Report on Gaming in Education: Gamification and Game-Based Learning

White Paper

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<u>Executive Summary</u>

- The prevalence of gaming has led to the question of how gaming can be used effectively as an aid to learning
- One report suggested that 99% of 8-15-year-olds play video games, constituting 22% of the 33 million gamers in the UK, taking into consideration games played on consoles, computers, tablets and smart phones
- We will focus on two main areas of gaming for education: gamification and game-based learning
- Gamification refers to the application of gaming thinking and mechanics to a non-gaming situation
- Game-based learning refers to the playing of games for an educational purpose
- This report will look at the existing literature on the subject of gamification and game-based learning and also our experiences in the field
- We will be releasing a research report collecting evidence from interviews and surveys of the opinions of teachers, pupils and parents in the coming weeks
- We will look at the positive and negative arguments and critiques of using gaming for educational purposes
- We need to re-evaluate our current beliefs about teaching and learning to see if those beliefs are still compatible with today's learners

Introduction

In September 2014, The Guardian reported on a study conducted by the Internet Advertising Bureau that found 99% of 8-15-year-olds play games on computers, smart phones, tablets or consoles.

This age group constitutes 22% of the 33 million gamers in the UK. This age group also played for the longest, 'racking up 20 hours of gaming a week'. This prevalence of gaming among school-aged children has led to the question of whether it can be applied to the purpose of education.

The impact that games such as Minecraft have had on educational gaming is a perfect example. In 2014, it was identified that over 200 schools in the UK and 3000 schools internationally use Minecraft in their classrooms to aid learning. Minecraft is a sandbox game that allows users to explore and go anywhere within the game, rather than having a specific linear narrative.

> 'Traditionally, our conception of learning has been associated with formal curricular structures, information dissemination and retrieval, formal and regular time patterns and formalized relationships of teacher and pupil, where a hierarchy of power relations is implicit in the sets of learning processes and relationships. A choreographic approach demands a reworking of how we think of learning. It needs conceptual shifts as well as praxis shifts to the infrastructure and practices of learning.'
>
> de Freitas & Maharg (2011)
>
> 'Digital Games and Learning: Modelling Learning Experiences in the Digital Age'

Although not created as an educational game, the potential for education was observed, leading to the development of classroom-ready MinecraftEdu.

In this report, we are going to focus on the idea of using gaming and certain ideas from the gaming world in order to improve learning outcomes and increase engagement with education. We will largely be looking at the digital application of these concepts, however, specifically in reference to gamification; the use of technology does not always have to be included. The aim of this study is to evaluate the potential of digital learning and analyse the effect on school-aged learners, and its ability to engage, motivate and provide greater depth of knowledge. Two of the main methods of digital learning that are gaining increasing recognition are game-based learning and gamification. For those not familiar with these concepts, I would like to analyse the distinctions between the two in the next section.

This concept of using gaming in education forces an evaluation of our current beliefs of teaching and learning. We need to see if those beliefs are still compatible with today's learners and the learners of the future or if a shift is necessary for pupils to be adequately prepared for life after secondary education.

We will be publishing a separate report in the coming weeks after collating the opinions of teachers, parents and pupils on the subject of gaming in education.

Gamification

Definition: The application of typical elements of game playing (e.g. point scoring, competition with others, rules of play) to other areas of activity – OED

In education, this can be achieved digitally or non-digitally. In a classroom environment, pupils may undertake a project that has minor and major tasks or aims, with progress being recorded in the form of a progress meter, accruing points and earning rewards such as extra points, XP, 'levelling up' or gaining badges and trophies. As we can see, this brings in gaming elements to a non-gaming context.

This concept has seen a rise in various aspects of education and training.

As discussed above, gaming elements may include:

- Points or scores
- Badges or trophies
- Progress metres
- Leader boards

Game-Based Learning

Game-based learning refers to the use of games to encourage learning. This can be through the use of 'serious games' inside and outside of the classroom to benefit education, or through the use of non-educational games in an educational manner.

'Serious games' are ones that have been specifically designed with an educational purpose in mind. They may have clear learning objectives and have been developed to support learning in specific subjects, usually English, maths and science.

The game itself is the learning content, which can be useful to back up a previously taught concept whilst bringing it into a new context.

