Gamification: Its use as a teaching tool.

Adele Sewell
Bishop Burton College
16 July 2017

Abstract

Gaming and its usage is on the increase in our ever more digitised world. We are, as educators, finding that students are increasingly becoming disengaged with educational tasks in favour of gaming activities. There has been a great deal of attention focused upon the negative aspects of gaming and its impact on an individual's education. However, recent studies have shown that gaming has many positive cognitive aspects. Researchers are now asking how can these be used within education and is there a model that can be applied? Thus there are many examples of good practice using technologies throughout the education system. The key question that is discussed in this paper is it that digitised technologies are only used effectively where there is already outstanding teaching. If this is the case then we should be looking at supporting educators to further their pedagogical knowledge in order to apply technological applications in an outstanding way.

Introduction

This paper explores the notion of gamification and edutainment and its role within pedagogy. It will examine definitions and seek to draw on recent research to link pedagogical practices and the use of games to enhance this. The paper also explores the notion that the use of technologies within the classroom domain can enhance learning but this is synonymous with the tutors pedagogical knowledge and skills.

We are living in an increasing digitised society where connecting with each other is done through an electronic interface rather than face to face. Kurshan (2016) estimates we spend more than 3 billion hours a week playing video and computer games with 5 million people playing an average of 45 hours a week of games. In addition secondary school students on average spend at least three hours a day playing video or computer games. Further research evidence suggests younger children (at primary or lower secondary levels) are more likely to play games regularly than children in the upper years of secondary school (McFarlane 2002).

Discussion of Research

Some may be alarmed at these figures: 'children are not getting an education', 'children are playing games over and above their homework', and 'children do not play anymore' are all arguments frequently quoted. Collins (2011) further states that screen technologies cause high arousal, which in turn activates the brain system's underlying addiction and reward, indicating that playing too many computer games could cause a shorter attention span and reckless behaviour in children. However, this contradicts the work of Bavelier (2009), Kuhn (2013) and Gazzley (2016) showing that games increase spatial awareness, problem solving skills and brain development. This then leads to the hypothesis that gaming can develop cognitive ability when used efficiently. Huang and Soman (2013) also point to the positive benefits of reducing boredom and supporting learning through a 'learn by failure technique'. Thus when the benefits of engaging in gaming are examined, there is a high level of immersion involved signifying a high level of brain activity.

Gamification and edutainment are terms that are used to identify the engagement that gamers experience with games when used within an educational context to engage and motivate learners. The term edutainment is a combination of two words (education and entertainment), and as the term expresses, this concept provides educational entertainment or entertainment-education. This is usually seen in education through quizzes such as Kahoot or other game based learning applications.

Work by McGonigal (2010) and Lee and Hammer (2012) have sought to investigate the key elements of gaming and use these to enhance the learning experience. Through their research they have observed that when games and IT applications are used in education learners do not display the same level of immersion, resilience, engagement and determination as gamers do. They advocate that this is due to the fact that failure and trial and error are built into games, but are not evident in educational contexts e.g. within a game a gamer can keep trying to problem solve until they complete the tasks and move to the next level, but within education, a product based curriculum (Tyler 1949) promotes the ethos of only one attempt at a task, thereby introducing demotivation and failure into the learning experience.

We assume the premise that teaching and learning is very much dependent upon the interactions between tutors and students (Coe *et al.* 2014) and that feedback received has to be meaningful and immediate to move learning forward (Race2016). We then need to apply these principles to their use in gaming situations. Schell (2017) suggests an element of reality within gaming increases engagement. McGonigal (2010) advocates the inclusion of role play and problem solving experiences in a game scenario to enhance learning. Schell (2017) further talks about building gratification or extrinsic motivation (as identified by Hertzeberg 1966) into problem solving experiences as prizes or points that can collected. One further

point that McGonigal (2010) highlights is the need to make the scenarios as close to real life as possible. Schell (2017) notes that popular games (e.g. Club Penguin, Pokémon and Super Mario) are successful because they reflect reality.

Much research has identified the key elements of excellent pedagogical practice, such as feedback (Petty 1993), mastery (Eisner 1993) and scaffolding of learning (Bruner 1990). Similarly elements of gamification are narrative, immediate feedback, fun, scaffolding learning, mastery, social connection and player control (McGonigal 2010 and Knapp 2014). Streetland (1996) discussed the need for a safe environment for learners that enables them to engage in enquiry without failure. Coe *et al.*'s (2014) list of elements of effective teaching recognises that effective teachers have strong pedagogical content knowledge, use effective questioning and assessment, know their students and can identify how to support them. Timperley (2007) proposes that effective pedagogy consists of more than just a set of classroom techniques, but depends on the ability to make complex judgements about which technique to use and when as key to effective practice.

