LITERATURE REVIEW

Can game-based learning inform and benefit my teaching practices while offering alternative learning experiences for students?

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Abdul Jabbar, A.I., Felicia, P. (2015) *Gameplay Engagement and Learning in Game-Based Learning: A Systematic Review*. Waterford Institute of Technology. Review of Educational Research, Vol. 85, No. 4, pp. 740–779. Retrieved from http://journals.sagepub.com.ezproxy.viu.ca/doi/10.3102/0034654315577210

This article investigates game design features that promote engagement and learning in game-based learning settings. The authors reviewed 91 papers studying participants aged 8-17 published between 2003-2013 within electronic databases. The authors categorised the elements that make up engagement in a game into four areas: multimedia, fun, interactive and motivational. They looked at the effect each of these elements had on emotional and cognitive engagement. The study found that most research shows that gaming provides opportunities for players to have something to gain from game play. Game-based learning helps students to develop skills and knowledge and strengthens their ability to handle the learning experiences provided by the games. Engagement in the game-based learning context is related to students' cognitive and emotional involvement in the gameplay. The authors final recommendations state that engagement, when it comes to learning, as a personal process. Therefore, it is important to consider all the elements that influence the gaming and learning experience to maximize the impact of game-based learning. Some key elements to promoting engagement were: sensory environments that make use of avatars and virtual reality that make the player feel more personally invested in the game, providing challenges and conflicts that match students' abilities, offering control and choice to students, appropriate scaffolding and feedback to promote competence.

Bicen, H., Kocakoyun, S. (2018). *Perceptions of Students for Gamification Approach: Kahoot as a Case Study*. International Journal of Emerging Technologies in Learning (Vol 13, No 02). Retrieved from http://online-journals.org/index.php/i-jet/article/view/7467

This paper investigated the perceptions of students on the best method of gamification of education using Kahoot software as a case study. The study was conducted on 65 undergraduate students at the Department of Pre-school Teaching with an average age of 22 at Istanbul Aydin University in Istanbul Tuckey. The study starts by stating that the aim of gamification is to make the learning process more attractive to learners and that learning experiences that increase student motivation can be created by including competition. The authors add that because motivation is an important element leading to student success, a more effective learning process can be produced if gamified designs that consider the element of motivation are added to learning spaces. The paper describes what Kahoot software is, how successful it currently is, and how to join and use it. The researchers had students participate in Kahoot quizzes and then fill out a questionnaire to provide feedback on their experience. The paper concluded that the gamification method using Kahoot software was fun for students and made them feel more

self-confident. Getting a higher score than their friends motivated students to study harder and actively participate in class. The competitive environment created positive feelings and an eagerness to come to class. Some disadvantages included: problems with internet connections that affected active participation, time limitations for questions and that it was hard to catch up to the leaders if questions were answered wrong early in the game. The data at the end of the study indicated that gamification of learning increased student interest in the lesson, and encouraged students to become more ambitious for success. Overall, the inclusion of gamification had a positive effect on student motivation.

Dicheva, D., Dichev, C., Agre, G., Angelova, G. (2015). *Gamification in Education: A Systematic Mapping Study*. Journal of Educational Technology & Society, Vol. 18, No. 3 pp. 75-88. International Forum of Educational Technology & Society. Retrieved from https://www.jstor.org/stable/jeductechsoci.18.3.75

This paper presents the results of a study of the published works on the application of gamification to education, and outlines the tendencies and emerging practices in this area. The authors start with the premise that traditional schooling is perceived as ineffective and boring by many students and it is largely agreed that schools today face major problems around student motivation and engagement. The authors point out that the use of educational games as learning tools is a promising approach due not only to the motivational power that games have, but also games' ability to reinforce knowledge, problem-solving, collaboration, and communication. However, creating a highly engaging instructional game is difficult, time consuming, and costly and their effective classroom adoption requires certain technical infrastructure and appropriate pedagogical integration. The gamification approach allows educators to use game thinking and game design elements to improve learners' engagement and motivation without using elaborate games that requiring a large amount of design and development efforts. The study concludes that the majority the reviewed papers share the opinion that gamification has the potential to improve learning if it is well designed and used correctly. The majority of course management systems, however, do not support gamification very well. The authors state that the lack of proper technological support is one of the major obstacles for applying game elements to education and the development of software tools that support gamification in various educational contexts would contribute to a larger-scale adoption of gamification of education.