As we looked at earlier, the use of Minecraft would fall into the category of game-based learning. Although not originally designed for

> 'When we are playing games, our learning abilities are challenged. We need to understand the controls of the game and its goals, perform within its rules and its fiction, make meaning of the narrative and characters, and explore the provided game space. Furthermore, we are acquiring information that we need to memorize, and we solve problems while we are forced to take actions. Sometimes we role play, cooperate with or fight against others, or interpret the actions of the simulated others. In video games, learning takes place on different levels and in a variety of ways.'
>
> Mitgutsch (2011)
>
> 'Serious Learning in Serious Games'

the purpose of education, the potential for an educational benefit was seen by people who had played the game. This then translated to the development of an educational version, which is now used in over 3000 schools worldwide.

The Goals of GBL and Gamification

Game-Based Learning and Gamification both share a common goal: to engage pupils and improve learning. The literature surrounding both methods make a clear argument for updating the way we think about learning in order to suit the needs of learners in a digital age.

As Karl M. Kapp states in his book, *The Gamification of Learning and Instruction*, 'When you get right down to it, the goals of both gamification and learning games are relatively the same. Serious games and gamification are both trying to solve a problem, motivate, and promote using game-based thinking and techniques.' (Kapp, 2012)

Below we will look at some of the key aspects of gaming for education, analysing the elements that are believed to have a positive effect on learning.

Motivation

Engagement and motivation is one of the key benefits of gaming. This is a key component of both gamification and game-based learning. The 'fun' element of gaming can be a welcome change to traditional teaching methods, which can certainly go a long way in helping pupils who may not be engaging with the traditional approaches.

Targets and objectives that are achievable and have immediate rewards for reaching them serve to keep a pupil engaged with the activity. Having small milestone goals and being able to see their own progress in this context can assist the perseverance of the child.

Environment

The gaming environment allows failure, and thus learning can arise from the opportunity to try again. In gaming, multiple lives may be given or you can simply try again. This allows a pupil to learn from the mistakes they made the first time round and be given the opportunity to try again, putting different methods or techniques into practice to succeed. This also teaches perseverance. Pupils need to not be afraid to fail, and gaming gives them this environment where they are able to take risks, identify what they did well or what they need to work upon. In this same vein, their efforts are rewarded. Rather than being punished for their failures, they are rewarded for progress.

Wood *et al.* (2013) identify the ability to replay as a key component of gaming for education, as 'Replay enables learners to gain insight, attempt to solve problems using new methods, and learn from past mistakes in a rapid, iterative process.' The rewards that may be offered as incentives motivates pupils to try again once they have failed, whether this is to achieve a certain score on the leader board or gain a badge or trophy once they have been able to overcome their barriers to success.

Different games will of course have different obstacles to overcome, and it is often the second or third time round in playing a game that shows how beneficial it can be. Pupils are able to learn from their experiences and put what they have learned into practice.

Competition

The idea of competition can be a powerful motivator. Leader boards where healthy competition can take place can stimulate learning, as mentioned previously, encouraging pupils to try again if they have occurred failure in order to beat their friends' scores, or even try to beat their own personal best.

Objectives

Aims and objectives are already a large part of the curricula. Key stages have skills that should be developed and mastered by the end of each academic year. Gaming provides a great environment for setting short and long-term goals and objectives that can be worked towards and achieved in parallel to one another.

Context for learning

Games can allow learners to put skills into practice through virtual 'real life' scenarios. This can provide an effective context for learning, allowing pupils to revise their skills and test their knowledge by transferring it to a gaming context.

Benefits and Barriers to Overcome

Gaming has received its fair amount of negative press, with studies reporting links to negative behaviours and aggression. However, a more balanced view is coming to light with the benefits gaming can have. The study we previously mentioned from Oxford University shows this. We will look more into the positive and negative perceptions of gaming as highlighted by a study of the current literature in this field in the next section.

Although a large quantity of research on the topics of gamification and game-based learning identify its potential to assist learning through improvement of engagement and motivation, along with the ability to increase depth of knowledge and develop specific skills depending on the game itself, the evidence to support these assertions is so far inconclusive.

A lack of clear, conclusive evidence is a significant barrier we face when it comes to implementing gaming in schools. It is this lack of evidence that may prevent teachers from adopting gaming for education concepts such as gamification and game-based learning.

