awareness at the core. Students will use these competencies to problem solve, discuss issues, and make decisions. The new curriculum will be fully implemented in the fall of 2016 for grades k-9 and grades 10-12 in fall of 2017.

Clark, D. B., Tanner-Smith, E. E., and Killingsworth (2014). S. *Digital Games, Design, and Learning: A Systematic Review and Meta-Analysis*. **Menlo Park, CA: SRI International. Retrieved from https://www.sri.com/sites/default/files/publications/digital-games-design-and-learning-executive_summary.pdf**

This meta-analysis reviews research done on digital games that measured learning. Over 60,000 articles were revised with 68 articles. The search was reduced, not by favorable results, but by meeting quality standards. For example, the studies must compare digital games to a non-digital comparison. Their analyses showed that digital games were on average more effective than non-game instructional conditions. This review also concluded that future research should how digital games can support learning not if.

Gee, James Paul. (Nov. 13, 2013). Principals on Gaming: What Video Games Have to Teach Us About Learning and Literacy. [Video File]. Retrieved from https://www.youtube.com/watch?v=4aQAgAjTozk

James Paul Gee is the Presidential Professor of Literacy Studies at Arizona State University. Gee's work on the learning principles as applied to video games are also effective learning principles when applied to classroom environments. In this video Gee outlines 13 principles that make video games effective for learning. He defines each one with clear examples of how these principles can be used effectively in the classroom.

Institute of Play. Why Games and Learning? Retrieved from http://www.instituteofplay.org/about/context/why-games-learning/

Education in the 20th century focused on learning skills and knowledge. The 21st century requires learners to use that knowledge to think critically. Educational games support this type of learning by allowing students to solve complex problems, being creative, use critical thinking skills and interact with others through technology (4C's). Beyond that, games also teach skills using just-in-time learning. Educational games enable learners to master certain skills, engage, and entertain the learner.

Kiili, K., Devlin, K., Perttula, T., Tuomi, P., Lindstedt, A. (2015). Using video games to combine learning and assessment in mathematics education. *International Journal of Serious Games, Vol. 2, Nr. 4.* **Retrieved from http://profkeithdevlin.com/Papers/Kiili-Devlin_2015.pdf**

This study was conducted to determine if rational-numbers based knowledge could be improved using two video games, Semideus and Wuzzit Trouble. The study looked beyond simple recall of knowledge, to a broader conceptual understanding of rational numbers. The researchers used quantitative measures to present results. The researchers concluded that the two video base games improved conceptual knowledge of rational numbers.

Kolk, M. (2011, March 30). The 21st century classroom – where the 3 R's meet the 4 C's! Tech4Learning. [Web log post]. Retrieved from http://web.tech4learning.com/blog-0/bid/45149/The-21st-century-classroom-where-the-3-R-s-meet-the-4-C-s

Melinda Kolk discusses the needs of 21st century learners. Students need to be taught the 3 R's (reading, writing, and arithmetic) but also must master the 4 C's (creativity, critical thinking, communication, and collaboration). Students need to uncover information (constructivism) and apply this knowledge using the 4C's. Students need to be challenged with problems presenting more than one answer. Since information is available online, students can apply the 4C's using the technology available to them.

Magnacca, Shannon. (2013). *"Game-Based Learning in the Social Studies Classroom".* **Instructional Technology Education Specialist Research Papers. Paper 7. Retrieved from http://digitalcommons.georgiasouthern.edu/edu-papers/7**

This paper was completed for the Instructional Technology Department of Georgia State University. The study investigates if using game-based learning in a grade 6 social studies classroom will increases student academic achievement and motivation when compared to traditional modes of instruction. Students were given pre and post-test, and a survey to determine motivational levels. The results showed game-based instructions had higher achievement levels. The motivation for learning was the same for both study groups.

Mayo. M. J. (2009). "Video Games: A Route to Large-Scale STEM Education?" Science 323, no. 5910, 72–89. Retrieved from

http://science.sciencemag.org/content/323/5910/79.full

This journal reviews the data available for video games in science technology, engineering, and math (STEM) disciplines. Their research shows that well-designed digital games increase in learning levels between 7% and 40%. The researchers also found that the greatest effect was on poor learners. The journal also suggested that games with effective pedagogical practices yield positive learning benefits.

Sardone, N. & Delvin-Scherer, R. (2010). Teacher candidate responses to digital games: 21st century skills development. Journal of Research on Technology in Education, 42(4), 409-425. Retrieved from http://files.eric.ed.gov/fulltext/EJ895055.pdf

Researchers led a study using 21 undergraduate education university students to see if 21st century learning skills are associated with digital games and what effects they would have on motivation. The undergraduates used games instead of traditional teaching strategies within the classrooms they taught. The classroom students were able to choose from a list of games that they were interest in. The researchers concluded that regardless of the games chosen, students were motivated by the games and that students felt an increase in 21st century skills.

Sayan, H. (2015). The effects of computer games on the achievement of basic mathematical skills. *Educational Research and Reviews,* Vol. 10(22), pp. 2846-2853. Retrieved from http://www.academicjournals.org/journal/ERR/article-abstract/D6BB1F456358

To analyze the relationship between computer games and basic math skills, a study was conducted with 44 grade 5 students. 22 were in the control group and 22 in the experimental group. Both groups were given the same instructions. The control group used traditional classroom methods and the experimental group played math-related computer games. Both groups were given pre and post-tests to examine their academic growth. The results showed no significant differences in academic growth between the control and experimental group.

Vandercruysse, S., Vandewaetere, M., & Clarebout, G. (2012). Game based learning: A review on the effectiveness of educational games. Retrieved from https://www.researchgate.net/publication/260360868_Game-Based_Learning_A_Review_on_the_Effectiveness_of_Educational_Games DOI: 10.4018/978-1-4666-0149-9.ch032

Many claims have been made on how effective educational games are in supporting students learning. This study looks at the learning effects of educational games and under what conditions the games could be used most effectively. Researchers were aware that there are many variables and contexts by which education can be measured. The study noted that research can be difficult under such circumstances. It was also noted that empirical evidence did not support conclusions that were made. The researchers believe that this is due to the number of variables that influence the game choices, type of learner, prior knowledge, and which learning goals are tested. Their final conclusion was that a general statement on the effectiveness of educational games is virtually impossible.

Summative conclusion

B.C.'s new curriculum, The Institute of Play, Gee, and Kolk all demonstrate that creativity, critical thinking, communication, and collaboration (4 C's) are critical in 21st century learning. The latter three authors demonstrate how web-based games are extremely effective in teaching the four C's. Many studies have shown the effectiveness of web-based games on student's academic performance (Blunt, Clark, Kiili, Magnacca, Mayo, and Sardone). Other studies showed no significant differences in academic progress (Sayan and Vandercruysse). Research regarding web-based games often noted how difficult it is to demonstrate learning. Standardized testing is more knowledge based (the 3 R's) whereas games are more applicable to the 4 C's. The web-based games vary greatly in design and how they are used by educators. Such variables make it difficult to make definitive statements about the effectiveness of web-based games and how web-based games can support learning.