Furdu, I., Tomozei, C., Köse, U. (2017). *Pros and Cons Gamification and Gaming in Classroom*. Brain: Broad Research in Artificial Intelligence and Neuroscience. Retrieved from https://www.researchgate.net/publication/318726293_Pros_and_Cons_Gamification_and_Gaming_in_Classroom

This paper assesses the challenges that gamification in education are facing. The authors discuss benefits and disadvantages to using gamification in the classroom. They define gamification as the integration of game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems. The benefits of gamification that are outlined in the article are as follows: they provide a better learning experience by combining fun with learning, they provide instant feedback and metrics that can easily be seen by the learner and the trainer, the learning experience is personalized and allows the learners to evolve at their own pace in a safe manner, it can initiate

behavioural change if combined with the scientific principals of cyclical learning and retention. The drawbacks or negatives of gamification are: it can create rule-based experiences that feel just like school by making play mandatory, if mastery is rewarded instead of effort and students are not able to repeat in the case of an unsuccessful attempt students may become unmotivated or fearful. Finally, extrinsic motivators such as points, badges, and leaderboards are not effective for students who are not naturally competitive and will cause some students to lose interest. Designing an intrinsically motivating experience is more important for long term retention than the external rewards that gamification employs.

Gee, J.P. (2007). *Good Video Games and Good Learning*. Retrieved from http://www.academiccolab.org/resources/documents/Good_Learning.pdf

In this article James Paul Gee outlines 16 principals of good learning that good video games incorporate. They allow learners to commit to their learning by developing a sense of identity. Learners are able to interact with the games and get immediate feedback on their decisions. Learners are producers/co-designers of the learning experience and not just consumers of knowledge. Learners are encouraged to take risks and explore because the consequences of failure are low. Learners are able to customize their experience to suit their learning styles and skill levels. Learners are empowered by being given a strong sense of agency and control over what they are doing. Problems are well-ordered such that early problems and situations prepare the learner to solve more complex problems as they advance in the game. As learners master a certain problem or level, they are challenged by a new problem that requires them to rethink their old mastery which builds upon and improves their knowledge. Information in games is provided to learners as they need it as opposed to overwhelming the learner with information that they are not ready for yet. The meanings of words are situated with actions, images, and dialogue which allows leaners to learn new words more effectively by linking them to the experiences they refer to. Good video games are pleasantly frustrating and challenge learners at the edge of their competency which can be conducive to learners experiencing a state of "flow". Games encourage system thinking by having learners think about how things relate to one another, as opposed to showing isolated events or facts. Learners are encouraged to think laterally and explore topic and situations in depth before moving onto the next topic. Games require players to manipulate characters with are a form of "smart tools", which have knowledge things that the player does not. Massive multi-player games require players to play in teams in which each player has a different set of skills. This teaches learners how to integrate their specializations and knowledge into a group and coordinate with others to achieve a goal that they could achieve on their own. Finally, good video games allow learners to perform a task before they are competent which allows them to eventually become competent at the task.

Gee, J.P. and D.W. Shaffer. (2010) *Looking where the light is bad: Video games and the future of assessment (Epistemic Games Group Working Paper No. 2010-02)*. Madison: University of Wisconsin-Madison. Retrieved from http://classroom-aid.com/2013/03/30/8-reasons-that-we-should-teach-to-the-game-gbl/

This article is about how the principals of good games can be used in assessment. It starts by stating that games are good learning tools because they require the kind of thinking that is needed in the 21st

Century. They not only test current knowledge and skills, but also preparation for future learning. The authors suggest that schools should make tests more like the games that students are already playing outside of school. Testing in schools should be based on 21st Century skills such as problem solving, critical thinking, innovation, and collaboration rather than memorization of facts. The authors state that games create the conditions of good 21st Century assessment because they are built around problem solving, require learners to modify and design their own levels, assess whether players are ready for future challenges, collect information about how players develop and deal with problems across time, integrate learning and assessment, provide information that players can use to improve, are equitable to different sorts of players. Games can help the education system shift away from the old paradigm of teaching to tests by shifting the focus to complex problem solving, tracking many different kinds of information about a student, and changing the purpose of assessment from sorting students to providing feedback that can be used to make decisions that support good learning.