Therefore digital games provide an interactive learning environment with an active learning agenda which results in the engagement of students in that particular topic. This increases cognitive skills and enhances their way of thinking and problem solving skills. Kirriemuir and Macfarlane (2003) undertook a survey on how and why online games are used as an integrated part of formal classroom learning. They presented a number of examples of the use of such games, and tried to determine likely trends in their use in such an environment. They found that an increasing number of schools are using computer and video games in variety of situations, many of which are imaginative, or support the learning process within a range of other tools and resources. However, on the negative side, they pointed out that there is a lack of games being used in relevant subject-based learning.

Higgins *et al.*'s (2014) research highlights a number of myths about digital technologies that have in many ways inhibited the usage of technologies within the classroom. Firstly, "new technologies are being developed all the time and therefore become quickly out of date": this does little to inspire the teacher to utilise and experiment with things that are available. Secondly, the notion that "children learn differently as they are the next generation of digital natives" has little evidence. Neurological research shows that brain development has not changed over the last fifty years and that although our cognitive abilities are fundamentally the same as thirty years ago they are shaped by our experiences. Therefore if our experiences are digital ones, then we will naturally be more able to be 'net savvy'. Thirdly, there is the concept that "children learn best through technology": certainly they enjoy using technology and it is great motivator but the caveat is that it is only as good as the practitioner using the technology. Finally, the idea that "we must use technology because it is there": we should be thinking about aspects of teaching and learning

and how technology can enhance them and not that technology is an enhanced form of teaching and learning.

Essentially then, as educators, are we using games in a superficial way without looking at the underlying pedagogy of their application? Should we be looking at the way learning takes place generically, and indeed the way that our students learn, in order to usefully apply games scenarios. Dianne Laurillard (2017) argues that interactive and cooperative digital media have an inherent educational value as a new means of intellectual expression, helping the students in their appropriation of the world. This view is further supported by Johnson *et al.* (2016) who firmly believe in the use of technology as a means of transforming education. These thoughts are echoed by FELTAG (2012) who state that learning technology, when astutely used by teachers and providers, can improve FE learners' chances and successfully influence what students do to learn, so that every student can fulfil their learning potential.

Research on the motivations for game playing have been carried out by researchers across a number of disciplines. One of the earliest, and most cited, research works is by Malone (1981) who identified three main ways in which games were able to motivate players: fantasy, challenge and curiosity. Amory *et al.* (1988) identified curiosity ("what happens if I do this") as a common motive in playing a game. This is essentially using behaviourism and classical conditioning to work through games scenarios and cognitive principles to make the connections within them.

Higgins *et al.* (2014) state that it is difficult to identify effective digital practices as they are so varied. However, it can be assumed that effective teachers will use digital technologies most effectively due to their extensive application of teaching and learning techniques. These teachers may also be assumed to be effective at using non digitised technologies within their classrooms. It is these practitioners who actively ask the key gaming question: "what does this do"? Where this makes a further difference may also be in what the technology *replaces*. As teachers introduce and adopt technology they stop doing something else (Somekh 2007) and displace or replace other teaching and learning activities which may have been as (or more) effective.

Much of the research shows little impact of technology on learning (Davis and Graf, 2005, Kanuka and Keland 2008, Passey and Higgins 2011) or attainment (Vogel 2006), but does show that well motivated and experienced learners can develop very effectively through application of digital learning. Certainly children and young people are often highly motivated by computer games and simulations. The challenge is to ensure that the learning can be applied outside of the game environment. Huang and Soman (2014) suggest one way to do this is by utilising motivators or self-elements (points, levels, badges) and social elements (leader boards).

Conclusion

There are many myths that surround the use of technologies with school and colleges and universities. Many of these inhibit the use of technologies as learning tools. Likewise the lack of knowledge of teaching and learning principles also inhibits some pedagogy. Research has shown that there is certainly a link between cognition and gaming, with links are being made between the effective practioner and the way that games can be used to support teaching and learning. Research suggests that by using the simple gaming principles within our classrooms, by using reality based problem solving scenarios and competitions and allowing trial and error we are certainly supporting our students to achieve and are providing them with an enriched learning experience, an experience built upon cognitive and behaviourist principles.