> The results suggest that three in four British children and teenagers play video games on a daily basis, and that those who spent more than half their daily free time playing electronic games were not as well adjusted. It speculates that this could be because they miss out on other enriching activities and possibly expose themselves to inappropriate content designed for adults.
>
> Meanwhile, when compared to non-players and those who played very frequently, those who played video games for less than an hour (estimated to be less than one-third of their daily free time), were associated with the highest levels of sociability and were most likely to say they were satisfied with their lives. They also appeared to have fewer friendship and emotional problems, and reported less hyperactivity than the other groups.
>
> Przybylski (2011)
>
> http://www.ox.ac.uk/news/2014-08-04-little-video-game-playing-linked-better-adjusted-children

From teachers who have implemented elements of gamification or game-based learning, the vast majority seem to have seen the potential of games for learning through their own personal experiences of gaming. Some teachers who do not have personal gaming experiences may be more reluctant to incorporate gaming techniques in their lessons as they may lack confidence in their own ability to play and therefore teach using the games.

This is less of an issue with gamification, as technology is not compulsory to adopt this concept. Class projects or subjects can be gamified easily, through the use of rewards and class trophies, turning pieces of work into 'missions' to complete, for example.

Time restraints would therefore be a significant barrier to overcome when considering using gamification or game-based learning in the classroom, along with issues that may arise with some teachers' barriers to a new initiative.

It is vital that teachers believe in the method and are able to implement and oversee the process confidently. It may be that the teacher takes on a learner role as pupils may have more knowledge of gaming or specific games utilised for learning than the teacher has. This student-centred approach allows teachers to use what young people may already be doing at home to support learning.

Sandford, Facer and Williamson (2011) evaluate the views of gaming, 'For teachers, then, the domain of computer games is one that increasingly features in their professional discourse. The negative representation of computer games has become well-established over the last decade, with games characterized as encouraging violence, mindlessness and other anti-social behaviours,' they continue, 'However, more positives associations are being made through policy and research publications that emphasize the desirable qualities of many computer games for educators.'

Findings from research carried out by Oxford University suggests that young people playing on video games for an hour a day can lead to better-adjusted children than those who never play on video games and those who play for three hours or more a day. It is clear that although gaming should not replace traditional methods, it can be an effective way to support other methods and encourage student-centred learning.

Neurological studies suggest the release of dopamine when playing video games, which is linked to pleasure and intrinsic motivation. This could therefore link the form to increased motivation and engagement when used in an educational environment.

From the Futurelab report on console games in the classroom, the main barrier for teachers and head teachers appeared to be the perception of gaming to those outside the classroom, such as being able to show the benefits to parents and overcome any doubts they may have. The negative perceptions linking gaming to negative behaviours such as aggression and violence need to be addressed and the possible benefits highlighted in order to create increased awareness of the positive aspects to gaming, particularly when it is used to support learning.

A possible alternative may be to set game-based learning or gamification into homework or group tasks, placing the responsibility onto the pupils.

EDLounge: Gaming for Education in Practice

From the outset, EDLounge has believed in the concept of learning through gaming, regardless of a pupil's ability.

Along with a platform of e-learning content with lessons in a range of subjects, the platform served to reward pupils' learning with games. Time pupils spent learning is rewarded with time spent in a virtual world, EDVille. Any aspect can also be turned on or off at specific times.
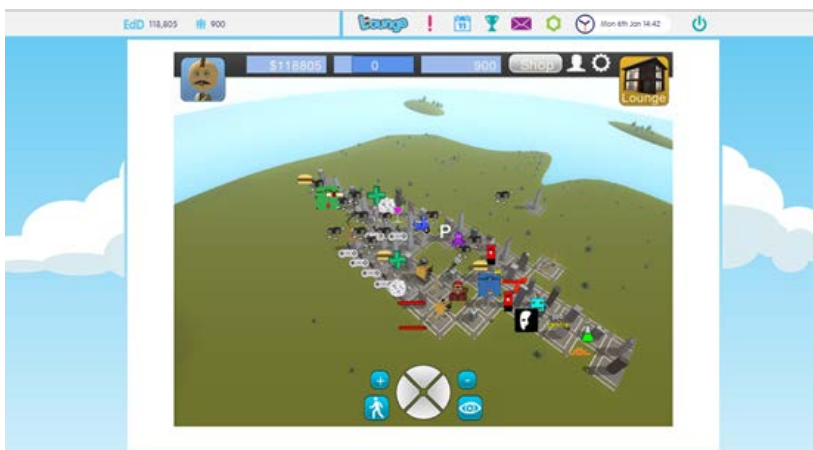

Figure 1: EDVille

This is where each student automatically becomes the Mayor of EDVille, making managerial decisions to build enterprises to turn their small island into a village, then city, and eventually into an empire. The student can invest the virtual money (EDDollars) they have earned through completing work on the system into their businesses to generate more revenue, custom and increase their village's population. As the student's enterprises and city earns revenue, the student is rewarded with even more virtual money. By completing independent tasks, pupils will be able to unlock hidden gems, games and applications to motivate them to continue learning.