Guido, M. (2016). *5 Steps to Implementing Game-Based Learning in the Classroom*. Prodigy Game. Retrieved from https://www.prodigygame.com/blog/implementing-game-based-learning-in-the-classroom-examples/

This article outlines steps to implementing game-based learning into your classroom. The author starts by stating that although many teachers recognize the benefits of game-based learning, they struggle to smoothly incorporate it into their lessons. He outlines five steps to help teachers incorporate games into their teaching. Step one is to determine the purpose of the game to help you narrow your search and find an appropriate game. Games can be used for intervention if a student is struggling, enrichment if a student has already mastered the core material, or to reinforce curriculum content. Step two is to play and test the game yourself to determine if it is aligned with your learning goals. Look for things such as teacher control, intuitiveness, engagement, content type, and content levels. Step three is to ensure it meets expectations of parents to get them to buy into what you are doing. Step four is to dedicate consistent time to in-class play as sporadic game-based learning is not as effective. Step five is to assess student progress through data you collect from the games. This can help you shape your instruction and identify levels of student success. This can be done by using in-game reports generated by the games themselves, self-reports from the students which encourages them to take ownership of their progress, and class discussions after playing games to allow students to share difficulties, progress, and accomplishments.

Hallberg, A. (2017). *Gamification in Education (The Good and The Bad)*. In What Language. Retrieved from https://www.inwhatlanguage.com/blog/gamification-in-education/

The author of this article starts with the premise that although gamification is an important part of the future of e-learning, there are both benefits and negatives to it. The author defines gamification as the application of typical elements of game playing and principals in non-game contexts to encourage participation, improve engagement, and increase loyalty. He outlines the following benefits: Students are used to playing digital games and completing hard gaming challenges with their friends and gamification can increase motivation by allowing them to transfer this same concept to their schooling. Gamification can activate the pleasure centres of a student's brain by increasing the release of the

neurotransmitter dopamine. Games can increase motivation and develop an optimistic mindset by praising students for achievements. Students can have their self-confidence increased by being rewarded for successes but having only minor consequences for failure. Knowledge retention is improved by increased levels of dopamine in the brain which helps move what they have learned into long-term memory. Games provide students with immediate feedback that can help students identify their strengths and weaknesses. The author then outlines the following negatives of gamification: The motivation provided by gamification may only be superficial and extrinsic which may not prepare students for solving real-world problems. Some educational games are designed poorly and focused mainly on making money for the creators of the game. Finally, gamification can cause students to focus more on winning than learning.

Holloway, S. (2018). ***Gamification in Education: 4 Ways to Bring Games to Your Classroom*****. Top Hat. Retrieved from https://tophat.com/blog/gamification-education-class/**

This article focuses on ways that teachers can implement gamification in their classrooms. The author defines gamification as the use of game design and mechanics to enhance non-game contexts by increasing participation, engagement, loyalty and competition. She states that games increase motivation through engagement and this is important in education because it could potentially reduce drop out rates and the amount of time that it takes students to earn a four-year degree. The following are ways the author suggests you can gamify your classroom. Use it in your assessment system by implementing experience points rather than traditional grades. Use badges to reward students for completing assignments or mastering skills. Integrate educational video games into your curriculum. Create competitions by adopting game mechanics such as tournaments and leaderboards. Have a class-wide rewards system that encourages teamwork and collaboration. The author concludes by stating that even though critics argue that relying on games can be detrimental to intrinsic motivation, games can be used to enhance the learning experience but not replace pedagogy.