References

Bavelier, D. (2009) 'Increasing speed of processing with action video games. current directions.' *Psychological Science* **198** (6)

Bavelier, D. (2009) *Your brain and video games.* [online] Available at:<https://www.ted.com/talks/daphne_bavelier_your_brain_on_video_games#t-383390> [Accessed 16July 2018]

Bruner, J. (1990) *Acts of Meaning* Massachusetts: Harvard University Press

Coe, R., Aloisi, C. Higgins, S. and Major, L.E. (2014) *What Makes Great Teaching? Review of underpinning research.* London: Sutton Trust

Cole, J.M. and Hilliard, V. R. (2006) 'The effects of web-based reading curriculum on children's reading performance and motivation.' *Journal of Educational Computing Research*, **34**(4) pp. 353-380

Collins, N. (2011) 'Video games can alter a child's brain.' *The Daily Telegraph, 14 October 2011*

Davies, J. and Graff, M. (2005) 'Performance in e-learning: online participation and student grades.' *British Journal of Educational Technology* **36**(4) pp.657–663

Eisner, E. W. 'Emerging models for educational evaluation.' *The School Review* **80**(4) pp. 573-590

Evans, C. (2011) *Game designer Jane McGonigal interviewed by Cameron Evans, U.S. Education CTO, Microsoft.* [online] Available at: <http://www.youtube.com/watch?v=5-mc9Rrfs00> [Accessed 16 June 2017]

FELTAG (2014) *Paths forward to a digital future for Further Education and skills* London: FELTAG

Gazzaley, A. and Rosen, L. (2016) *The Distracted Mind: Ancient brains in a high-tech world.* Massachusetts: MIT Press

Hattie, J. (2008). *Visible Learning: A synthesis of over 800 meta-analyses relating to achievement.* London: Routledge.

Hertzberg, F. (1966) *Work and the Nature of Man.* Cleveland, New York: World Publishing Company

Higgins, S. Xiao, Z. and Katsipataki, M. (2012) *The Impact of Digital Technology on Learning: A summary for the Education Endowment Foundation.* Durham: Durham University

Johnson, L., Adams Becker, S., Cummins, M., Estrada, V., Freeman, A., and Hall, C. (2016). *NMC Horizon Report: 2016 Higher Education Edition.* Austin, Texas: The New Media Consortium

Kirriemuir, J. and McFarlane, A., (2002) *Report 8: Literature Review in Games and Learning* Bristol: University of Bristol (Futurelab)

Kirriemuir, J., and McFarlane, A. (2003). 'Use of computer and video games in the classroom.' Paper presented at Level Up: The Digital Games Research Conference 4-6 November 2003 at the Utrecht University

Knapp, K. M., Blair, L., and Mesch, R. (2014) *The Gamification of Learning and Instruction Fieldbook: Ideas into practice.* San Francisco: Wiley

Kühn, S., Gleich, T., Lorenz, C., Lindenberger, U. and Gallinat, J. 'Playing Super Mario induces structural brain plasticity: gray matter changes resulting from training with a commercial video game.' *Molecular Psychiatry* 19, pp. 265-271 (February 2014) | doi:10.1038/mp.2013.120

Kurshan, B. (2016) *The Intersection of Learning and Fun: Gamification in education* [online] Available at: <https://www.forbes.com/sites/barbarakurshan/2016/02/11/the-intersection-of-learning-and-fun-gamification-in-education/#c514ebb9c19d> [Accessed 16 June 2017]

Laurillard, D. (2008) *Digital Technologies and Their Role in Achieving Our Ambitions for Education.* London: University of London Institute of Education

Lee, J. and Hammer, J. (2012) 'Gamification in Education' [online] Available at: < http://www.tc.columbia.edu/articles/2012/may/gamification-in-education-paper-by-tcs-joey-lee-and-jessi/> [Accessed 16 June 2017]

McGonigal, J. (2011) *Gaming can make a better world.* [online] Available at: <http://www.youtube.com/watch?v=dE1DuBesGYM> [Accessed 16 June 2017]

Passey, D., and Higgins, S. (2011). 'Learning platforms and learning outcomes– insights from research.' *Learning, Media and Technology*, **36**(4), pp. 329-333

Petty G. (1993) *Teaching Today* Cheltenham: Nelson Thornes

Race, P. 'Using feedback to help students to learn.' [online] Available at: <https://phil-race.co.uk/wp-content/uploads/Using_feedback.pdf 2016. [Accessed 16 June 2017]

Somekh, B. (2007) *Pedagogy and Learning with ICT: Researching the Art of Innovation*. London: Routledge.

Streefland, L., (1993) 'The design of a mathematics course: a theoretical reflection.' *Educational Studies in Mathematics* **25** pp. 109–135.

Streefland, L. and Elbers, E. (1996) *Learning and 'Teaching' in a Community of Inquiry,* Paper presented at the International Congress on Mathematical Education. Seville, July 15–19

Tyler, R. (1949) *Basic Principles of Curriculum and Instruction.* Chicago: University of Chicago Press