Although here we see gaming used as a reward and a motivational feature for pupils to complete educational content, over the last few months we have been seeking to further develop our application of gaming by using it not only as a reward but to deliver and develop content knowledge itself. This has resulted in a series of mini-games with pupils being able to select a specific subject area to develop knowledge and understanding, particularly in maths, English and science.

Figure 2: Short Circuit

Richard Howard, Lead Game Developer at EDLounge, is a firm believer in the potential of gaming in education, he stated, "Education can be seen as boring or compulsory, couple it with games and it can be turned into something exciting, rewarding, challenging and compelling."

As we develop the gaming portal of EDLounge, we are adding trading elements, along with rewards such as stars and ratings. We believe this will further increase motivation and engagement with the platform.

EDLounge has found that EDVille and the mini-gaming suite has been effective in engaging pupils, who have often chosen to play the educational games we have in their own time in the evening, at weekends and over school holidays. A large element of the 'fun' factor of a game to increase motivation rests on the fact that children choose to play; it is not something they are forced to do. It

Figure 3: Road Hog - Level on Vowels and Consonants

is also important that they have the opportunity to play autonomously, being able to work out for themselves what they did wrong and what they will need to do the next time they play in order to get a higher score, for example.

The games available through the system can be played in a generic 'quick play' mode, or focus on specific subject areas or topics.

The addition of leader boards has also proven to be effective, with pupils able to measure their scores against their friends' along with a global leader board covering all of the schools on the system.
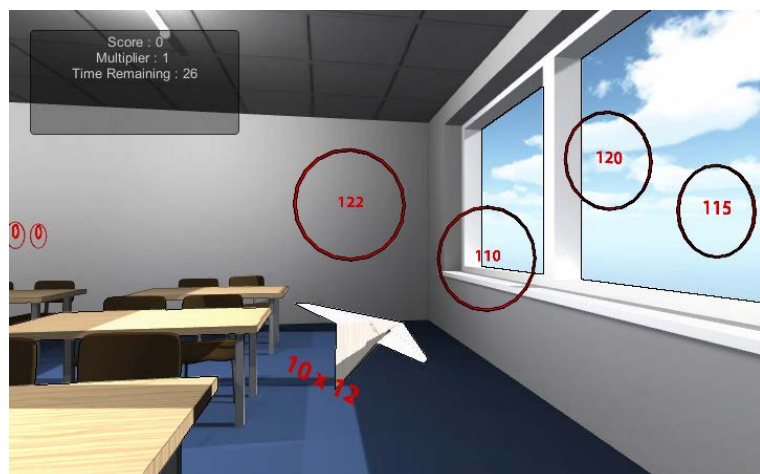

Figure 4: Flight Math

Users can send challenges to their friends, further enhancing the competitive element, which as we have seen can be an effective motivator and increase learning potential. Not only can friends challenge one another, but parents can also challenge their children. We believe that this feature will increase parents' understanding of the positive effect gaming can have on their child's education.

Conclusion

In conclusion, gaming seems to be an innovative and effective method of aiding learning. Links to increased motivation and engagement show that both gamification and game-based learning can successfully be used in education to develop skills, aid depth of knowledge and present information to school-aged children in a way that is accessible to them as digital natives.

As we have seen, the possible benefits of gaming in education include increased motivation and engagement; a safe environment to fail, therefore learn, and progress teaching perseverance; developing skills and depth of knowledge by transferring previously taught aspects into a new and engaging context.

Although there are many perceived benefits to adapting a game-based pedagogy, it is clear that the extents of the possible negative or positive effects have so far not been sufficiently proven or disproved through current research.

From our experience in 250 schools around the UK, we have seen a positive impact on learning both through offering gaming as an incentive for completing work and from having a specific area of educational mini-games.

Although there are barriers to overcome, more practitioners are seeing the potential of gaming for learning and introducing it into their lessons and schools. This trend shows that we are recognising the need to adapt our teaching methods for learners in a digital age in order to both engage them further in their education and to prepare them for the future.

We hope that the research we are currently conducting into the experiences and viewpoints of teachers, pupils and parents will give us further insight into the possibilities of gaming for education.

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