Kleman, M. (2013). ***The Debate: Gamification and Education*****. Technology Advance. Retrieved from https://technologyadvice.com/blog/information-technology/debate-gamification-education/**

This article looks at the positives and negatives of gamification of education. The positive aspects that the author outlines are: by using computers to play games students will improve their technological literacy which will transfer well into the future job market, most games require participants to handle multiple things at once which will improve students ability to multi-task, a properly set up gamification system can encourage teamwork and social networking, games can increase learners focus on projects as they become engrossed in the action, games allow for personalized instruction by allowing students to work at their own pace. The negative aspects of gamification outlined by the author are: games are expensive to develop and computer equipment is also costly, the content of games can be limiting, some games can be socially isolating and students will not have the same face-to-face interaction as in a traditional classroom environment, Attention Deficit Disorder is a growing problem with children and it has been linked to video games. The article concludes by saying that gamification may work great in some environments but not in others and the motive for teachers to utilize it should be to improve learning and not just fun.

Lister, M.C. (2015). ***Gamification: The effect on student motivation and performance at the post-secondary level*****. Issues and Trends in Educational Technology (Vol 3, No 2). Retrieved from https://journals.uair.arizona.edu/index.php/itet/article/view/18661/18410**

This article examines the effect of gamification on student motivation and performance at the post secondary level. It begins by providing facts on how the majority of Canadians play video games and access post secondary course materials through the internet, so incorporating computer games into the classroom is a great way to engage todays technology savvy students. The author reviewed 19 peer-reviewed sources from journals and conference proceedings to identify similarities, differences, patterns, and common themes on the effect of gamification on student motivation. The three main themes she found were: common elements of gamification, motivation effectiveness, and impact on performance. The common elements of gamification were: badges and achievements, points, levels, leaderboards, challenges, progress bars, peers, interactions and collaborations, coins, and storyline. The author found that 12 of 19 studies reported a positive impact on student motivation as a result of gamification, 2 of the studies reported a negative impact or no impact on student motivation, and 3 studies reported mixed results. The impact on learning and performance was not clear or mixed as many studies did not report on this. Some studies showed students increased their performance while others showed a decrease in performance. Other findings were that some studies showed an increase in student participation, lecture attendance, speed of learning, ability to transfer knowledge, feelings of acknowledgement, and accomplishment. The author concludes by stating that not all learners are motivated or benefit from gamification but the majority of studies report that the inclusion of gamified elements such as points, badges, achievements, leaderboards, and levels result in positive effects on learner motivation among post-secondary students. However, there is limited research upon which to draw a conclusion about the impact of gamification on student academic success and performance.

Lynch, M. (2017). ***How Does Gamification Affect the Learning Process?*** **The Edvocate. Retrieved from https://www.theedadvocate.org/how-does-gamification-affect-the-learning-process/**

This article discusses the positive affects that playing video games can have on the brain and learning. The author describes three ways in which games can lead to changes in brain function. The first way which gamification can affect the learning process is by optimizing the brains processing of new information. The brain processes information using visual and auditory channels and when information is presented using both these channels in small chunks like it is in games we can accommodate more new information. The second way gamification cam improve learning is through increases in motivation and engagement. Elements in games such as immediate feedback and earning badges can have a strong influence on students drive to engage in their learning. The social component of gamification can also have many benefits on brain function by activating neurotransmitters in the brain which increase brain plasticity, rewiring, and mitigate brain inflammation which can delay dementia in the elderly population. The third point of the article states that gamification can modify the brain's reward and pleasure centre by releasing dopamine when a player receives positive feedback. This can lead to a long-lasting affinity for an academic subject or solving complex problems. The increase in dopamine levels can also promote the storage of new information in long-term memory. The author concludes by saying that there is evidence that adopting gamification in education may be a healthy initiative that goes hand in hand with the digital era.

Marquis, J. (2012). Game-based vs Traditional Learning – What's the Difference? Classroom Aid. Retrieved from http://classroom-aid.com/2012/08/16/game-based-vs-traditional-learning-whats-the-difference/

This article focuses on the differences between a game-based learning environment and a traditional learning environment. The first point is that game-based learning offers a more authentic learning experience because it is not possible to engage in a truly authentic learning exercise in a classroom. Games allow students to experience simulations of reality that replicate real world activities much closer than any classroom project can because they can theoretically elicit the same emotional and learning responses in the brain as actually doing the real activity. The second point of the article is that game-based learning is more engaging for students. People develop an understanding of the world around them and social relationships they need by playing games. Students are more engaged when they are enjoying what they are doing. Games allow learners to have fun while learning. The third point is that game-based learning fosters creativity and innovation better than traditional classroom learning. Standardized curriculums and evaluations do not encourage students to think outside the box and be creative as well as games have the potential to. Games can do a better job of putting students in control of their environment and learning. The article also states that game-based learning is more costly than traditional classroom-based learning and requires that students have access to computers of other gaming devices. Students are ready for game-based learning, but the education system, teachers, parents, and the gaming industry currently lacks the infrastructure to implement it on a large scale.

