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8. LEARNING BY CREATING EDUCATIONAL EXERGAMES

Creative Pedagogy That Gets Students Moving

ABSTRACT

With the rapid social, economic, and technological changes currently taking place in our society, collaboration skills and creativity are nowadays seen as basic survival and success factors. Technology-driven changes are also generating new challenges in the knowledge society. For example, the widening gap between daily information-centered activities carried out inside and outside school is undermining students' engagement in school studies. What's more, they are leading increasingly sedentary lifestyles and consequently obesity is becoming an increasing problem in many countries. So there is a clear call for educators to introduce innovative learning solutions and practices that engage students, support the development of 21st century skills, and increase the level of physical activity performed in schools.

In this paper we propose a new pedagogical approach, learning by creating educational exergames, an approach that entails user-generated content and gets children moving during school hours. We report the results of a pilot study in which students created educational exergames for their peers. The aim was to explore what happens when the learning-by-creating-educational-exergames approach is introduced in primary school and how students experience the creation of educational exergames. The results clearly indicate that this innovative approach can be successfully implemented in classroom teaching, it can make the school day more physically active, and help to engage and motivate students.

Keywords: *creative pedagogy, exergames, learning*

INTRODUCTION

Over the past decade, digital gameplay has become a very popular activity with a variety of audiences. Although academic debate continues on the effectiveness of game-based learning, researchers have increasingly argued that the meaning-making practices that occur when people engage with digital games define a form of literacy that is potentially better suited to address the needs of 21st Century learners (Gee, 2003; Squire, 2008; Devlin, 2011). However, recent research has

ACKNOWLEDGEMENTS

This work has been co-funded by the EU under the FP7 program (Games and Learning Alliance – GALA – Network of Excellence, G.A. 258169) and the LLP program (Making Games in Collaboration for Learning – MAGICAL). This publication [communication] reflects only the views of the authors, and the Commission cannot be held responsible for any use that may be made of the information contained therein. MAGICAL project: <http://www.magical-project.net>

REFERENCES

- Antle, A. (2013). Research opportunities: Embodied child–computer interaction. *International Journal of Child-Computer Interaction*, 1, 30-36.
- Birmingham, S., Charlier, N., Dagnino, F. M., Duggan, J., Earp, J., Kiili, K., Luts, E., Van Der Stock, L., & Whitton, N. (2013). Approaches to collaborative game making for fostering 21st century skills. In C. Vaz de Carvalho & P. Escudeiro (Eds.), *Proceedings of the 7th European Conference on Games-Based Learning*, 8. Reading UK: Academic Publishing International.
- Bottino, R. M., Earp, J., & Ott, M. (2012). MAGICAL – Collaborative game building as a means to foster reasoning abilities and creativity. In *ICALT, Proceedings of ICALT* (pp. 744-745). IEEE Computer Society.
- Castelli, D. M., Hillman, C. H., Buck, S. M., & Erwin, H. E. (2007). Physical fitness and academic achievement in third- and fifth-grade students. *Journal of Sport & Exercise Psychology*, 29, 239-252.
- Clark, K., & Sheridan, K. (2010). Game design through mentoring and collaboration. *Journal of Educational Multimedia and Hypermedia*, 19(2), 125-145.
- Devlin, K. J. (2011). *Mathematics education for a new era: Video games as a medium for learning*. AK Peters Ltd.
- Donnelly, J., & Lambourne, K. (2011). Classroom-based physical activity, cognition, and academic achievement. *Preventive Medicine*, 52(1), 36–42.
- Eow, Y. L., Ali, W. Z. B. W., Mahmud, R. B., & Baki, R. (2010). Computer games development and appreciative learning approach in enhancing students' creative perception. *Computers and Education*, 54(1), 146–161.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York, NY: Macmillan.
- Hedley, A., Ogden, C., Johnson, C., Carroll, M., Curtin, L., & Flegal, K. (2004). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *Journal of the American Medical Association*, 291, 2847-2850.
- Hutchinson, J. C., & Tenenbaum, G. (2007). Attention focus during physical effort: The mediating role of task intensity. *Psychology of Sport and Exercise*, 8(2), 233-245.
- Kafai, Y. B. (2006) Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture*, 1(1), 36-40.
- Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in playful learning environment. *Thinking Skills and Creativity*, 5(1), 1-15.
- Kiili, K. & Perttula, A. (2013). A design framework for educational exergames. In *New pedagogical approaches in game enhanced learning: Curriculum integration* (pp. 136–158). US: IGI Global.
- Link, T., Moeller, K., Huber, S., Fischer, U., & Nuerk, H. C. (2013). Walk the number line—An embodied training of numerical concepts. *Trends in Neuroscience and Education*, 2, 74-84.
- Mayer, R. E. (Ed.). (2005). *The Cambridge handbook of multimedia learning*. New York, NY: Cambridge University Press.
- Mueller, F., Edge, D., Vetere, F., Gibbs, M. R., Agamanolis, S., Bongers, B., & Sheridan, J. G. (2011). Designing sports: A framework for exertion games. In *CHI'11: Proceedings of the SIGCHI*

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- Conference on Human Factors in Computing Systems*, Vancouver, Canada, May 7-12. New York, NY: ACM.
- Robertson, J. (2012). Making games in the classroom: Benefits and gender concerns. *Computers & Education*, *59*, 385-398.
- Robertson, J., & Howells, C. (2008). Computer game design: Opportunities for successful learning. *Computers & Education*, *50*, 559-578.
- Rokholm, B., Baker, J. L., & Sørensen, T. I. A. (2010). The levelling off of the obesity epidemic since the year 1999 – A review of evidence and perspectives. *Obesity Reviews*, *11*(12), 835-846.
- Scott, L. M., Scott, D., Bedic, S. P., & Dowd, J. (1999). The effect of associative and dissociative strategies on rowing ergometer performance. *The Sport Psychologist*, *13*, 57-68.
- Sothern, M. (2004). Obesity prevention in children: Physical activity and nutrition. *Nutrition*, *20*(7-8), 704-708.
- Squire, K. (2008). Video games literacy: A literacy of expertise. In J. Coiro, M. Knobel, D. Leu, & C. Lankshear (Eds.), *Handbook of research on new media literacies*. New York, NY: Macmillan.
- Tenenbaum, G. (2001). A social-cognitive perspective of perceived exertion and exertion tolerance. In R. N. Singer, H. Hausenblas, & C. Janelle (Eds.), *Handbook of sport psychology* (pp. 810-820). New York, NY: Wiley.
- Tenenbaum, G., & Connolly, T. C. (2008). Attention allocation under varied workload and effort perception in rowers. *Psychology of Sport and Exercise*, *9*(5), 704-717.
- Vanderwater, E., Shim, M., & Caplovitz, A. (2004). Linking obesity and activity level with children's television and video game use. *Adolescence*, *27*(1), 71-85.
- Zimmerman, E. (2007). Gaming literacy: Game design as a model for literacy in the 21st century. *Harvard Interactive Media Review*, *1*(1), 30-35.

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