Plass, J.L., Homer, B.D., Kinzer, C. K. (2015). *Foundations of Game-Based Learning*. Educational Psychologist, 50:4, 258-283. Retrieved from https://www.tandfonline.com/doi/full/10.1080/00461520.2015.1122533

This article starts by defining game-based learning as a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome that makes learning more interesting and engaging. The authors then provide arguments for why games are effective learning environments. Games have the ability to motivate learners to stay engaged over long periods of time, to be adaptable and customizable to the player's current situation or level of knowledge, and to allow for graceful failure by lowering the consequences of taking risks. The article goes on to describe the elements of game design for learning. These are game mechanics, visual aesthetic design, narrative design, incentive system, musical score, and content and skills. The content and skills that games are designed to teach can include preparation for further learning, teaching new knowledge and skills, practicing and reinforcing existing knowledge and skills, and developing 21st Century skills such as socioemotional skills related to teamwork, collaboration, problem solving, creativity, and communication. The next section of the article explains how game-based learning can facilitate cognitive processing by incorporating situatedness, transfer of learning, scaffolding and relevant feedback, dynamic assessment, visual representation of information, interaction design, and gestures and movement. The article also states that games with well designed game mechanics can increase students' intrinsic motivation to pursue a subject area.

Ronan, A. (2015). *The Ultimate Guide to Gamifying Your Classroom*. Edudemic. Retrieved from http://www.edudemic.com/ultimate-guide-gamifying-classroom/

This article outlines what gamification is and explain components and methods to gamifying your classroom. Gamification is the process by which teachers use video game design principals in their learning environments without actually playing video games. This can lead to increased student engagement and enjoyment. Components of video games that can be incorporated into the classroom are: a system to earn points, badges that recognise achievement such as mastery of a topic, levels that increase in difficulty progressively, appointments that can be set up to team up with other players to work towards achieving a task together, bonuses or hidden rewards that players can discover, infinite time allowed to master a skill or topic before moving on. Backwards design is important when gamifying your classroom. Before starting you should have a specific goal in mind and know how you want the students to get there. Gamification can be expensive, so whenever possible use free resources such as Classcraft. To make the process less overwhelming, start small by gamifying one assignment or activity, then progress to a unit, then a whole course. Create a marketplace that allows students to buy, sell, and trade with each other and the teacher. Offer the opportunity for students to level up if they have mastered a topic early by providing extension work. The article concludes by saying that gamification has many benefits and the best advice is to just dive in, but start small and work your way up to a fully gamified unit or course.

Trybus, J. (2009). Game Based Learning: What it is, why it Works, and Where it's Going. Retrieved from https://oltd508lewis.weebly.com/uploads/1/1/6/7/116785175/wp-trybus-game-based-learning.pdf

The author starts by stating that games are ideal learning environments and that the built-in learning process is what makes good games enjoyable. When people play games, they are enjoying being actively engaged in the learning process and are highly motivated to apply problem-solving skills to understand the systems and goals of the game. Effective game-based learning environments have participants work towards a goal, experience the consequences of their choices, and allow them to experiment and experience failure in a risk-free setting. The behaviours and thought processes that are learned in games are easily transferred into real life. This is much more effective and engaging than traditional rote memorization-based learning. In comparison to traditional training and learning environments, game-based learning is more engaging, has a pace tailored to individual students, provided immediate feedback in response to mistakes, offers superior transfer of learning to real-world environments, and is more engaging. The article concludes by stating that the interactive environment that games provide is much better aligned to how people learn than traditional, passive training methods because they involve the learner in the process rather than simply telling them or showing them.